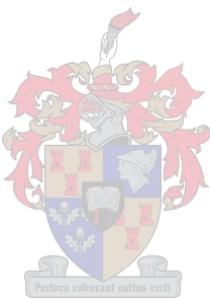


**A HOUSEHOLD SOLID WASTE RECYCLING PROGRAMME IN STELLENBOSCH:
HOUSEHOLDERS' ATTITUDES AND WILLINGNESS TO PARTICIPATE**

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Thesis presented in partial fulfilment of the requirements for the degree of Master of Arts
at the University of Stellenbosch.



Supervisor: Dr PH DE NECKER

APRIL 2006

DECLARATION

I, the undersigned, hereby declare that the work contained in this thesis is my own original work and that I have not previously in its entirety or in part submitted it at any university for a degree.

Signature:

Date:

ABSTRACT

Municipal waste presents problems of pollution, health hazards and resource conservation. Household waste forms part of municipal solid waste that is a challenge to control due to its heterogeneity and diversity. The ever-filling landfills for the disposal of solid waste due to rapid population increase and urbanization call for urgent waste management strategies to reduce, reuse and recycle solid waste. In this study householders' attitudes, participation in recycling and willingness to participate in household solid waste recycling are investigated to design and implement a household solid waste recycling programme in Stellenbosch. Questionnaire survey data about the awareness of, attitudes towards, and participation in household waste recycling were analyzed using descriptive statistical methods in the STATISTICA V6 program. Results were displayed in frequency tables, bar charts, maps and pie charts. The same statistical program was used to find the relationship between the householders' willingness to participate in the household solid waste recycling programme, namely the Blue Bag Household Waste Recovery Programme (BBHWRP), and their socio-demographic and socio-economic characteristics. The respondents' willingness to sort household waste is compared to their willingness to participate in the BBHWRP in Stellenbosch. The willingness of householders in different residential areas is also compared. The relationships were analyzed by performing cross-tabulations and the chi-square test.

The householder's attitudes towards household solid waste recycling were found to be positive, showing pro-recycling and pro-environmental behaviour among the respondents. Participation in recycling was found to be relatively moderate where separation of waste, self-delivery of recyclables to recycling buy-back centres and depots were commonly practised. Composting was least reported to be practised by householders in Stellenbosch. Respondents showed strong willingness to participate in the BBHWRP, however, most of the explanatory factors used, including place of residence, did not relate to respondents' willingness to participate in the BBHWRP. Despite this situation, smaller families and respondents' willingness to sort household waste at home by householders were found to relate directly to willingness to take part in the BBHWRP. There were, however, poor response rates in the study. Although reminders were used to improve response rates, only a 30 per cent response rate could be reached. It is recommended that a household solid waste sorting and recycling scheme in Stellenbosch should be considered in order to minimize and recycle household waste to extend the lifespan of the town's landfill site.

KEY PHRASES: household solid waste recycling, attitudes towards solid waste collection, participation in household waste recycling, willingness to participate in household waste recycling, household waste separation

OPSOMMING

Munisipale afval skep probleme vir besoedeling, gesondheidsrisiko's en hulpbronbewaring. Huishoudelike afval vorm deel van die vaste afval wat moeilik is om te beheer weens die heterogeniteit en diversiteit daarvan. Die stortingssterreine vir vaste afval word al hoe voller weens die immer groeiende bevolking en weens verstedeliking, en dringende afvalbestuurstrategie om die soliede afval te verminder, weer te gebruik en te herwin, word benodig. In hierdie studie word gekyk na die houdings van die huisgesinne, hulle deelname aan herwinning en hulle gewilligheid om deel te neem aan vaste afvalherwinning sodat 'n huishoudelike vaste afvalherwinningsprogram ontwerp kan word en in Stellenbosch implementeer kan word. Vraelysopnamedata oor die bewustheid van, houdings teenoor en deelname aan huishoudelike afvalherwinning is ontleed met beskrywende statistiese metodes in die STATISTICA V6-program. Die resultate word vertoon in frekwensietafel, balkdiagramme en sektordiagramme. Dieselfde statistiese program is gebruik om die verwantskap tussen die huisgesinne se gewilligheid om deel te neem aan die huishoudelike vaste afvalherwinningsprogram, naamlik die Blue Bag Household Waste Recovery Programme (BBHWRP), en hulle sosio-demografiese en sosio-ekonomiese kenmerke te vind. Die respondent se gewilligheid om huishoudelike afval te sorteer is vergelyk met gewilligheid om deel te neem aan die BBHWRP in Stellenbosch. Die gewilligheid van gesinne in verskillende woongebiede is ook vergelyk. Die verhoudings is ontleed aan die hand van kruistabulasies en met behulp van die chi-kwadraat toets.

Daar is gevind dat die huisgesinne se houdings teenoor die herwinning van vaste huishoudelike afval positief is, wat 'n aanduiding gee dat die respondent pro-herwinning en pro-omgewing is. Daar is gevind dat die deelname aan herwinning relatief gemiddeld is waar sortering van afval en die self-aflewering van afval by herwinningsterugkoopsentra algemeen beoefen word. Baie min huisgesinne in Stellenbosch is betrokke by die maak van kompos. Respondente toon gewilligheid om deel te neem aan die BBHWRP, maar daar is gevind dat die verklarende faktore, insluitende woonplek, nie verwant is aan hulle gewilligheid om deel te neem aan die BBHWRP nie. Ten spyte van hierdie situasie is daar gevind dat kleiner gesinne en die respondent se gewilligheid om huishoudelike afval tuis te sorteer, direk verwant is aan gewilligheid om deel te neem aan die BBHWRP. Daar was egter swak responskoerse in die studie. Alhoewel herinneringbriewe gebruik is om responskoerse te verbeter, is 'n responskoers van net 30 persent behaal. Daar word aanbeveel dat 'n vaste huishoudelike afvalsorteringskema in Stellenbosch oorweeg moet word om huishoudelike afval te verminder en te herwin en om die lewensduur van die stortingsterrein te verleng.

SLEUTELFRASES: herwinning van huishoudelike vaste afval, houdings teenoor vaste afvalverwydering, deelname aan huishoudelike afvalherwinning, gewilligheid tot deelname aan huishoudelike afvalherwinning, storting van huishoudelike afval

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CHAPTER 1: THE URBAN SOLID WASTE PROBLEM: A QUESTION OF RECYCLING

1 INTRODUCTION: WASTE NOT, WANT NOT

The management of solid waste continues to be a major challenge in urban areas throughout the world, but particularly in rapidly growing cities and towns of the developing world (Seik 1997). Ineffective and inefficient solid waste management can result in environmental health hazards and can have negative impacts on the environment. Solid waste presents a problem of disposal, but is also seen as a possible resource. These two possibilities require an understanding of the difference between waste and refuse. According to Ojeda-Benitez, Armijo-der-Vega & Ramirez-Barreto (2000), when waste is disposed of in the same container and mixed together, causing unpleasant odours and pollution, and making it impossible to reuse some, it is called “refuse”. However, when the disposed of objects are handled correctly, they can have value and are called “waste”. Furthermore, when such objects are kept separate, waste such as tins, cans, cardboard, glass and plastic containers can be re-used and/or recycled. Reuse refers to the reuse of products in the same capacity for which they were originally manufactured, for instance, reusing of bottles and other containers by washing them and refilling them. Recycling involves the processing of residuals to produce the same raw materials used in the initial manufacture of the final product (Judais 1986). Improving recycling rates might be the primary target of many recycling schemes, however, it is important to understand that recycling should not be seen as a goal in itself, but only as a means of reaching a paramount environmental goal (Backman & Lindqvist 1992). Diversion of waste from landfills can be achieved in many ways and public understanding and participation are the most important factors in this process (Thomas 2001).

The collection, handling and disposal of solid wastes in large cities constitute a problem that is causing worldwide concern. Recycling is perhaps the most positively perceived and feasible of all the waste management practices (Kreith 1994; Noehammer & Byer 1997). Recycling returns raw materials to the market by separating reusable products from the rest of the waste stream. Solid waste recycling is one component of a more comprehensive solid waste management strategy that usually includes solid waste collection, storage and transportation as well as solid waste disposal options such as waste reduction, reuse and recycling besides incineration and landfills (Seik 1997). However, sustainable urban solid waste recycling, particularly household solid waste recycling,

should consider, among other factors, community participation, a market for recyclables, state of recyclables, storage, method of collection and/or transport.

1.1 Municipal solid waste management (MSW)

Municipal solid waste dynamics in less developed countries (LDCs) and more developing countries (MDCs) reveal that rapid population growth and urbanization have led to the massive growth of cities in LDCs, which has far outstripped efforts of municipal governments to provide basic services to their citizens (Taylor 2004). In most cities in LDCs there is an extremely uneven provision of sanitation services and other urban needs. There is therefore an urgent need to find effective solutions to municipal solid waste (Taylor 2004).

Urban solid waste is the product of a wide range of activities that take place in commercial, household, industrial, institutional and agricultural activities in urban areas (Pacione 2001). Municipal solid waste comprises primarily household collected waste, but also includes light commercial and industrial waste collected by local authorities. Thus the latter can also be referred to as urban waste (Buenrostro, Bocco & Cram 2001). According to Read (1999), it is best to address municipal solid waste because, as the waste that the public has most contact with, the management of municipal solid waste has achieved a high political profile. Household waste is an element of municipal solid waste, which is one of the most challenging sources of waste to manage effectively because of the diverse nature of its material (Jackson 1975; Mbande 2003). Municipal solid waste recycling programmes can be designed to serve one or any of a combination of residential, commercial, and institutional sectors within a community (Noehammer & Byer 1997). According to Noehammer & Byer (1997), residential programmes can differ in the point of collection, and in other factors such as programme type, materials collected, number of segregations, provision of collection container, collection frequency, collection day, collection vehicle type, availability of education programme and economic incentives. Common issues that are experienced with recycling programmes are that they overrun the expected implementation costs, there are variable public participation rates, fluctuating markets for recyclable materials and resistance to sorting at source by householders. Hence, it is important that municipalities properly design and remain in control of a recycling programme throughout its existence.

1.1.1 Environmental aspects of solid waste recycling

According to Judais (1986), all waste and refuse has only two possible ends: discharge into the environment or reuse, reclamation and recycling. Environmental arguments in favour of waste reuse and recycling have traditionally focused on conserving resources and lessening the impacts of disposal methods (Ball 1999). Gould (2000) maintains that waste reduction, reuse and recycling –the 3Rs of environmental conservation – represent an important component of any serious attempt to address the waste management problem in African countries. Other problems associated with waste and the need to protect the environment are the threat of pollution and the nuisance caused by waste. Judais (1986) points out that environmental quality can be improved by a substantial reduction of waste generated by humans through (i) conserving the materials and energy and sacrificing economic growth, and (ii) planned reuse, reclamation and recycling. The former solution would mean some form of rationing, unemployment and the collapse of industrial society.

Reuse, reclamation and recycling, on the other hand, would mean first of all that some goods could be used more than once for the same purpose for which they were originally manufactured. Secondly, the useable waste would be collected, sorted and upgraded for conversion – reclamation and finally further processed into new products – recycling.

1.1.2 Proponents of and opponents to recycling

The selection of an appropriate "optimal" recycling alternative has to take into consideration both the ecological and economic effects of the entire life cycle (Peter & Salhofer 2004). Despite this, sometimes economists consider recovery of products from waste recycling to be uneconomical (Judais 1986). Nevertheless, in the recycling effort, economics is not the sole criterion against which the cost of recycling, which involves handling, transport, and treatment, should be measured. The benefits and importance of recycling can be immense. In general, using recycled materials to make new products costs less and requires less energy than using new materials. Recycling can also reduce pollution, either by reducing the demand for high-pollution alternatives or by minimizing the amount of pollution produced during the manufacturing process. Recycling decreases the amount of land needed for garbage dumps by reducing the volume of discarded waste (Judais 1986; Hartman 1999). Opponents to recycling emphasize that some recycling operations may result in the generation and discharge of residuals that are more damaging to the environment than the residuals of processing activities in the first time around (Judais 1986). It is equally argued that the amount of energy required for recycling may be greater than that required when using virgin material.

Either way, recycling in general or metal recycling in particular is believed to enjoy a very bright future (Tilton 1999). As resource depletion, environmental concerns and other factors drive primary production costs up, the relative importance of recycling in supplying the material needs of society will grow (Tilton 1999).

1.2 Problem statement: The question of domestic solid waste management

The recycling of domestic waste and other waste is beset by a number of problems. Not least of these are the high cost of collection and economic difficulties encountered in separating the usable components. Sorting at the source – by the householder – may be difficult to implement, but offers an attractive alternative which holds an opportunity for recycling as a practical matter (Kirov 1975; *Hermanus Times* 2003). Public attitudes about and willingness to participate in recycling are the main driving forces in such endeavours. Equally so is the need for increased levels of investment and expenditure in order to achieve an increased level of diverting waste from landfills, and of treating recovered materials in an environmentally friendly manner (Read 1998) as in Evison & Read (2001). Recently, initiatives have been taken by South African municipalities to control solid waste management. In terms of these initiatives all municipalities have to have an integrated waste management plan (IWMP) in place by 2005 (Kotze 2004; *Stellenbosch Municipality Newsletter* 2004). The IWMP clearly stipulates recycling and waste reduction as major issues. The Stellenbosch municipality is currently implementing a household solid waste recovery programme; hence the need to investigate local attitudes towards and willingness to participate in such activities (Kotze 2004).

1.2.1 Rationale of the study: Recycling household solid waste in Stellenbosch

Informal waste collection has recently spread from the central business district to the residential areas of Stellenbosch, where waste collectors roam the suburbs and dig in the household refuse bags in search of recyclables, as predicted by Van Lill's (1998) study. Often, after taking the recyclables, the refuse is left to litter the area. Some residents (for example, Ward 2003), believe that sorting the waste at home could put an end to the activities of the itinerant collectors. However, Semoli (1998) found that there was no official recycling of household solid waste in Stellenbosch.

The Blue Bag Household Waste Recovery Programme (BBHRWP) is Stellenbosch municipality's initiative to introduce household solid waste recycling in Stellenbosch. It is a household solid waste separation and recycling scheme run on a voluntary basis in selected areas of Stellenbosch.

(Brandwacht, Ida's Valley and Cloetesville). In the past Stellenbosch did not practise any formal recycling activities per se and did not have an official recycling policy (Semoli 1998; Kotze pers. com 2004). A composting project in Stellenbosch was halted because it was argued that the exercise was very expensive (Kotze 2004 pers. com.; Van der Merwe 2004 pers. com). The efforts in the recent past in recycling have been an initiative at the Stellenbosch dumpsite by an individual, who sells the recyclables to recycling companies, and the informal recycling, which involves scavengers (Semoli 1998; Van Lill 1998). The Stellenbosch municipality is therefore exploring the feasibility of the BBHWRP as a way to reduce the amount of waste going to the landfill, thereby extending the life-span of the landfill site for future generations. In addition, it is also an attempt to discourage informal "trolley collectors" from going to the residential areas and from scratching through the black refuse bags, by trying to engage some of them in sorting activities at a central location, in partnership with local recycling centres (Dittke 2004 pers.com; Kotze 2004, pers. com). A project team headed by EnviroSense CC in partnership with the Fairest Cape Association (FCA) and Environmental Cleansing Services (ECL) has been appointed by the Stellenbosch Municipality to run this pilot project with 1 000 households for a period of twelve months (July 2004-June 2005).

1.3 The purpose and objectives of the study

The overarching aim of the thesis is to determine the potential feasibility of a household separation and recycling scheme in Stellenbosch's urban residential areas.

The research intends to address the following objectives:

1. To investigate the attitudes of the householders towards household solid waste separation and recycling and determine their actual participation in the process;
2. To gauge and explain the potential willingness of householders to take part in the BBHWRP; and
3. To provide recommendations on the implementation of a household recycling programme in Stellenbosch based on community willingness to participate in and their attitudes towards household solid waste recycling.

Semoli (1998) has investigated householders' participation in solid household recycling in Stellenbosch. He found that only 23 per cent of the population surveyed participated in glass recycling and 33 per cent participated in paper recycling at least once a month. Therefore,

implementation of a household solid waste recycling scheme in Stellenbosch localities will present an opportunity to further improve householders' participation in domestic solid waste recycling. The study area covered in this research is described in the following section.

1.4 Study area: Stellenbosch town

The study area covers the Stellenbosch urban residential area (Figure 1.1). It is situated about 50 kilometres from Cape Town and has a population of around 90 000 as of the year 2000, not counting students. This estimate is based on formally housed residents (Wikipedia s.d.). As such it is almost certainly understated, as the Stellenbosch region also includes a number of informal settlements (Wikipedia s.d.). However, Stellenbosch municipality has a total population of 117 705 as of the year 2001 (Statistics South Africa 2001). The coverage of this study area is expected to provide a wide variation in the attitudes of residents towards household waste recycling to enable the implementation of a suitable household solid waste recycling scheme for the diverse population of Stellenbosch, in terms of socio-economic and demographic characteristics.

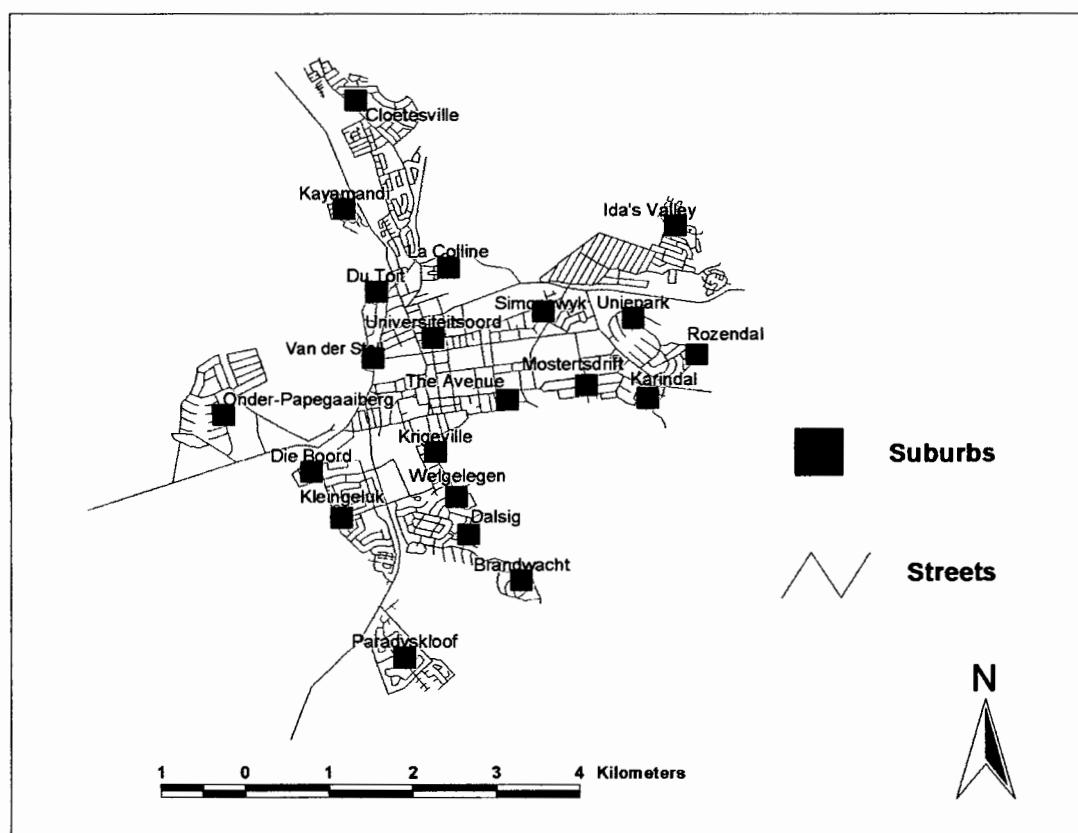


Figure 1.1: The study area – Stellenbosch residential suburbs

1.5 Research methodology: Household survey

The study is survey research. In survey research a questionnaire is administered to a sample of respondents selected from some population. Survey research is appropriate for making descriptive studies of large populations; survey data can also be used for explanatory purposes (Babbie 2000). This section explains the method undertaken to achieve the research objectives. It begins with the data needs, sampling procedure, methods of data collection and sources and the data analysis, and concludes with a diagrammatic research design.

1.5.1 Data needs

The data required are both secondary and primary. An extensive literature survey on solid waste recycling and its efficacy in other parts of the world and in South Africa was undertaken utilizing various sources of information such as journals, books, reports and newspapers (Makau 2004). A list of all Stellenbosch households was provided by the Stellenbosch municipality's housing department. The list contained physical addresses and postal addresses which enabled the researcher to locate the households during the distribution of the questionnaires.

Primary data were obtained by a questionnaire survey in Stellenbosch's residential areas. The data required in this research can be grouped into (i) general information about the respondents which covered socio-demographic, socio-economic and spatial characteristics; (ii) attitudinal data which covered householders' awareness about domestic solid waste recycling in their localities as well as their participation; and (iii) potential participatory and recycling behavioural data which covered willingness to participate in a household waste recycling scheme.

1.5.2 Sampling procedure

A sample of respondents in Stellenbosch was drawn from the list of 8 331 addresses and property owners obtained from the Stellenbosch municipality (September 2004 pers.com). A computerized random sampling procedure in STATISTICA V6 selected a sample of 274 households (3.3 per cent of the total households). The sample was stratified proportionally depending on the number of households in each suburb such that in each suburb 3.3 per cent of households were randomly selected (see Appendix 1).

1.5.3 Data collection method: Mailed questionnaire survey

A self-administered questionnaire was used. Questionnaire distribution was done by a combination of home delivery and return mailing. The choice of home delivery and return mailing was made to avoid confusion in the cases where the owners of the property were renting their houses to tenants who would be the respondents. The researcher delivered a questionnaire to each address selected in all the residential areas. Each questionnaire was accompanied by a postage-paid envelope addressed to the researcher, which the respondent could use to mail back the questionnaire. The questionnaire structure, response rate and problems encountered are briefly discussed below.

1.5.4 Composition of the questionnaire

The questionnaire is divided into three sections: section A deals with the general information about the respondent, section B concentrates on participation in and the attitude towards solid waste recycling, and section C is concerned with the willingness to participate in household recycling (see Appendix 2). The questionnaire was designed in such a way that each section addresses one or a combination of the research objectives. The questionnaire was accompanied by a covering letter explaining the aim of the survey and providing assurances about confidentiality.

1.5.5 Response rates

The response rate to the initial distribution of 274 questionnaires was 21.5 per cent (59 questionnaires). Reminders were delivered by hand two weeks after the initial distribution and the response rate increased by another 7.7 per cent (21 questionnaires), giving a final response rate of 29.2 per cent (or 80 usable questionnaires). Response rates of less than 29 per cent were obtained from some suburbs (Cloetesville, Ida's Valley, Paradyskloof, Die Boord/Kleingeluk and Onder-Papegaaiberg) and non-response from La Colline and Du Toit/Alexander/Bergzicht) as shown in Table 1.1. The response rates in this study show a tendency for low response levels from some White suburbs and both of the Coloured areas, whereas there was a high response level from the African township and the other areas. This can be due, on the one hand, to reluctance to participate in the research and, on the other hand, to participate in the hope of getting something in return. The latter was most encountered in Kayamandi where people asked if the municipality would compensate them for participating in the research.

Table 1.1: Household response rates to questionnaire survey regarding the implementation of a household solid waste recycling scheme in Stellenbosch

Date of delivery	Delivered questionnaires	Suburb	Actual return	% actual return	% return rate
12/09/2004	35	Kayamandi	24	30	69
13/09/2004	4	La Colline/Kromriver/Prinspark	0	0	0
14/09/2004	13	Onder-Papegaaiberg	3	4	23
15/09/2004	19	Paradyskloof	3	4	16
15/09/2004	5	Simonswyk	3	4	60
16/09/2004	10	Rozendal/Uniepark/Jonkerspark	8	10	80
17/09/2004 & 21/09/2004	19	Welgelegen/Dalsig/Brandwacht/Krigeville	14	18	74
21/09/2004	25	Die Boord/ De Oewer/ Kleingeluk	8	10	32
21/09/2004	48	Cloetesville	3	4	6
21/09/2004	50	Ida's Valley	5	6	10
25/09/2004	10	Mostertsdrift/Karindal/Van der Stell	6	8	60
01/10/2004	3	The Avenue	1	1	33
02/10/2004	19	Du Toit/ Alexander/Bergzicht	0	0	0
02/10/2004	11	Universiteitsoord/Merriman/Banhoek	2	1	9
02/10/2004	3	Die Laan	0	0	0
Totals	274		80	100	29

1.5.6 Data analysis

The questionnaire comprises structured, open-ended and multiple response questions. Answers were coded and entered into Excel files for analysis. The Excel files were transferred to STATISTICA V6. Frequency tables, multiple response tables and cross-tabulations were generated and the chi-square test was performed. Chi-square is the most common test for significance of the relationship between categorical variables. The statistical significance of a result is an estimated measure of the degree to which it is "true" (in the sense of "representative of the population"). In this study the significance of the relationship between the variables is drawn based on the p-level of 0.05. The higher the p-level, the less we can believe that the observed relationship between variables in the sample is a reliable indicator of the relationship between the respective variables in the population. The results are displayed in tables, bar graphs, pie charts and maps.

1.6 Research framework

Figure 1.2 diagrams the research design and method of research used in the study. It is a logical explanation of steps that can be followed to replicate the same kind of research in the future and elsewhere. It explains in a nutshell a possible method of evaluating householders' attitudes towards and willingness to participate in a domestic waste recycling programme. The major steps are to (i) define the aim of the study; (ii) define ways to achieve the objectives; (iii) describe the data required to achieve the aim of the study and method of data collection; (iv) provide background information about urban solid waste management; (v) list the methods of data analysis to produce results that describe and explain the findings; and (vi) draw conclusions, make recommendations and assess the successfulness of the research.

Aim: Investigate feasibility of household solid waste recycling programme for Stellenbosch residents (Blue Bag Household Waste Recycling Programme (BBHWRP)) by assessing community participation and willingness

Objectives: Determine households' attitudes to and participation in domestic solid waste recycling; explain willingness to participate in household solid waste recycling using householders' socio-demographic, socio-economic and locational characteristics
(Chapter 1)

Data description and collection method

- Householders' general data—socio-demographic, socio-economic and spatial data; household waste solid recycling awareness and views about it, potential participation and willingness to participate in domestic solid waste recycling
- Home delivery and return mail household questionnaire survey

(Chapter 1)

Literature review: Theoretical overview of urban solid waste management; urban solid waste recycling programmes; attitudes towards domestic solid waste recycling; barriers to and motives for household solid waste recycling; domestic solid waste recycling in Stellenbosch

(Chapter 2)

Data analysis: Descriptive statistical analysis (frequency tables, bar graphs, cross-tabulations, chi-square test); describe householders' attitudes towards and participation in household solid waste recycling; explain the relationship between householders' characteristics (age, gender, educational status, employment status, income, housing tenure, housing type as well as their residential location and willingness to participate)

(Chapters 3 & 4)

Conclusions and recommendations: Assess the achievement of objectives; draw conclusions of the findings and provide recommendations; identify limitations and provide recommendations for further research to improve household solid waste recycling programme

(Chapter 5)

Figure 1.2: Research design for the evaluation of residents' attitudes towards and willingness to participate in a household solid waste recycling programme

1.6.1 Organization of the report

The thesis report consists of five chapters. Chapter 1 provides background information about municipal solid waste recycling and has set out the problem formulation, objectives, data

requirements, methodology, the study area and the research framework. Chapter 2 deals with the theoretical background of municipal household solid waste recycling. This is achieved through a literature review concerning the nature of municipal household recycling programmes and collection systems adopted. Informal recycling is reviewed as well as household participation in household solid waste recycling and recycling behaviour. Chapter 3 evaluates the respondents' attitudes towards household solid waste recycling in Stellenbosch. The householders' participation in and attitudes towards household solid waste recycling are analyzed using frequency tables and graphs. Respondents' awareness of domestic solid waste recycling is evaluated based on households' knowledge of household solid waste recycling and their views about waste collection systems. Chapter 4 provides an estimation of willingness to participate in the local household solid waste recycling programme. The householders' willingness to participate in domestic solid recycling is gauged using explanatory factors (socio-demographic, socio-economic and locational data). Chapter 5 presents an evaluation of objectives, as well as the conclusions and recommendations. It also identifies limitations of the study and provides recommendations for further research. In the next chapter the literature concerning urban solid waste issues is reviewed.

CHAPTER 2: SOLID WASTE MANAGEMENT IN URBAN AREAS: WHAT WORKS BEST?

2 INTRODUCTION: DOMESTIC WASTE MANAGEMENT STRATEGIES

The importance of waste management is becoming increasingly topical because of the lack of an efficient collection and treatment system (Marlow & Clapton 2003). According to Westaway (1993), between 30 and 50 per cent of solid waste generated in urban areas of developing countries is neither collected nor treated. It is projected that by 2025 urban waste in developing countries will more than quadruple (Sanoi 1998). Sanoi (1998) has suggested that the solution to this problem lies in recycling, and composting of organic material. Noehammer & Byer (1997) point out that municipalities can approach the design of recycling programmes from two perspectives, namely (i) to achieve a specified waste diversion target or (ii) to optimize design by considering trade-offs between a higher diversion rate and higher costs. In the former approach municipalities are usually faced with a critical shortage of landfill space and a concern for achieving a high diversion target. In the latter approach they concentrate on developing a balance between cost and effectiveness in their recycling programme, if landfill space is still available. The objective of this chapter is to provide theoretical and background information on different designs for urban waste recycling programmes with the focus on residential recycling programmes. The literature emphasizes the important influence the type of recycling programme has on householders' participation in recycling, their attitudes and behaviour towards and the barriers to recycling. The terms "recycling programme" and "recycling scheme" are used interchangeably in the discussion.

2.1 Design components and features of residential solid waste recycling programmes

Many variables must be addressed when designing a residential curbside recycling programme: for example, whether participation in the programme by residents is mandatory or voluntary; the types of materials to be recycled and number of segregations; whether a collection container is provided and its type; collection frequency and day of collection; collection vehicle type; education programme; economic incentives (Spencer 1994; Noehammer & Byer 1997; Watts & Probert 1999); convenience (Everett & Pierce 1993); and information and knowledge (McDonald & Oates 2003). The following section discusses the characteristics that define different recycling programmes and their design features.

2.1.1 Mandatory versus voluntary solid waste recycling programmes

When developing a recycling programme a key decision that must be made early in the process is whether participation in the programme by households (waste generators) is mandatory or voluntary. Noehammer & Byer (1997) define a mandatory programme as one which requires by law that all residents participate in the recycling programme; hence the type of enforcement mechanism used is a key factor that influences participation and recovery rates. In contrast, voluntary recycling programmes give residents the choice whether to participate or not. As a result, it is crucial for features of voluntary programmes to include the provision of some incentives for residents to participate. In the United States mandatory recycling has resulted in high recovery rates—from 30 to 100 per cent—compared to voluntary recycling (Everett & Pierce 1993). However, Spencer (1994); Glenn (1994); and Noehammer & Byer (1997) argue that there is no evidence to indicate that well-communicated voluntary recycling cannot achieve the same levels of participation as a mandated programme.

2.1.2 Types of material to be recycled and sorting methods

The system of the collection of recyclables has a significant impact on the programme cost and the quality of recyclables collected. Noehammer & Byer (1997) indicate that the two primary collection methods are segregated and commingled collection. Spencer (1994) identifies source separation and mixed municipal solid waste collection. Segregated collection requires residents to separate their recyclables into various categories, for example, newspapers may be bundled and glass and plastic placed in a container. Another segregated collection system requires the separation of garden waste into a green bin and unmixed waste into black bins. In some German cities residents had up to seven different bins in which to place different materials (Schultz, Oskamp & Maineri 1995; Woodard, Harder, Bench & Philip 2001). Commingled collection requires residents to make one segregation, i.e. to separate recyclables from non-recyclable materials. In this case recyclables are transported to a central place or material recovery facility (MRF), where they are segregated into separate recyclable components (Spencer 1994; Noehammer & Byer 1997). Source separation involves separation of recyclables into separate components either by the waste generator or at the curbside by the collector. Finally, mixed municipal waste does not involve any segregation of recyclables from other waste materials. In this case mixed trash is placed on the curbside for collection and is disposed of in landfill or by incineration (Spencer 1994). Source separation and segregated methods require a high degree of generator involvement and imply high collection costs but low processing costs. The commingled method requires only an intermediate

added collection cost (Spencer 1994) and has participation rates of 75 to 95 per cent (Noehammer & Byer 1997).

2.1.3 Provision and type of container

Noehammer & Byer (1997) point out that municipalities have three options regarding the provision of a container, namely (i) to provide a container to residents free of charge; (ii) charge residents for a specific container; or (iii) provide no container. It has been documented that provision of a container increases participation rates and recovery levels. For example, Platt, Doherty, Broughton & Morris (1991) found that participation rates for six communities in the United Kingdom that provided containers for curbside collection of recyclables averaged 93 per cent, against 82 per cent in nine communities that did not. The high participation rates and recovery levels associated with the provision of a free container are owing to increased convenience, a visual reminder to recycle and peer pressure, since the absence of a container clearly identifies non-recyclers (Platt *et al.* 1991).

2.1.4 Collection frequency and collection day

Everett & Pierce (1993) argue that collection frequency and day relate to convenience in such a way that, when recyclables are picked up frequently, convenience may be increased because if one pick-up day is missed the wait for the next is shorter so that there is less build-up of materials and cost and participation are not adversely affected. Noehammer & Byer (1997) identify the five common collection frequencies among recycling programmes as weekly, biweekly, once every three weeks, monthly and bimonthly. In each case the municipality must decide whether it is worthwhile spending more money on more frequent collections. Although research carried out on the impact of collection frequency has shown conflicting results, Everett & Pierce (1993) found that collecting all waste on the same day may be more convenient, because it is easier for recyclers to remember if they are already putting out their non-recyclable waste.

2.1.5 Convenience

Convenience is often cited as an important factor related to participation in household recycling. Everett & Pierce (1993) point out that the cost of participation is an additional factor in encouraging participation in recycling. Hence, making participation more convenient reduces personal cost and thus should increase participation. Recycling behaviour would appear to be related to the level of *inconvenience* caused by (i) the type and design of the scheme offered, (ii)

the materials being recycled, and (iii) the level of change required in existing household behaviours in order to participate in a scheme and recycle each type of material (Perrin & Barton 2001).

2.1.6 Knowledge and information about recycling

Tucker (1999) and Corral-Verduga (2003) point out that knowledge, information and convenience are vital for a successful residential recycling programme. Adequate communication and information in recycling are important because they can change the habits and traditions as well as attitudes and motivations of the residents for the better (Watts & Probert 1999; Evison & Read 2001). The degree to which the recyclers and non-recyclers are informed about recycling may be the only difference between these two groups and thus the lack of knowledge can act as a barrier to recycling (Simons & Widmar 1990; Vining & Ebrey 1990; Perrin & Barton 2001; Barr, Ford & Gilg 2003).

A successful refuse collection and recycling scheme needs to be both user- and operator-friendly (Read 1999). This means that both the scheme and its promotional material should be simple to operate and participate in and easy to understand, and free for the residents (Read 1999). Spencer (1994) maintains that the simpler the recycling scheme, the higher the diversion and recycling rate – all other things being equal.

Everett & Pierce (1993) and Spencer (1994) conclude that a well-designed residential refuse collection and recycling scheme will (i) provide weekly collection, (ii) distribute a household storage container, (iii) pick up recyclables on the same day as waste collection, and (iv) promote the programme vigorously. However, it is important to understand that recycling should not be seen as a goal in itself, but only as a means of reaching a paramount environmental goal (Turner 1992). In the next section the factors used to evaluate what makes a solid waste recycling scheme best achieve its goals are briefly set out.

2.2 What determines the success of a recycling scheme?

A good recycling rate can be achieved in different ways. Thomas (2001) points out that diversion of waste to recycling will depend not only on the number of people who participate, but on how well they do so and how effectively they participate. Spencer (1994) and Thomas (2001) agree that it is difficult to measure quantitatively the performance of recycling programmes on a consistent and standard base. However, Spencer (1994) and Thomas (2001) mention that four useful

performance measures have been defined: capture rate, participation rate, recycling rate and diversion rate.

- Capture rate is the weight or percentage of some eligible material in the total refuse stream actually separated out for recycling.
- Participation rate denotes the percentage of households (or businesses) which regularly set out recyclables.
- Recycling rate is used to indicate the quantity of recyclables collected per household per unit of time.
- Diversion rate represents the weight of total refuse that is not landfilled (or not incinerated).

In a domestic waste recycling programme, success is likely to be gauged by participation rates and recycling rates. High participation rates lead to high capture rates and diversion rates. Urban solid waste management involves not only a householder's participation but also a network of the state, private organizations and companies and communities to manage solid waste effectively. This is discussed in the following section.

2.3 Solid waste management (SWM) in urban areas: Alliances and parties involved in recycling

There are several main types of alliances formed around the SWM activities of formal collection, transportation and disposal, as well as informal collection, trade, reuse and recycling. These include public/private, public/community, community/private and private/private alliances. Figure 2.1 shows the links between the national and local government, non-governmental organizations and the community-based organizations in urban SWM. Local authorities work together with large enterprises and non-governmental organizations (NGOs), but they are averse to dealing directly with the informal trade and recycling enterprises which recover large fractions of waste, rather linking to them through NGO or community-based organization (CBO) mediation (Baud, Grafakos, Hardijk & Post 2001).

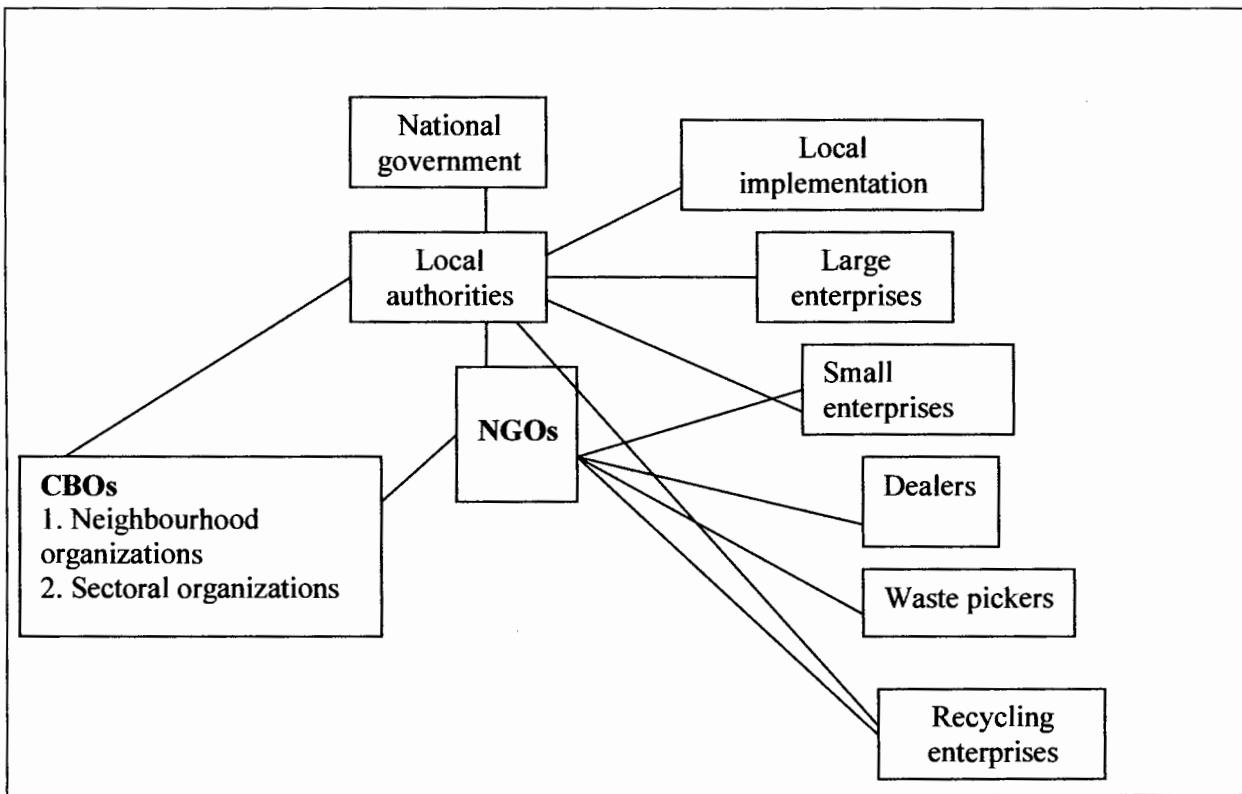


Figure 2.1: Alliances and parties involved in solid waste management

Source: Adopted from Baud *et al.* (2001: 10)

There are positive spin-offs in terms of socio-economic and ecological sustainability when local authorities and the small-scale and informal recycling bodies are integrated into the official system (Huysman 1994; Pacione 2001). According to Gerlagh, Beukering, Verma, Yadau & Pandey (1999) there is a need for a new paradigm of SWM which extends the technical model to tackle a range of problems associated with waste management in order to achieve socially and environmentally responsible waste management. They suggest that SWM should include a range of activities, issues and processes such as the types of waste generated, the number of stakeholders and economic activities involved, and the various economic, social and environmental effects of SWM, and may include legitimization of the informal system, public participation and possibly partial privatization.

Weinberg, Pellow & Schnaiberg (2000) have identified various urban waste recycling programmes in Chicago. Weinberg, Pellow & Schnaiberg (2000) argue that recycling constitutes a model of sustainable community development. Recycling is said to be one of the few common elements in discussions among scholars, policymakers and activists concerned with sustainable community

development. It is one of the few ideas advocated that embraces all three Es (economy, equity and environment). In addition, Kaseva & Mbuligwe (2003) show that solid waste recycling is currently recognised as a sustainable approach to SWM and that it helps communities economically, environmentally, socially and ecologically. Recycling is emphatically an economic development tool as well as an environmental one (Weinberg, Pellow & Schnaiberg 2000).

2.3.1 Community-based recycling

Until the 1980s solid waste management programmes in most African cities were formulated without significant public participation, waste management focused on components of economic and/or social value and it occurred at several levels (UNEP International Environmental Technology Center (IETC) 1996). Recycling initiatives that aim to promote community involvement have been reported from several Asian countries in recent years (Mongkolnchairunya 2003). In one project residents of poorer communities are encouraged to bring recyclable material to monthly exchanges in local communities, where they exchange the materials for hens' eggs. The project aims not only at garbage reduction, but also at community empowerment through self-reliance, and at establishing new relationships of more equality and less dependence between poor communities and the municipal administration.

In Chicago the community-based recycling facilities revolve around three overlapping goals: (i) to offer recycling services to communities and individuals; (ii) to offer recycling and environmental education to constituencies in ways that would mobilize people to push for broader social change; and (iii) to provide jobs for low-income urban populations (Weinberg, Pellow & Schnaiberg 2000). Community involvement in solid waste management can either be an instrument for instituting a financially and environmentally viable waste service or, equally important, for improving the waste collection service (Muller, Iyer, Keita, Sacko & Traore 2002). It was discovered that in both instances residents increased their co-operation when waste services were provided. However, participation rates dropped in both partnerships due to lack of information on money earned from the sales and on the way these funds were spent. Suspicions and doubts about the misuse of funds undermined household interest in the projects and resulted in lack of sustainability. Muller *et al.* (2002) conclude that a sustainable community-based waste service requires (i) a systematic back-up service by the authorities, (ii) leadership and communication structures that are open and trustworthy to its own residents, and (iii) a capacity among a wide range of residents to organize themselves and exercise local supervision and control.

2.3.2 Municipal solid waste recycling programmes

Municipal or urban waste recycling programmes form the basis of formal recycling. Solid waste as a management problem is mostly perceived to be an urban problem in that the concentrations of industrial and human waste producers are situated in cities (Van der Merwe & Steyl 1997). Accompanied by the rapid increase of economic activity, the amount of urban waste that is discarded every day is increasing together with municipalities' expenditure on the removal, recovery, treatment and disposal of waste. The collection and disposal of refuse absorbs between 30 and 50 per cent of municipal budgets worldwide (Pacheo 1992). Municipal recycling programmes, as opposed to informal waste management, consider urban waste as a health and environmental hazard and believe that every step should be taken to protect the environment against it (Poerbo 1991).

In Mexicali, Mexico, formal recycling is done by legally established businesses that pay taxes and work under a commercial name, in which the businesspersons buy recyclables from individuals who separate materials with commercial value. However, they avoid buying from landfill pickers due to the poor quality of their recyclable material (Ojeda-Benitez, Armijo-de-Vega & Ramirez-Barreto (2000). Usually recycling of municipal solid waste in developing countries relies largely on the informal recovery of materials from waste, carried out by human scavengers (Medina 2000). Ojeda-Benitez, Armijo-de-Vega & Ramirez-Barreto (2000) maintain that the informal sector is important where municipal services for solid waste handling do not have the capacity to advance at the pace of urban growth. It is estimated that in Asian and Latin American cities up to two per cent of the population survives by scavenging (Medina 2000).

2.3.3 Privatized solid waste recycling programmes

Since the early 1990s many governments in developing countries have been showing a great deal of concern for improving urban SWM because urbanization and rapid economic growth in these countries have resulted in large increases in refuse output. The consequences for these countries have been a rapid depletion of landfill sites and the poor performance of existing waste disposal systems (Kaseva & Mbuligwe 2003). Several approaches have been suggested in order to improve SWM in developing countries. The contracting out of waste collection and disposal services to private solid waste collection and disposal contractors has been adopted in Dar es Salaam (Kaseva & Mbuligwe 2003). Similarly, municipal governments in South Africa have been turning increasingly to commercialization (i.e. privatization, outsourcing, and corporatization) as a way of

addressing the refuse collection backlog (Qotelo, Xali & Barcheisi 2001). According to Kaseva & Mbuligwe (2003), private agencies engaged in waste management have higher operating efficiencies because they are free from bureaucratic hurdles and the upkeep of their equipment is excellent. The privatization of solid waste collection in Dar es Salaam laid the basis for employment creation and income generation through waste collection, disposal and recycling and thereby contributes to poverty reduction and urban environmental upkeep.

By contrast, in South African towns the opposite has occurred. A micro-enterprise initiative in Khayelitsha has been unable to fully achieve its objectives of providing better refuse collection services, job creation and community empowerment (Qotelo, Xali & Barchiesi 2001). The problems identified are inadequate background in waste management of the entrepreneur, poor service delivery, particularly house-to-house collection, and poor municipal management. Qotelo, Xali & Barchesi (2001) further note that the newly-corporatized refuse collection service in Johannesburg called "Pikitup" experienced similar pitfalls. The conclusion drawn is that both initiatives are driven by the same commercialization impulse that is reshaping the waste management sector throughout South Africa. The poor performance of the two private schemes is indicative of a lack of proper public consultation in the commercialization process, the loss of public sector skills and the impact of service restructuring on municipal workers (Qotelo, Xali & Barchesi 2001). In other cases of failure of privatizing solid waste management, it was found that: (i) contracts between private companies and municipalities left the enforcement of labour laws to the companies; (ii) municipalities fail to monitor contracts; and (iii) private companies cut down on their workforces and costs, leading to staff shortages (Samson 2003). Consequently, Samson (2003) found that women are used to make up for bad waste management services and as a result work hard. Volunteers and poverty alleviation projects sometimes help in waste management, particularly in clean-up campaigns, but poverty alleviation projects are said to hire unemployed township residents to clean streets and do the same jobs as municipal and private company workers. In essence, whether privatized or not, waste management should be conducted in a manner that is in accordance with the principles of public health, economics, engineering, conservation and other environmental considerations and that is also responsive to public attitudes (Samson 2003). Urban solid waste management services are usually provided by the local government. Municipalities collect and dispose of solid waste and/or store waste for recycling or incineration. Hence the next section discusses the work of municipalities in urban solid waste management.

2.4 Municipal solid waste collection and storage systems

Local councils are responsible for waste collection and disposal. The responsibilities include the removal of waste from households, removal of litter from streets, service lanes and other public places, removal of bulky waste from private premises and open areas, and provision of adequate landfill sites (Kneale & Chettle 2004). Waste management systems without recycling do not require separate collection. In contrast, collection systems that do include recycling play an important role as subsystems in waste management systems that include recycling (Beigl & Salhofer 2004). Lessons learnt from collection systems reveal that such systems must be designed to accommodate the particular conditions of the community (Korfmacher 1997). Bannister, Silverman & Zack (2002) note that, after the democratic elections of 1994 in South Africa, many local authorities entered into partnerships with large multinational utilities for improved efficiency. However, all too often local communities derived few benefits from these new arrangements. In contrast, Durban Solid Waste followed a different approach in which it formed partnerships with a number of small contractors instead of multinational utilities (Bannister, Silverman & Zack 2002). The small contractors proved best for the communities in that city, where 23 contractors provide a comprehensive waste collection service to approximately 190 000 households. Turner (1992), Spencer (1994), Palmer Development Group (1996) and Korfmacher (1997) describe collection systems and service levels by which household waste can be collected and that may better suit developing countries. These are elaborated below.

2.4.1 House-to-house collection

This is sometimes termed a primary collection system. It differs from traditional First World collection systems in respect of financing, organization and technology. These programmes use local or indigenous resources, for example donkey carts are used for collection. In addition, house-to-house collection programmes aim at convincing individual households to pay for private garbage collection services. However, their success is not yet evident (Korfmacher 1997).

2.4.2 Communal collection sites

This alternative method involves communal skips or site collection (Korfmacher 1997). In this option householders place their waste at predetermined locations containing a communal storage facility (Palmer Development Group 1996). Communal collection sites operate in a similar way to the “bring” system in which individuals take their recyclables to public or on-street collection sites

either voluntarily or sometimes owing to some incentive (Semoli 1998). Gandy (1994) notes that the advantages of a bring system are low labour and capital costs, but the system is also associated with low levels of materials recovery, adverse local environmental impacts, contamination of materials and low community participation. Many of these programmes use financial incentives to encourage recycling by paying different prices for different materials. They are mostly practised in developing countries (Palmer Development Group 1996).

2.4.3 Block collection

In this system a collection vehicle travels a scheduled route, stopping periodically for residents to bring their refuse. The system eliminates the need for intermediate storage containers, but is less convenient for residents (Korfmacher 1997). The key features of block collection are high dependence on maintenance of schedule and high household involvement (Palmer Development Group 1996). This method requires well-planned street routes. In the city of Philadelphia, GIS is used to create route maps for garbage truck drivers, in which the routes take into account the speed and tonnage of garbage trucks, width of streets, and the volume of trash a building generates (Mitchell 1998). Malherbe (1999) evaluated the use of GIS to improve municipal waste collection service by developing optimal routes for household and commercial refuse collection and disposal. The exercise done in Paarl used a GIS to develop optimal routes for waste collection which were found to be shorter than those currently used in Paarl (Malherbe 1999). Consequently GIS has proved to be a suitable means to improve existing refuse collection systems or to develop new ones.

2.4.4 Non-collection system

This system does not involve collection by contractors in the usual sense and does not involve planned and managed removal of waste from residential sites (Palmer Development Group 1996; Korfmacher 1997). Instead, residents receive incentives for bringing their refuse to central locations. An example is Curitiba's "Garbage Purchase" programme in which residents sell their garbage for bus tickets or for agricultural or dairy produce, since there is no formal garbage collection service (Korfmacher 1997). Such a scheme may be accompanied by some adverse impacts such as improper means of waste disposal.

Lebogo (2002) ascertained that in Soshanguve several community-based contractors provided a waste collection service. The result was that, while the community at large in the so-called proclaimed areas received services, settlements in some areas received no services at all. This

meant that the residents undertook various methods of waste disposal such as dumping waste at street corners, thereby creating health hazards. For this reason Palmer Development Group (1996) state that under this system households need to be made aware of the methods of disposal as well as the recycling options available. They conclude that this method is not suitable for hazardous waste that may be toxic.

2.4.5 Curbside collection

In curbside collection recyclable materials are set out for commingled collection. In this case the recyclables are separated only from non-recyclables (Noehammer & Byer 1997). Newspapers are usually kept separate from the rest of the commingled recyclables to avoid their becoming soiled (Spencer 1994). This method involves collection directly from the waste producers, i.e. households, shops, offices and smaller factories (Turner 1992). Direct collection projects are also characterized by labour intensiveness and have in the past relied heavily on government job-creation programmes. According to the Palmer Development Group (1996), key features of a curbside collection include a high level of service from the point of view of the user and regular and well organized collection service—householders must know when to put out waste. If badly co-ordinated, the result is infrequent collection and resulting health and odour problems.

The design of a residential curbside recycling programme often affects the participation rate as well as the effect of interactions between the design variables (Noehammer & Byer 1997). However, as Noehammer & Byer (1997) note, there is no single ideal design for residential curbside recycling programmes—indeed a variety of combinations of design variables have proven successful.

Residential curbside collection is encouraged for effective recycling. In Chicago, a “blue bag” recycling model is highly encouraged for household solid waste sorting. Chicago’s blue bag programme requires residents to place their recyclables in blue plastic bags alongside regular garbage bags containing household trash (Weinberg, Pellow & Schnaiberg (2000)). A similar exercise was employed by a collection scheme introduced in Falkirk, Scotland and operated by Scottish Conservation Projects, whereby participants in a paper collection scheme were given a green bag and an explanatory leaflet. Another fortnightly collection scheme, targeting plastic bottles, was also operated, working on alternate weeks to the paper collection scheme (McDonald & Ball 1998). This section has outlined the role of formal solid waste collection and storage systems, however along with them there is informal solid waste management. An overview of informal solid waste recycling is provided in the following section.

2.5 Informal solid waste recycling and scavenging

Parallel to the formal system of waste management, there exists an active informal network (Ferh, De Castro & Calcado 2000; Ojeda-Benitez, Armijo-de-Vega & Ramirez-Barreto 2000). Informal recycling also takes place on a widespread basis but is difficult to quantify (Palmer Development Group 1996; Metin, Erozuturk & Neyim 2003). Venkateswaran (1994) defines informal waste management or scavenging as that part that draws out of the waste stream those wastes with a resale value. Scavengers may collect waste directly from house to house or separate saleable wastes (mostly packaging material) from household and neighbourhood dumps, transfer deposits and final dumping sites. They pick through rubbish bags left on the side of the road for collection, gathering cardboard and paper that they sell to recycling companies at suburban pavement "weigh and pay" stations (Broughton 2004). In one recycling project in Johannesburg, informal waste collectors salvage recyclable material from the surrounding neighbourhood as well as wealthier suburbs farther afield and bring it to a central recycling site where they get paid (Bannister, Silverman & Zack 2002). According to De Necker & Van Lill (2001), two types of informal waste pickers, namely sedentary garbage dump pickers and peripatetic cardboard collectors operate in Stellenbosch. They reported that, although 60 per cent of the Stellenbosch residents were in favour of waste pickers in their suburbs, opposition against waste pickers was that street waste pickers commit crime in suburbs, cause littering and disrupt traffic. However, it was concluded that dump and street pickers are a reality that authorities cannot run away from in Stellenbosch; hence it was suggested that possible actions and strategies to accommodate waste picking in the town's waste management services should be considered (De Necker & Van Lill 2001).

The informal waste management approach considers urban waste as an economic resource from which marketable products can be derived and it achieves several objectives at the same time, i.e. reducing the volume of waste that needs to be dumped as well as the need for financing and subsidizing waste management (Poerbo 1991). Hence, Baud *et al.* (2001) note that waste pickers, itinerant buyers-dealers, dealers-wholesalers and wholesalers-recycling enterprises are regarded as traders in waste management. Informal solid waste collection may simply be a survival strategy but it makes a positive contribution to the environment. Although there are institutional, commercial and industrial waste recycling programmes, the following section describes household solid waste recycling by householders.

2.6 Household solid waste recycling

Waste recycling at the household level in low-income areas begins with the use of plastics, paper, cardboard and cans for domestic purposes, after which they are disposed of only when they are no longer of any use to their owners. The opposite occurs in high-income areas, where recovery is mainly done by domestic servants who sell the materials to middlemen in order to supplement their incomes (Bradi & Kuitunem 2003). In the United States recycling is attractive at two levels, namely at the national level, where it contributes to the national goals of energy and materials conservation, and at the local level, where it reduces the composition and quantity of the waste stream by diverting some materials from landfills or incinerators, thereby helping to lessen waste management costs (Lansana 1993). However, participation rates vary considerably from community to community.

2.6.1 When and why do householders participate in solid waste recycling?

A number of cross-disciplinary and interrelated factors need to be considered when analyzing the level of recycling of household waste (Mcquaid & Murdoch 1996). Research has been undertaken to evaluate factors which promote or inhibit recycling and other pro-environmental behaviours such as composting, anti-littering and multiple-conservation activities related to recycling (Lansana 1993; Barr, Ford & Gilg 2003). At the core of the framework of environmental behaviour is the relationship between the intention and the action (Barr, Ford & Gilg 2003). Furthermore a comprehensive environmental action requires an understanding of appropriate organization of a range of the possible variables involved in influencing environmental behaviour (Barr 2002; Barr, Ford & Gilg 2003; Barr 2004). Various researchers analyze participation in household recycling, behaviour and/or attitude from different perspectives, as discussed in the following section.

2.6.2 Operational procedures of domestic solid waste recycling programmes

Some investigations have focused on the operational procedures of the programmes and the basic decisions regarding how the policies are designed and implemented in communities (Lansana 1993). For instance, Peters & Grogan (1988) and Everett & Pierce (1993) found that mandatory recycling programmes have higher levels of participation if formal enforcement is in place, and in California Folz (1991) found that citizen participation in mandatory programmes has been almost twice as high as in cities that have voluntary programmes. Mcquaid & Murdoch (1996) contend

that the characteristics of the households themselves (socio-economic and demographic factors, values, and beliefs) determine the degree of their participation.

2.6.3 Personal and situational variables in domestic waste recycling

The effects of personal (personality, demographics and attitudes towards environmental concerns) and manipulable situational variables can also influence household recycling (Schultz, Oskamp & Maineri 1995). In other words, there are linkages between the demographic attributes of the individuals and their environmental behaviour. Schultz, Oskamp & Maineri (1995) indicate that, in studies of recycling behaviour, the four most reported demographic variables are age, gender, income and education. In various instances the positive involvement of younger people in environmental activities justifies the view that younger people are more highly educated about the importance of the environment and are more politically liberal (Barr 2002). However, studies of recycling behaviour in the United Kingdom show that younger people were least likely to participate in recycling programmes (Ball & Lawson 1990). In addition, Vining & Ebrey (1990), Lansana (1992) and McDonald & Ball (1998) state that elderly people do tend to recycle.

2.6.4 Attitudes towards and awareness about domestic solid waste management

Attitudes and awareness form an important influence on participation in recycling (Watts & Probert 1999) and the assessment of these factors on recycling behaviour and its consequences assists in understanding the public's response to the environment (Ebrey & Vining 2000). In addition, socio-demographic characteristics may also influence recycling behaviour, because they may be reflected in psychological influences (Tucker 1999). According to Tucker (1999), attitudes and perceptions are difficult to quantify objectively and are usually assessed through direct questioning. Tucker (1999) further explains that some investigations have used a Likert scale of measurement in their assessments, providing responses of "strongly agree" to "strongly disagree" to offered statements, each response conveying a particular attitude. In a study using the Likert scale measurement, it was discovered that, on average, the non-users of the scheme had slightly weaker attitudes towards recycling across all the attitudes, though general and specific environmental reasons and economic reasons were scored very highly by both recyclers and non-recyclers (Tucker 1999).

2.6.5 Barriers to domestic solid waste management

According to Schultz, Oskamp & Maineri (1995), one of the most common, but often overlooked, ways to improve recycling behaviour is the removal of barriers to recycling. Most of the time

people considered time and effort as major inhibitory factors to recycling and that may lead to drop-outs from participation (Tucker 1999). Three common barriers emerge in the literature.

- Distance: Although the use of central collection may reduce the cost of the recycling programme as viewed from the administrative perspective, it may add personal costs of extra time and effort for the transportation of recyclables to a collection centre. Parfitt, Lovett & Sunnenberg (2001) found that in England and Wales, where most of the schemes consist of house-to-house collection, increasing recycling infrastructure, such as curbside provision, leads to an improved waste collection service. Hector (2003) found that residents in Witzenberg municipal area were not prepared to travel a distance of more than 500m to take recyclables to a certain point of collection.
- Collection method: In drop-off location and curbside collection programmes, voluntary curbside collection had a higher participation rate compared to drop-off collection (Folz 1991). Furthermore, research reveals that participation in recycling is higher if both recyclables and other refuse are collected on the same day and at frequent intervals, compared to different-day collection schedules (Folz 1991; Spencer 1994). Everett & Pierce (1993) further show that collection day and frequency may be related to convenience, as missing one pick-up day when recyclables are collected frequently means that the wait for the next collection is shorter. However, Schultz, Oskamp & Maineri (1995) indicate that this finding combined reports on mandatory and voluntary programmes so that other possible complicating factors might be in play.
- Sorting: This is a barrier to recycling in that asking participants to sort recyclables into different bins complicates the recycling programme and hence affects participation (Schultz, Oskamp & Maineri 1995). An alternative to having participants sort their recyclables is to use commingled recycling in which participants place all recyclables mixed together in a single collection bin which is sorted at a materials recovery facility (Spencer 1994; Noehammer & Byer 1997). In this way, less effort is required of the participants, a factor which has been cited as a common barrier in waste recycling (McDonald & Oates 2003). However, Gamba & Oskampa (1994) found that in a non-separated recycling programme over 90 per cent of households participated on at least five consecutive occasions, while earlier in the voluntary separated recycling programme, less than 40 per cent of the city residents were estimated to have taken part. In contrast, Folz (1991) found no significant difference in the estimated average participation rates across 264 cities in Canadian mandatory and voluntary municipal recycling programmes either requiring

separation or not. Although there may have been too much generalization in some of these findings, the topic of separation clearly requires further research.

2.6.6 Attitude-behaviour consistency in domestic solid waste recycling

Attitude-behaviour consistencies addressed by social psychologists, sociologists and geographers, have also been investigated in the context of waste recycling behaviour (Barr 2004). Barr (2004) found that the figures relating to attitude and behaviour do not compare directly, and that ultimately there exists a conflict between stated attitude and action, which requires closer examination. According to Vining & Ebreo (1992), direct relationships between pro-environmental attitudes and recycling behaviour are sometimes insignificant in determining recycling behaviour. Perrin & Barton (2001) point out that fully understanding how to convert household attitudes and opinions into efficient participatory behaviour within what remains a voluntary activity is essential if targets are to be met at an affordable economic and environmental cost. Despite all other factors, it is argued that household recycling behaviour seems to be related to the level of inconvenience caused by the type and design of the scheme offered, the materials being recycled and level of change required in existing household behaviours in order to participate in the scheme and recycle each material (Perrin & Barton 2001).

If voluntary recycling is beneficial to communities, it would be essential to understand how to increase participation in recycling programmes as argued by Werner, Turner, Shipman, Twitchell, Dickson, Bruschke & Bismarck (1995). Experience has it that, although questionnaire and survey research suggests that people in the United States strongly support recycling programmes, for many of them recycling itself is a menial task (Werner & Makela 1998). Hence, it is not always the case that people prepare and separate recyclables properly, even where recycling is mandatory. As a result Werner & Makela (1998) and Ebreo & Vining (2000) have investigated attitudes towards recycling and the processes involved in recycling. Werner & Makela (1998) employed the theory of Sansone and colleagues (Sansone & Morgan 1992; Sansone & Harackiewicz 1996) to investigate personal attitudes towards recycling. The results were consistent with the Sansone theory, which shows that people with favourable personal recycling attitudes appeared to have reasons to persist in recycling and also reported ways of making recycling interesting (Werner & Makela 1998).

2.7 Lessons learned

This chapter has summarized some insights on how to increase the level of recycling, diversion rate, recovery level, or the performance rate of household recycling programmes. According to Lansana (1992), the potential determinants of recycling behaviour, as provided in the literature, usually include demographic attributes of residents and their awareness of the programme as independent factors that influence the household's decision to participate in the recycling programme. Coupled with these factors are other dependent factors of the environmental attitudes of the residents, their economic concerns, and their evaluation of the operational policies of the programme (see Figure 2.2). Changing citizens' recycling behaviour from anti-recycling to pro-recycling means increasing awareness in recycling, understanding their demography, environmental attitudes and the way they evaluate policies. Central to all these factors is understanding the economic concern of the citizens (Lansana 1993). Barr (2002) statistically analyzed the variations in recycling behaviour across communities in terms of causal relationships among the factors that influence a household's decision to recycle.

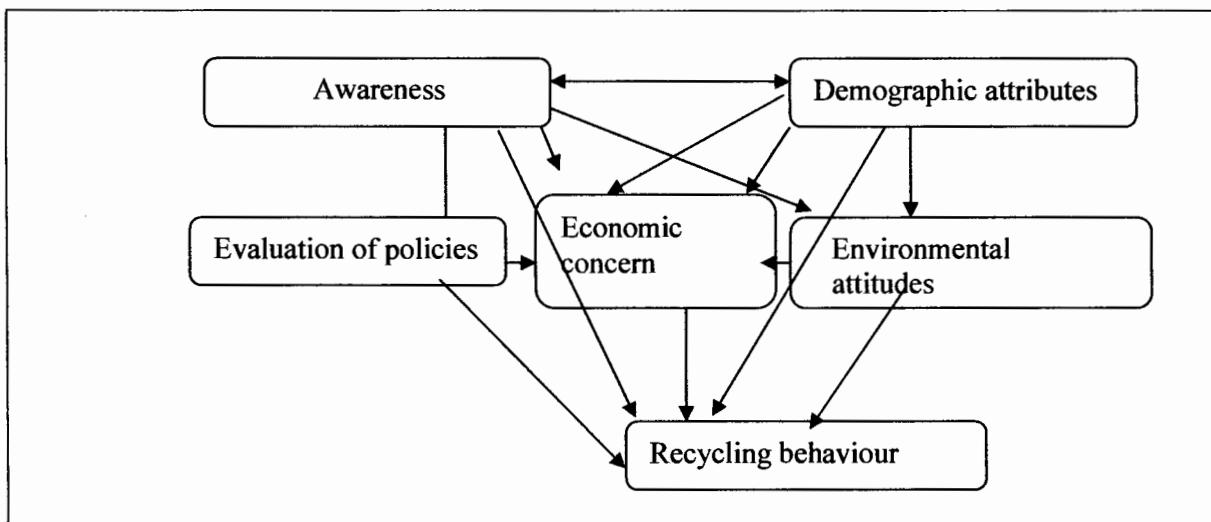


Figure 2.2: Determinants of household waste recycling behaviour

Source: Lansana (1993: 172)

The discussion in this chapter has provided a broad view of the theoretical background to urban solid waste recycling, touching on urban solid waste recycling, the parties involved in urban recycling and solid waste collection systems. It has shown that the success of household waste recycling is mostly dependent on the design of the recycling scheme, situational as well as

environmental attitudes, and the perception of individual households. Thus, in judging performance in source-separation recycling schemes by households, the focus has most often been on participation: on why people do or do not participate, and on their motivation and attitudes towards recycling and other environmental issues (Thomas 2001). The following chapters analyze and interpret these issues in Stellenbosch.

CHAPTER 3: ATTITUDES TO AND PARTICIPATION IN DOMESTIC SOLID WASTE RECYCLING IN STELLENBOSCH

3 INTRODUCTION: HOUSEHOLD SOLID WASTE SOURCE SEPARATION

The growing concern of public institutions about environmental matters has led to an interest in the management of municipal solid waste. However, the efficacy of any implementation by governments depends mainly on the attitudes shown by citizens towards these problems, as well as towards the measures in a specific plan (Junquera, Angelo del Brío & Muñiz 2001). The attitudes are likely to be moulded by a variety of factors, including the prevailing culture, individual lifestyle, circumstances and habits, and exposure to external influences (Hoinvile, Jowel & Associates 1978). The objective of this chapter is to analyze the opinions and attitudes of citizens in Stellenbosch who participate in household recycling and those who do not. According to Bernard & Russell (2000), analysis is the search for patterns in data and for ideas that help explain why those patterns are there in the first place. The general content of this chapter addresses the first objective of the thesis, i.e. to investigate the attitudes of respondents towards domestic waste recycling in Stellenbosch.

The questionnaire method has been used to elicit general information about the respondents (demographic, housing details, etc.), their participation in, and attitudes towards, solid waste recycling and their willingness to participate in household recycling. The exercise is intended to provide useful information for and about the implementation of a household recycling scheme in Stellenbosch. This chapter begins with a brief description of the Blue Bag Household Recovery Programme as background information. The attitudes of the respondents towards household waste recycling are analyzed as predictors of recycling behaviour in section 3.2. The meaning of "attitude" adopted here is the extent to which people are aware of, care about and view household waste recycling in their localities. Finally, household participation and non-participation in recycling are evaluated in sections 3.4 to 3.7.

3.1 The Blue Bag Household Waste Recovery Programme (BBHWRP): Reasons for its introduction

Stellenbosch is one of a few municipalities in the Western Cape with a licensed landfill facility. The present projected lifespan of the landfill is three to five years (in 2004). It is reported that, when the landfill site reaches its full capacity, the cost of a transfer station in Stellenbosch, which

will be the only option, is estimated at R5 million per year (Kotze 2004). Consequently it was decided by the Stellenbosch Public Safety Sub-Committee that recycling at home is an important and urgent matter. In fact, the stage has been reached at which all municipal councils will be compelled to practise recycling because of its positive effects (Kotze 2004). The Public Safety Sub-Committee decided to investigate the possibility of recycling in Stellenbosch. As a first step in this initiative EnviroSense CC was invited to do a presentation on such a project. The company proposed a pilot project for recycling at source to be undertaken in selected areas (Brandwacht, Ida's Valley and Cloetesville). Enough experience would be gained through the pilot project to enable the implementation of full-time recycling of all recyclable materials throughout Stellenbosch. The project was named "Blue Bag Household Waste Recovery Programme" (BBHWRP).

3.1.1 The major role players in the BBHWRP

- EnviroSense CC: This is an environmental consultancy that has specialized in the planning, development and facilitation of tailor-made industrial/commercial and residential integrated waste management programmes. It is responsible for the overall project design, management and monitoring of such programmes (Kotze 2004).
- The Fairest Cape Association: This is an independent, non-profit organization based in Cape Town. It initiates, participates and manages—with local and provincial government, community, business and education—waste awareness programmes and training. It is responsible for baseline assessment of the existing situation prior to starting a project for waste and project education of all stakeholders, and for preparing and environmentally sensitizing neighbouring communities for further rolling out of the project (Kotze 2004).
- Environmental Cleansing (ECL) (Pty) Ltd.: This Company has been an official subcontractor to the City of Cape Town since 1990. The core business of ECL is the collection of litter within the central business district (CBD) of Cape Town, street sweeping, dumping control, recovery and sorting of recyclables in collaboration with both the City of Cape Town and the Central Improvement District (CID). Its responsibilities in the BBHWRP are preliminary discussion and arrangements with stakeholders prior to the start of the project, day-to-day management and operation of the drop-off/sorting site by locally sourced supervisors, and sourcing and sorting of additional recyclables and waste resources received from private trucks entering the landfill site (Kotze 2004).

- **Mark Dittke (Specialist environmentalist attorney):** Mark Dittke practises extensively in waste and waste management related legal issues and projects at a local authority level. The role of a specialist environmentalist attorney in the BBHWRP is twofold. The first is to review and critically analyze the by-laws and any other local legislation currently applicable within the Stellenbosch municipal area to determine the extent to which provision is made and regulations provided for any household waste recovery project such as suggested for BBHWRP, any drop-off/sorting site such as that suggested as part of BBHWRP, and whether such by-laws and legislation are in line with current and pending national and provincial legal trends and guidelines. The second role is to provide further legal input once the BBHWRP is up and running should any queries or problems arise (Kotze 2004).

3.1.2 Proposed methodology of the BBHWRP

The BBHWRP is a pilot project. It is a household solid waste sorting and recycling programme in which households are expected to separate their recyclables from the non-recyclables. BBHWRP is privately managed by EnviroSense in collaboration with the Stellenbosch municipality. One blue bag for each week is supposed to be supplied to the pilot areas monthly. Collection of the blue bags is undertaken by private recycling companies on Monday mornings and taken to the buy-back centres for sorting and weighing. Sorting occurs at the buy-back centres by a group of informal collectors who are hired to do the job. The pilot project is funded by the Stellenbosch municipality at a cost of R250 000 and is to run from July 2004 to June 2005.

3.2 Analysis of householders' attitudes: What matters in domestic solid waste recycling programmes?

In this section the attitudes of the survey respondents towards domestic waste recycling are presented and discussed. The results give a picture of what may work for domestic waste recycling in Stellenbosch, particularly awareness of the respondents regarding household waste recycling in their localities and improving participation by householders in household waste recycling schemes or programmes. Although the research sample covered all residential areas in Stellenbosch in order to provide a representative picture of the population, the response rate was very poor in some areas and the views of approximately one per cent of the total number of households in Stellenbosch were obtained.

Solid waste management and particularly collection of waste in African cities constitute an environmental problem (Boateng & Haight 1993; Mbande 2003). Although the conventional municipal solid waste management approach is based on collection and disposal of waste, it is failing to provide an efficient and effective service to all urban residents (Mbande 2003). According to Census 2001, between 52 and 90 per cent of households in Stellenbosch town receive refuse removal service by the municipality at least once a week. However, in some suburbs only between zero and 26 per cent of the households receive the service (www.statssa.gov.za). In the next section the surveyed householders' attitudes are equated with their awareness of and views about collection of household solid waste.

3.2.1 Householders' attitudes towards method of recyclable solid waste collection

A set of questions about the means of collection of solid waste, and the day and frequency of recyclables collection was asked to find out the householders' attitudes towards waste collection and the recycling scheme in Stellenbosch compared to the current situation in their area. They were asked who collects recyclables in their area and how the recyclables are collected (questions B4 and B5 in Appendix 2). The results are shown in Figures 3.1 and 3.2. A related set of questions asked how respondents would prefer their recyclables to be collected as well as the reason(s) for their answers (questions C7 and C7(a) in Appendix 2). The results are given in Figures 3.3 and 3.4

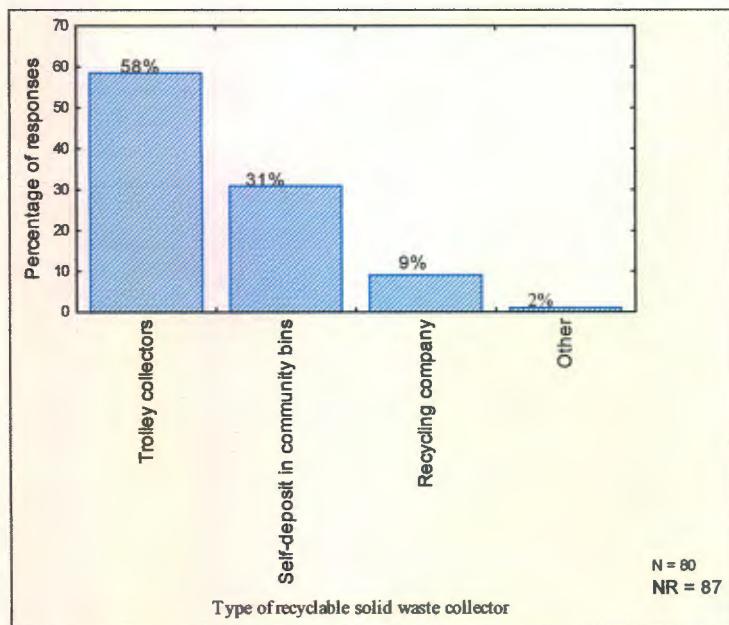


Figure 3.1: Types of recyclable solid waste collectors in Stellenbosch, 2004. (Note: In this figure and subsequent figures, N indicates the number of respondents and NR the number of responses).

The persons or institutions currently responsible for collecting recyclable household waste are reflected in the Figure 3.1. The method most frequently mentioned is informal trolley collectors. Surprisingly, the second most prevalent method is the use of community bins to which householders take their recyclables. The recycling company mentioned is a reference to the BBHWRP, and the “other” mainly stipulated the municipality as being responsible.

It can be deduced from these results that informal recycling is a reality in Stellenbosch. The itinerant waste collectors use supermarket trolleys to carry the waste they collect from residents’ refuse placed on pavements and then transport it to places where they can separate the recyclables and sell them to the buy-back centres. This situation confirms the prediction by Van Lill (1998) and De Necker & Van Lill (2001) that itinerant waste pickers or trolley collectors, as they are known in Stellenbosch, would spread from the CBD where they operated in 1998 to the suburbs. Given that nearly one third of the responses indicate that recyclables are taken to community recycling bins placed at various places in the town, it appears necessary that the recycling or material recovery facilities should be increased in number and made more accessible to residents in order to improve self-delivered recycling in Stellenbosch.

Figure 3.2 demonstrates the available methods of collecting domestic solid waste from households. Two thirds of the households relied on their recyclables to be collected at their places of residence (on the sidewalk). This implies that the trolley collectors, the municipality, or any other agents for transporting and collecting waste, collect the recyclables that are put out by individual households. When this method is carried out by municipal truck, it is called curbside collection. When trolley collectors do it, it is called scavenging and is usually a survival strategy of the poor (Huysman 1994; Venkateswaran 1994).

The option reported by the remaining respondents was the collection of waste at a particular point, i.e. the households answered that they take recyclables and other waste to recycling bins at particular places where it is collected by municipal trucks or recycling agents. This shows that some respondents do make an effort to transport recyclables to the material recovery facilities.

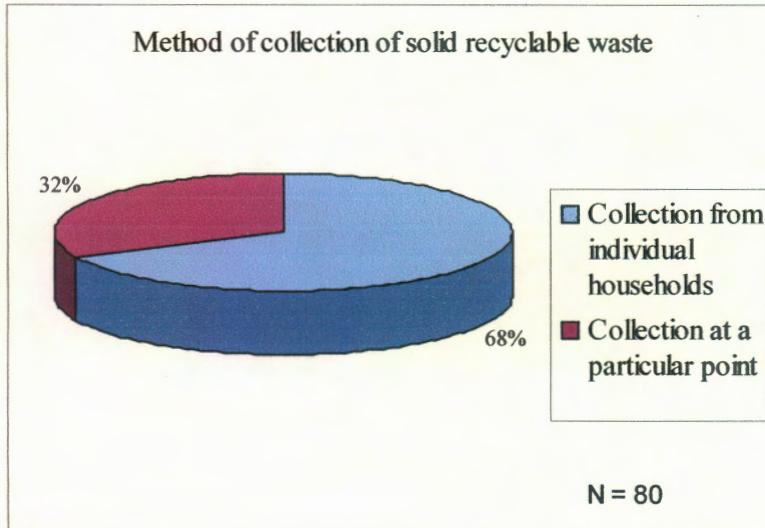


Figure 3.2: Method of recyclable solid waste collection in Stellenbosch, 2004

Could it be that Stellenbosch householders prefer trolley collectors, the municipality or a recycling company to do the collection of waste from their residences to transporting their own recyclables personally to the material recovery facilities? Figures 3.3 and 3.4 set out the preferred waste collection methods and the reasons for the preferences respectively.

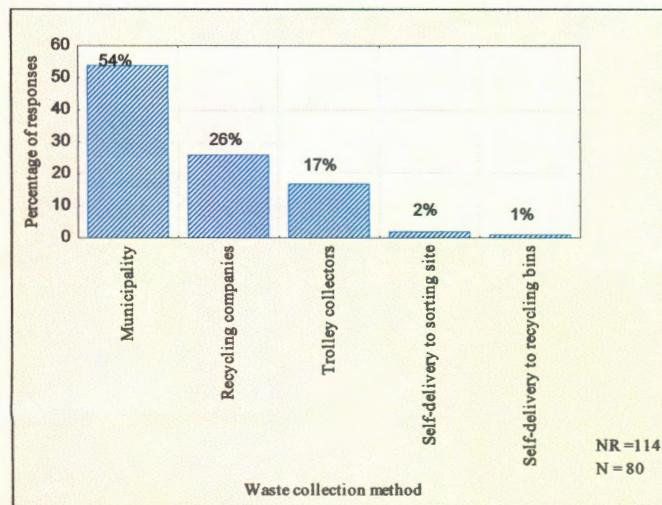


Figure 3.3: Householders' preferred methods of waste collection in Stellenbosch, 2004

More than half of the responses showed preference for the municipality to collect recyclables, and a quarter for recycling companies or a private organization to do the collection. Surprisingly, fewer than one out of five responses indicated preference for the trolley collectors, and preference for taking recyclables to the buy-back centres or recycling depots personally was negligible. The buy-

back centres and community recycling bins are located at various schools, in the CBD or at recycling depots. For example, residents of Uniepark take their paper to the nearby secondary school. Stellenbosch residents are clearly not inclined to self-delivery of recyclables. Speirs & Tucker (2001) indicate that in Ayrshire the majority of recyclers rationalize their recycling site preference according to nearness to the household and recycling facilities offered at that particular site compared to other sites. From these results one learns that few householders would be prepared to make an effort to take recyclables personally to recycling depots. The literature emphasizes that residential curbside collection is encouraged for effective recycling (Weinberg, Pellow & Schaiberg 2000). It appears that a domestic solid waste recycling scheme in Stellenbosch is likely to be successful if it requires less effort from the residents.

Mixed attitudes and feelings exist about the collection of waste by trolley collectors among Stellenbosch residents (*Eikestadnuus* 2003). In this study fewer than 20 per cent of the responses were in favour of individual trolley people to collect recyclables. Support for trolley people contends that such people make a living out of waste and therefore they must be given the opportunity to do so (*Eikestadnuus* 2003). In contrast, some residents complain about the unacceptable behaviour of some trolley collectors, saying that they leave rubbish lying around after taking away the recyclables. A further argument against the trolley people is that they are noisy and operate at awkward times, sometimes as early as five o'clock in the morning. The municipality has not intervened in this issue and has remained neutral towards both sides (Kotze pers. com. 2004). The BBHWRP initiative is expected to absorb some trolley collectors from the streets and suburbs to the central sorting place, where they will be supervised and get paid according to how much they have sorted (Diktte pers. com. 2004).

Since solid waste management is based on conventional municipal solid waste management, the majority of the responses (54%) cited the municipality as preferred waste collector. Clearly, because payment of a service charge is required for municipal solid waste collection, people expect the municipality to do the collection of waste. Responses citing a preference for collection by a private company most likely refer to the BBHWRP. The reasons the householders gave for their preference for certain solid waste collectors are discussed next.

The two main reasons for the preference for a collection method imply a desire for convenience and reliability from a collection system (see Figure 3.4). Tables 3.1, 3.2, 3.3 and 3.4 list the reasons for each of the four methods of collection preferred by the respondents. Table 3.1 outlines the reasons for householders who prefer the municipality to do waste collection.

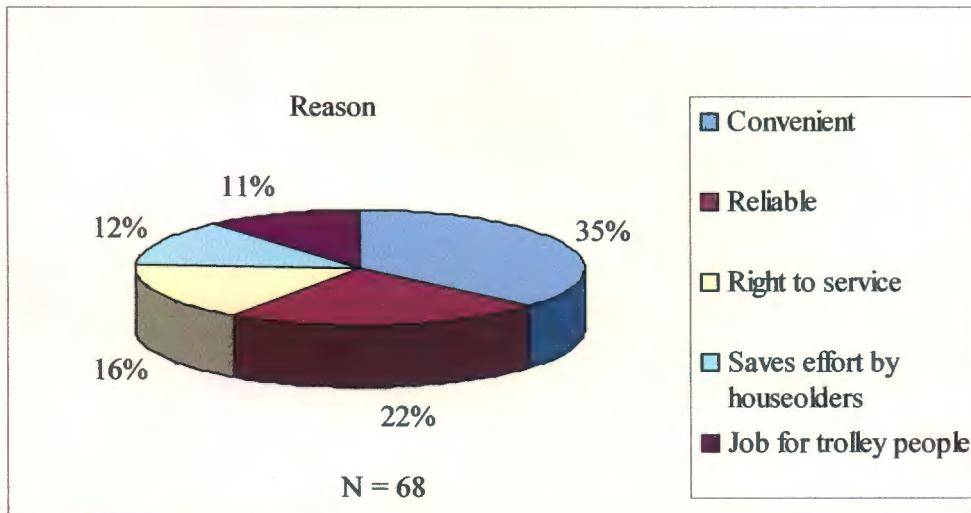


Figure 3.4: Reasons for householders' preferred waste collectors in Stellenbosch, 2004

Table 3.1: Reasons for the municipality as respondents' preferred solid waste collector, Stellenbosch 2004

Reason	Percentage citing reason
Saves effort by householders	100
Convenient	92
Right to service	91
Reliable	80
Cheap	33
Job for trolley people	0

NR = 68

Respondents who cited the municipality to be their preferred solid waste collector gave four main reasons for their choice, namely effort savings, convenience, right to service and reliability (Table 3.1). The results strongly suggest that the curbside method by municipal truck is desired by Stellenboschers. The emphatic avowal of right to service underscores the respondents' attitude that the municipality is obliged to provide the waste collection service to the community. This is further confirmed by the fact that few of the respondents consider the refuse removal service charge to be cheap. Interestingly, trolley collection is totally rejected by those that prefer municipal waste collection.

The recycling company referred to in this study is the one involved in the BBHWRP. Table 3.2 shows reasons why respondents prefer the recycling company to collect their solid waste. Only two

reasons stand out, namely effort savings by households and reliability. Closely coupled to these two main reasons, but less frequently mentioned, are convenience and cheapness.

Table 3.2: Reasons for a recycling company as respondents' preferred solid waste collector, Stellenbosch 2004

Reason	Percentage citing reason
Saves effort by householders	63
Reliable	53
Cheap	33
Convenient	33
Job for trolley people	0
Right to service	0

NR = 68

Informal recycling in Stellenbosch takes the form of itinerant waste collectors who collect waste from the suburbs as well as in town. In the suburbs, these people remove recyclables from the households' black refuse waste bags or simply pick up the recyclables sorted by householders. All the respondents who preferred trolley waste collectors mentioned their cheapness as a reason (see Table 3.3). Similarly, a large proportion are of the opinion that trolley waste collectors save households the effort of dealing with waste. Interestingly, whereas only 11 per cent of the responses (see Figure 3.4) mentioned solid waste collection as an income-generating job for trolley people, nearly 60 per cent cite the "employment" potential for trolley people. Unlike collection of waste by either the municipality or a recycling company, collection of waste by trolley collectors is not considered to be very reliable and convenient, and no-one saw trolley collection as part of their right to a service. Trolley waste collectors are a reality in Stellenbosch yet they are not acknowledged by the public nor the authorities as significant agents in solid waste management. Trolley waste collectors in the study area (and elsewhere) are sometimes characterized as being a nuisance in the suburbs (Venkateswaran 1994; *Eikestadnuus* 2003).

Table 3.3: Reasons for trolley collectors as respondents' preferred solid waste collector, Stellenbosch 2004

Reason	Percentage citing reason
Cheap	100
Saves effort by households	75
Job for trolley people	57
Reliable	27
Convenient	4
Right to service	0

NR = 68

In Table 3.4 the reasons for a preference for self-delivery of household waste to sorting sites in Stellenbosch are shown. There are a few sorting sites in the area, namely CL Waste, Captain and Store Metal buy-back and sorting centres, where recyclables such as paper, tins, glass, bottles and metal are exchanged for cash and where sorting of recyclables occurs. Only two reasons were named for preferring self-delivery of household solid waste to sorting sites, namely first the right and responsibility to participate in domestic waste recycling and second that it is convenient to do self-delivery of household waste. This is not surprising, because until recently there had not been any domestic solid waste recycling in the area. The reasons mentioned for desiring this type of waste collection show that some people are aware of the importance of household solid waste recycling in Stellenbosch and have taken action personally to do so. They see the advantages for a community to engage in a voluntary household waste recycling scheme. The situation shows that a recycling scheme with curbside collection is preferred by the Stellenbosch community to a non-collection system.

Table 3.4: Reasons for self-delivery of household solid waste to sorting sites as householders' preferred waste collection method, Stellenbosch 2004

Reason	Percentage citing reason
Right to service	9
Convenient	4
Reliable	0
Saves effort by household	0
Job for trolley people	0
Cheap	0

NR = 68

Generally a recyclable solid waste collection system has to be user-friendly and easy for the households to effect (Palmer Development Group 1996). The results of this study show that when choosing a solid waste collection method for recyclables, lesser effort by householders, convenience and cheapness are paramount. Table 3.5 illustrates the rank of each reason in each of the four types of solid waste collectors in Stellenbosch.

Table 3.5: Summary of reasons for preferred household solid waste collectors, Stellenbosch 2004

Reason	Type of solid waste collector				Ranking		
	Municipality	Recycling company	Trolley collectors	Self-delivery	Total	Average	Average rank
Convenient	2	3	5	2	12	3	2
Reliable	4	2	4	3	13	3.3	4
Right to service	3	5	6	1	15	3.8	5
Saves effort by household	1	1	2	3	7	1.8	1
Cheap	5	3	1	3	12	3	2
Job for trolley people	6	5	3	3	17	4.3	6

Without adequate waste collection services, residents are faced with little alternative but to dump waste and litter on street corners or empty lots (Lebogo 2002). In Stellenbosch, this is likely to lead to more trolley collectors in the suburbs. The findings also indicate that individual householders, trolley collectors and the municipality are all involved in solid waste recycling. It is shown that the municipality and the recycling company are better characterized by less effort required from householders to participate in recycling and trolley people are said to be the cheapest of all waste collectors, whereas self-delivery is given preference because it signifies the right and responsibility to participate in solid waste recycling. The integration of the roles of all these parties involved in solid waste recycling can lead to increased diversion rates of waste from entering the landfill in Stellenbosch and by so doing increase recycling of solid waste.

The householders' attitudes towards methods of solid waste collection showed that respondents are prepared to spend less effort in solid waste recycling and to deal with a reliable and convenient household waste collector. How many days a week could householders be prepared to put out solid waste for collection? The next section addresses householders' attitudes towards frequency of collection of their household recyclable solid waste. The reasons for the choice of frequency of household recyclable solid waste collection are also explored to better understand the preferred frequencies.

3.2.2 Collection day and frequency

Collection of household waste occurs on different days in the suburbs. Respondents were asked to give the day on which their household recyclable waste is collected (B6) and how often they would prefer their recyclables to be collected (C8). The responses to the first question shown in Figure 3.5 indicate that collection occurred mainly on Mondays or Tuesdays.

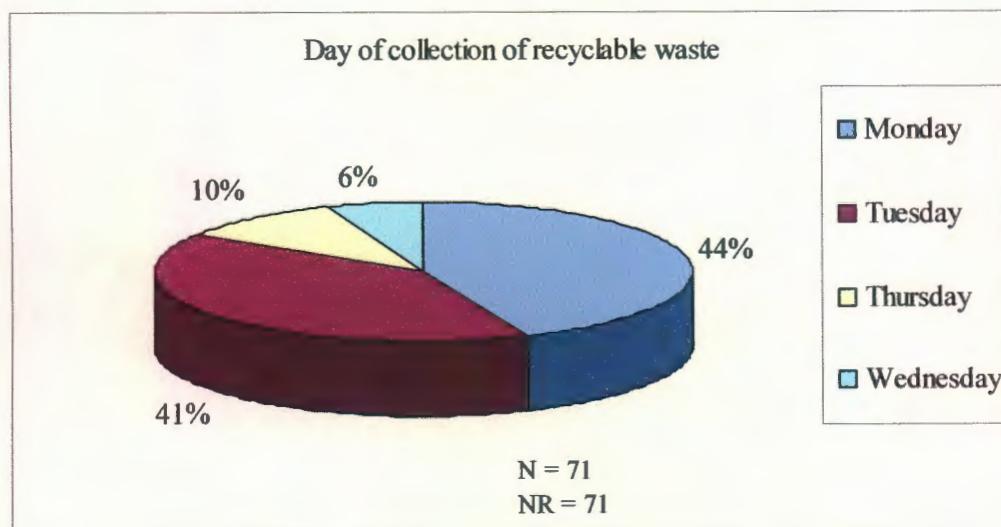


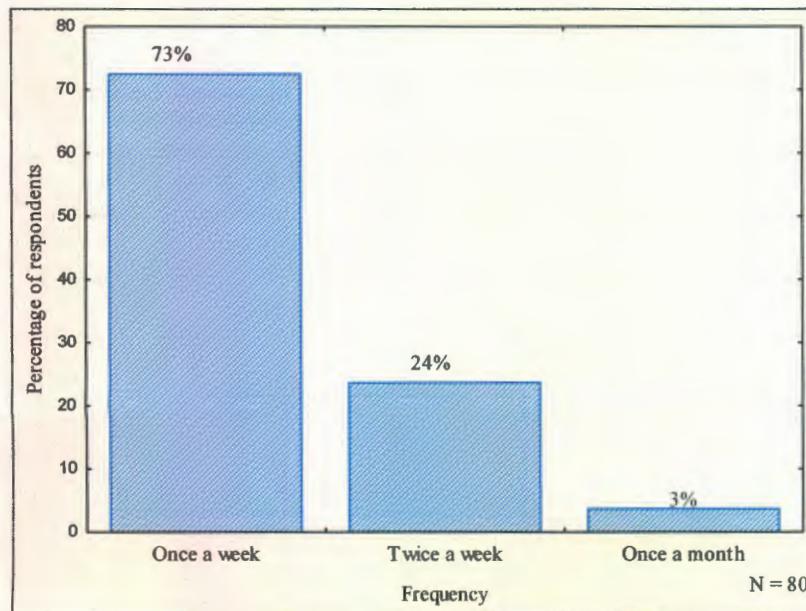
Figure 3.5 Collection days of recyclable solid waste in Stellenbosch, 2004

The days of collection varied by suburb as shown in Table 3.6. The results indicate that in ten suburbs collection occurred on Mondays, in thirteen on Tuesdays and in three on Wednesdays. The only suburb that reported Thursday as a collection day is Kayamandi but also on Tuesdays and Wednesdays. Kayamandi and Ida's Valley are the only two suburbs that reported three days of collection of recyclable waste. Although these responses from the surveyed householders indicate multiple collection days, the Stellenbosch municipality refuse removal guide for July 2004–June 2005 (the period of this study) indicates that collection of household solid waste recyclables occurs only once a week per suburb (see Appendix 3). The anomalies show that respondents are not certain about the day on which collection of waste occurs.

Table 3.6: Days of household solid waste collection in each Stellenbosch suburb

Day of collection	Suburb
Monday	Brandwacht, Cloetesville, Dalsig, Ida's Valley, Karindal, Mostertsdrift, Onder-Papegaaiberg, Paradyskloof, Simonswyk, Uniepark
Tuesday	Cloetesville, Dalsig, Die Boord, Ida's Valley, Karindal, Kayamandi, Krigeville, Mostertsdrift/Van der Stell, Paradyskloof, Simonswyk, The Avenue, Uniepark, Universiteitsoord
Wednesday	Ida's Valley, Kayamandi, Onder-Papegaaiberg
Thursday	Kayamandi

When asked (C8) how often they would prefer to have their recyclables collected, nearly three quarters cited once a week, about one quarter preferred collection twice weekly and, surprisingly, the remainder opted for once a month (see Figure 3.6). These results imply that householders are producing large enough amounts of recyclables to warrant a weekly collection, but not twice a week.

**Figure 3.6** Householders' preferred frequency of the collection of recyclables, Stellenbosch 2004

Householders were asked whether they prefer collection of recyclable waste and refuse to be done on different days (C9). The results are shown in Figure 3.7.

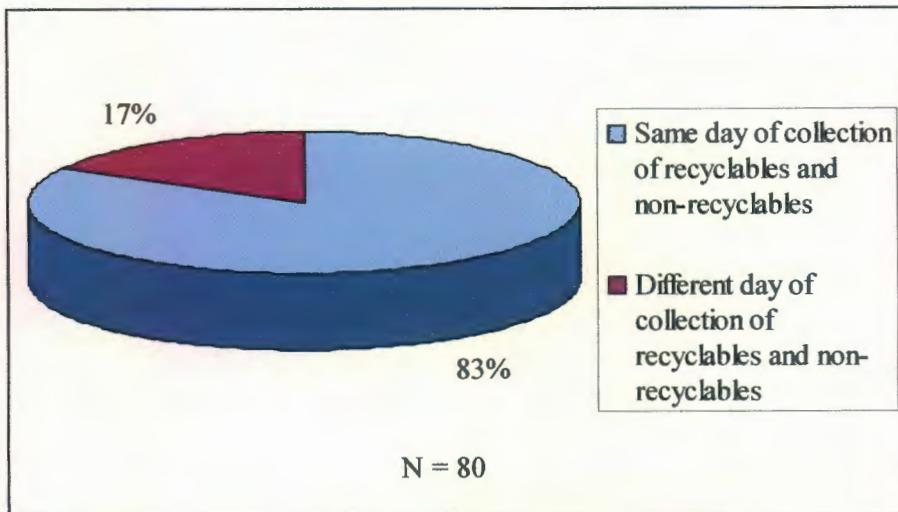


Figure 3.7 Householders' preferred day for collection of recyclables and non-recyclables, Stellenbosch 2004

Clearly, four out of five respondents would prefer the collection of their recyclables and non-recyclables to take place on the same day. When asked why, a number of reasons were given as shown in Figure 3.8.

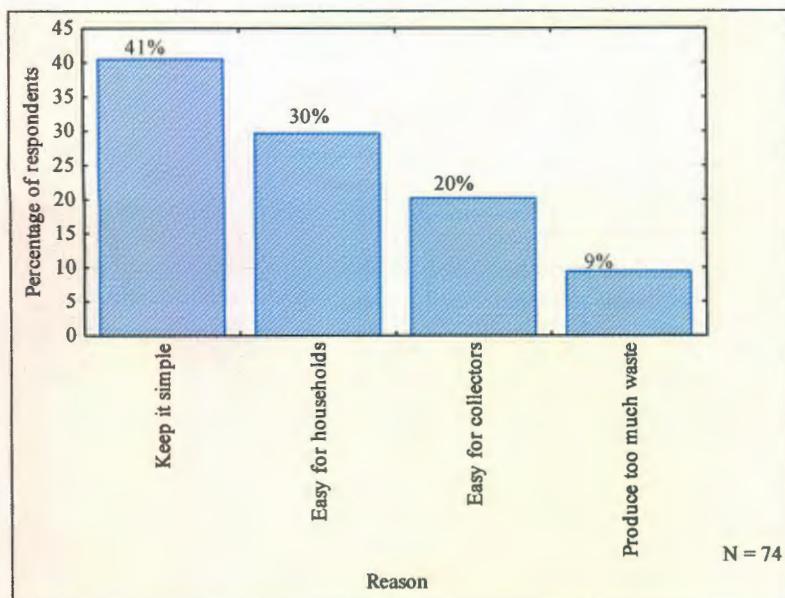


Figure 3.8: Householders' reasons for their preferred day of collection of recyclable and non-recyclable waste in Stellenbosch, 2004

Three reasons were given for same-day collection, namely keep the system simple – avoid the problems and hassle of having to take out the waste more than once a week – and make it easy for householders and for waste collectors. For respondents who preferred collection of recyclable and non-recyclable waste on different days, the reason given was that they produce large quantities of waste which they wish to have removed on different days each week. It appears that respondents prefer a simple waste collection system for both the collectors and the householders.

Since recycling programmes can be residential, industrial, commercial or institutional recycling schemes and since each sector generates different kinds of waste, it is important to analyze the types of recyclables that may comprise domestic waste when designing a household solid waste recycling scheme. Information about the types of recyclables produced by households can also determine the number of segregations needed to keep recyclables separated from non-recyclables. The following section reports on the types of recyclables produced by the householders surveyed.

3.2.3 Types of recyclables

Recyclables comprise used materials that may be remanufactured or reprocessed into useful raw materials or final products. Materials that can be recycled are metals, (broken) glass, newspaper, and plastic. In fact, recycling should start at home where different kinds of solid waste need to be kept separately because they are difficult to separate and make use of once they have been mixed. Respondents were asked (C3) to mark the types of recyclables contained in their solid waste. Figure 3.9 summarizes their answers.

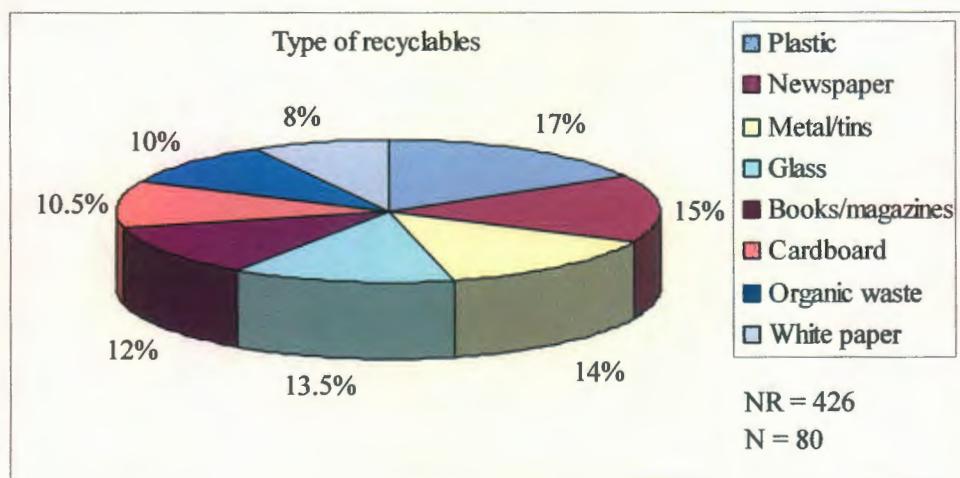


Figure 3.9: Types of recyclables produced by households in Stellenbosch, 2004

Eight types of recyclables were listed in the questionnaire and an option allowed for "other" types to be named. No others were added by the respondents. Mentions of the eight types varied between eight per cent (white paper) and 17 per cent (plastic) of all the responses. "Hard" materials (plastic, metals/cans and glass) constitute nearly half (44.5%) of the responses. "Soft" paper-based products (white paper, newspaper, books/magazines, cardboard) almost make up the other half (45.5%). Organic waste, which is recyclable by residents into compost, accounts for the remainder. The "hard" recyclables and cardboard are mainly packaging materials.

According to the study by Semoli (1998), in Stellenbosch 23 per cent of the respondents participated in glass recycling and 33 per cent participated in paper recycling at least once every three months. When one takes into account all the different types of material that can be included in a recycling programme, the various methods for segregation and various means and methods of collection are endless and confusing (Spencer 1994). Consequently, specific expertise is required to evaluate the optimum method of separation for a given community based upon its population, geographic location and proximity to markets for recyclables (Thomas 2001).

The waste collection system is an important factor to be considered in household solid waste recycling programmes and it is necessary to know the different types of material that can be included in a recycling programme (Spencer 1994; Noehammer & Byer 1997). The evidence so far from Stellenbosch is that a curbside collection system, characterized by reliability, convenience, collection frequency of not more than twice a week, same-day collection of recyclables and non-recyclables, and one that demands less effort by householders is desired. The next section deals with respondents' knowledge about, awareness of and actual participation in domestic solid waste recycling.

3.3 Knowledge about, awareness of and participation in solid household waste recycling

In order to determine householders' participation in solid household waste recycling it was necessary to find out how much respondents know about and are aware of the recycling initiatives in their localities. First, respondents were asked (B1) if they are aware of any household waste recycling activities in Stellenbosch town; secondly, they were asked (B2) to give the sources of information they use to learn or know more about recycling in their area; and thirdly, whether they recycled their solid household waste or not and to give reasons for doing so or not (B3). The results are presented in the next sections.

3.3.1 Knowledge about and awareness of domestic waste recycling in Stellenbosch

When respondents were asked about their awareness of any household recycling activities in Stellenbosch, 59 per cent were aware and 41 per cent not. In a follow-up question, respondents were asked to describe briefly the recycling activities they are aware of. Their answers are illustrated in Figure 3.10 which shows an awareness of four recycling activities/facilities.

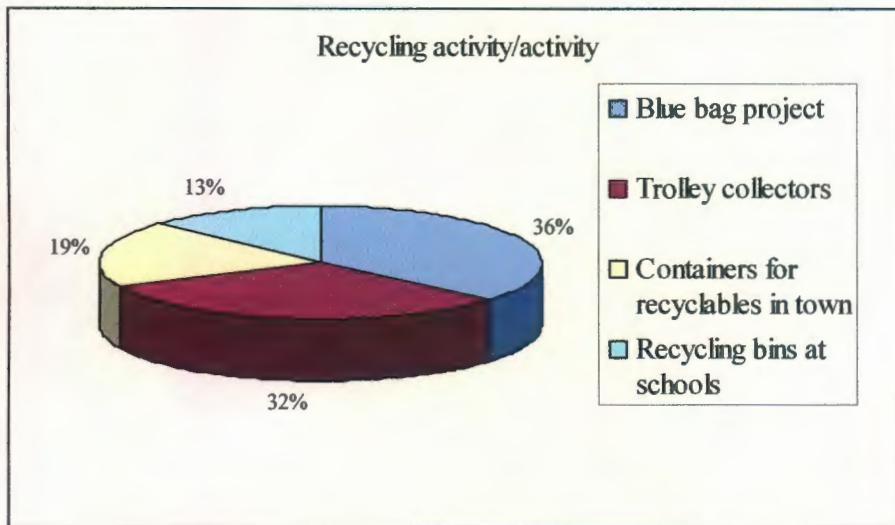


Figure 3.10: Recycling activities and facilities in Stellenbosch according to respondents, 2004

According to the responses, the greatest awareness is about the currently running blue bag project and the trolley collectors. Although the BBHWRP had only just been introduced at the time of the survey, it accounted for more than one third of the responses, possibly because of the publicity surrounding it. Similarly, the overt presence of the informal waste collectors in the town's suburbs is reflected in about one third of the responses pointing to awareness of their activities. It is noteworthy that fewer responses indicated knowledge and awareness of recycling facilities (bins and containers) available at various localities. The existing literature on the environment and recycling behaviour shows that knowledge is commonly seen as a necessary precondition for a person's behaviour where action-related knowledge and effectiveness are said to have a direct impact on performance (Frick, Kaizer & Wilson 2004). In other words, a community informed about household solid waste recycling issues means improved participation in household waste recycling. Hence, information on household solid waste recycling in Stellenbosch should be made accessible and available to householders. In view of this respondents were asked to name the

sources of information they use to learn, and keep up to date, about recycling in their locality. The results are presented in Figure 3.11.

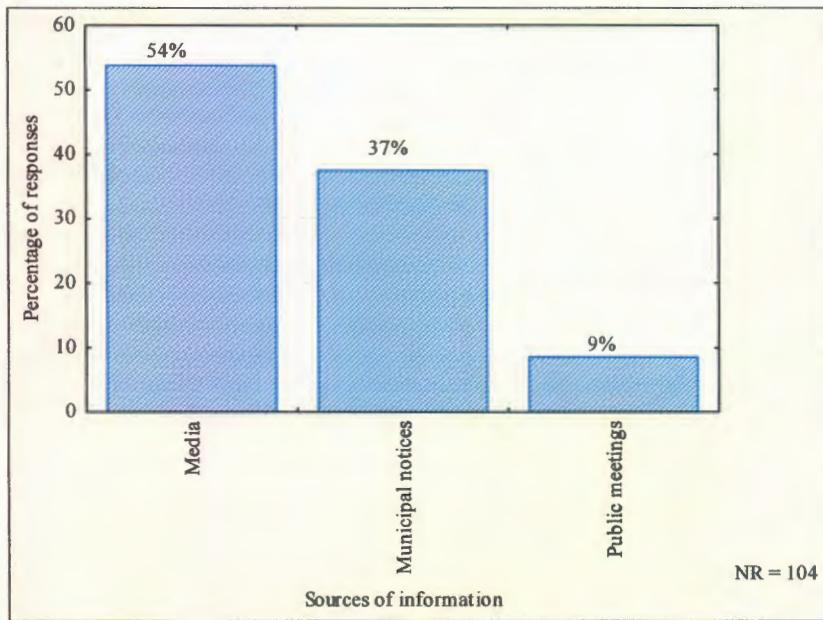


Figure 3.11: Sources of information about local solid waste recycling used by households in Stellenbosch, 2004

The most commonly used source of information is the media. The municipality was cited as the second most commonly used source of information in the form of municipal notices which can be obtained from the municipal offices free of charge. One can deduce that most respondents have access to the media, which constitute an effective tool for use by the municipality to communicate with the town's residents. Only nine per cent of the responses cite public meetings, perhaps because the public meetings are held at inconvenient times for respondents so that most respondents do not attend them. However, if public meetings are used properly they are a more direct way of reaching out to the residents (Marcus 2004 *per.com*). Through the ward meetings at the suburb level, awareness of the importance of recycling can be created at grassroots level. Interestingly, no other information sources were mentioned, although provision was made for this option in the question. It appears that the media are the most used source of information about recycling in Stellenbosch. The next section describes respondents' participation in solid waste recycling.

3.4 Participation in solid household waste recycling

Participation by householders is a significant factor determining the success of a household solid waste recycling scheme. In the survey three out of every five respondents (60%) said they recycle their household waste and 40 per cent do not (B3). Householders' recycling of solid waste can take various forms and the ways in which respondents participate are discussed later. But first it is illuminating to look at their reasons for practising recycling (section 3.5) and secondly to consider the reasons why they do not (section 3.6).

3.5 Reasons for householders' participation in solid domestic waste recycling

Participation in household recycling is determined by several factors. Li (2003) indicates that reasons for individual participation in recycling household waste are very complicated and related to environmental motivation, social pressure and economic incentives. In this study, knowledge about and awareness of recycling, the various reasons for recycling, as well as the methods of recycling, are used to describe the recycling behaviour of the respondents. When asked (B3(a)) about why they recycle their solid household waste, respondents gave reasons that can be classified in four categories, viz. ecological, environmental, economic, and sense of individual responsibility. The results are illustrated in Figure 3.12 and discussed in the relevant subsections.

3.5.1 Ecological arguments

Ecological reasons point to the respondents' awareness about the conservation of resources and the natural environment. The results imply that some respondents recycle because of the benefits that recycling offer the natural environment, particularly in conserving natural resources. Interestingly, ecological consciousness is foremost in their minds as close to half of the responses stated that they recycle for ecological reasons.

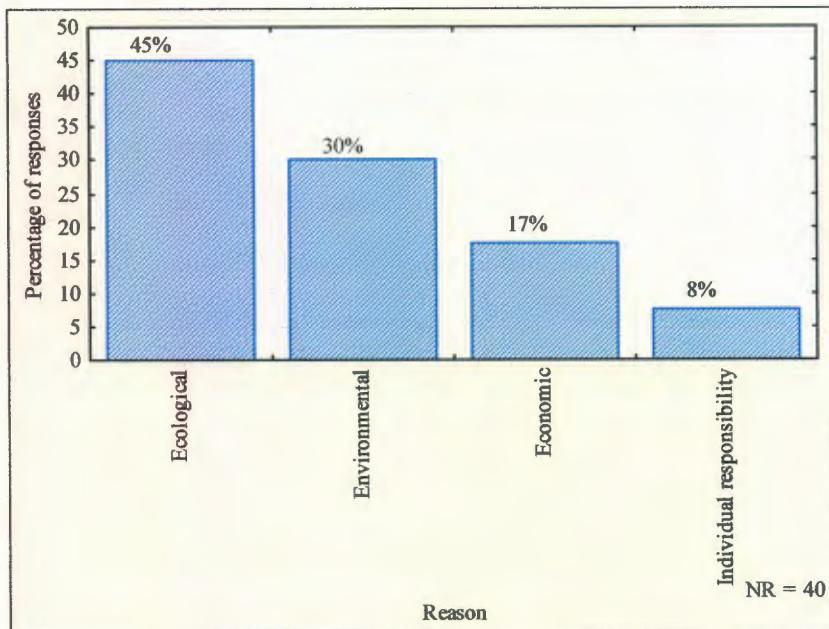


Figure 3.12: Reasons for practising recycling, Stellenbosch 2004

3.5.2 Environmental concerns

The second most numerous collection of reasons for practising recycling is a concern for the environment, i.e. avoiding litter in the surroundings and keeping them clean and unpolluted. Some 30 per cent of the responses given by those who recycle their waste indicate the practise of solid waste recycling for a cleaner environment. In this study, most respondents cited ecological reasons for practising recycling, whereas Tucker (1999) found that in South Ayrshire (South-west Scotland) 80 per cent of households practiced recycling for environmental reasons.

3.5.3 Economic considerations

Only 17 per cent of the responses by those who practise recycling mentioned recycling for economic reasons by which they mean that recycling has created a source of income for trolley people. It was mentioned that an income can be earned from selling recyclables to recycling companies. A few respondents from Paradyskloof mentioned that they give their newspapers to one particular waste collector, who sells them to the buy-back centres to supplement his income. Furthermore, it appears that respondents consider recycling as some form of business in which one can gain some profit. This situation shows that in Stellenbosch informal waste collectors are there to eke out a living by selling recyclables to the buy-back centres. Van Lill (1998) and De Necker & Van Lill (2001) found that the peripatetic collectors were poor people who moved from place to

place looking for recyclables in the CBD, while the sedentary scavengers worked at the municipal refuse dump to sort waste as it is dumped by municipal trucks. The itinerant collectors have subsequently moved their operations to the town's residential areas.

3.5.4 Individual responsibility

The motivation by individual responsibility was weak with only a minority of responses informing us that recycling is practised because it is every citizen's duty to recycle, if at all possible. This is not surprising given the fact that a solid waste recycling programme has just been introduced to the community. Perhaps, given time and through enhancement of local recycling infrastructure provision and awareness-raising activities, responsible household solid waste management has prospects for succeeding in Stellenbosch. On the other hand, it will be insightful to hear the reasons why respondents do not practise recycling. The results will convey potential barriers to recycling and inform us about the prospects for failure in the study area.

3.6 Reasons for householders' non-participation in domestic waste recycling

All recycling programmes involve effort on the part of the participants. The most common reasons provided in the literature for not participating in recycling programmes are inconvenience, lack of time, effort required for recycling, and lack of incentives or general commitment (Schultz, Oskamp & Mainieri 1995; Macdonald & Oates 2003). In this study, respondents also gave reasons for not practising recycling (B3(a)). The reasons cited for non-participation were sixfold, namely that (i) recycling requires too much time; or (ii) too much effort; or (iii) there is a lack of knowledge about recycling; or (iv) a lack of facilities for recycling; or (v) because of not being part of the BBHWRP; or (vi) that recycling is only associated with trolley/jobless people. The magnitude of the responses is shown in Figure 3.13 and the reasons are discussed briefly below.

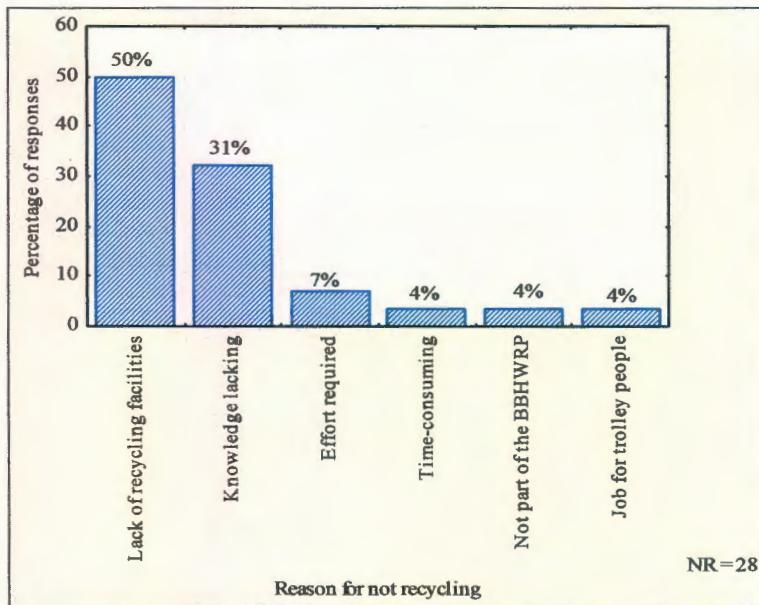


Figure 3.13: Reasons for non-participation in recycling, Stellenbosch 2004

3.6.1 Lack of recycling facilities

Clearly, one half of the responses indicated that recycling is not done because there is a lack of recycling facilities to use. It is not surprising that the majority of responses cite lack of recycling facilities as the reason for not taking part in recycling since Figure 3.10 also shows a low percentage of responses that indicate that respondents are aware of recycling bins which serve as facilities for recycling. Various types of recycling facilities can improve household solid waste recycling. In the United Kingdom household waste recycling centres (HWRC) are used to increase solid household waste recycling (Woodard, Bench, Harder & Stanzos 2004) and in Stellenbosch an increased number of strategically located recycling bins should improve participation in solid waste recycling.

3.6.2 Lack of knowledge about waste recycling

Nearly one third of the responses mentioned that respondents do not know what is expected of them in order to participate in household solid waste recycling. To express their lack of knowledge some respondents mentioned that they were involved in recycling for the first time in their life. From the literature it is clear that improving participants' understanding of recycling requirements ensures the effectiveness of the process of recycling (Thomas 2001). Such requirements include an understanding of which materials are accepted in recycling, how the publicity works and education about recycling.

3.6.3 Effort needed and time-consuming practice

Some respondents reasoned that they do not practise recycling because it requires effort or that it is time-consuming. The former claim that recycling requires some effort and is a hassle to them while the latter said that recycling costs them time, mentioning that they are too busy with work and do not feel like recycling, even if they have the time. In other studies effort and time are commonly cited as barriers to household solid waste recycling (Tucker 1999).

3.6.4 Job for trolley people and a sense of negligence in local recycling

A small proportion (4%) of the responses point to recycling as the job for trolley people and as a result the respondents do not participate in the process. A similar percentage do not participate in recycling because they are not part of the local recycling programme, the BBHWRP. Although only a minority said they consider recycling as a job for trolley people and not for them, recycling can serve a good cause as it helps poor people to make a living from selling recyclable material. Responses about not being part of the local recycling programme possibly hint at respondents feeling neglected in local recycling activities. Perhaps with proper information dissemination to the community explaining the stage and nature of the local recycling programme, householders will understand the importance of their participation in recycling despite the fact that they are not part of any recycling programme.

Ebreo & Vining (2000) have pointed out that, although recycling may not receive a great deal of attention, the provision and implementation of a recycling programme can have an effect on the public's attitudes and motives and their behaviour concerning recycling. Having outlined respondents' knowledge and awareness of, participation and non-participation in, as well as the potential for pro-recycling and the barriers to recycling, the next section describes the ways in which respondents do participate in household solid waste recycling in their localities.

3.7 Ways to recycle

Recycling programmes can be implemented in various ways. Recycling programmes can be either voluntary or mandatory, and the materials to be recycled can define recycling schemes. In this study, participation is evaluated by considering four recycling alternatives: (i) separation of waste into different recyclables for collection; (ii) making compost; (iii) taking recyclables to community recycling bins; and (iv) other methods (see question B3(b)). Figure 3.14 shows the range of

household participation in recycling in Stellenbosch. The three methods illustrated are discussed in the following sections.

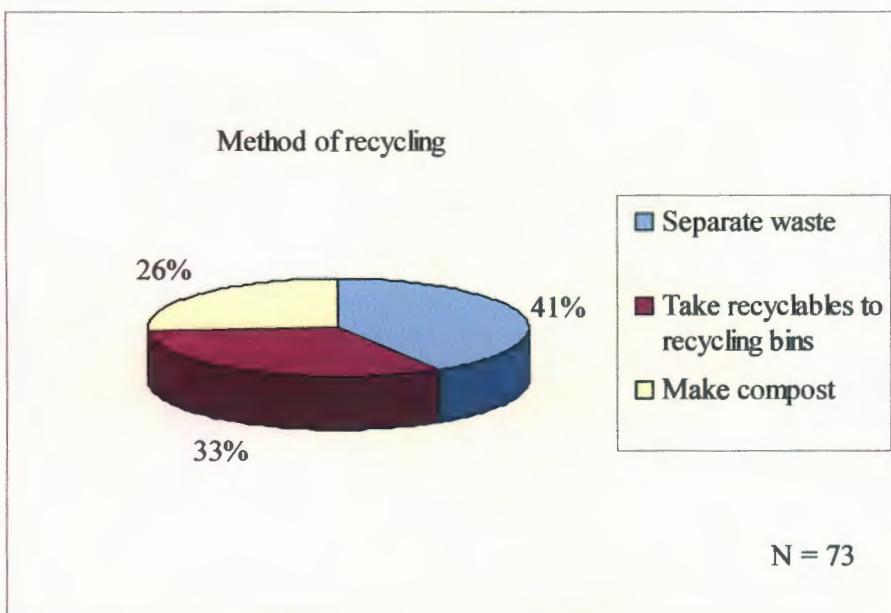


Figure 3.14: Methods of recycling used by households in Stellenbosch, 2004

3.7.1 Waste separation

Two out of five responses said that they separate waste for recycling. The separation at household level by householders themselves is called “source separation”. In this study, respondents said that they separate newspapers, books and magazines from other household waste for recycling. The reason for this is that they give these items to various charity organizations at churches and schools. Other household waste such as plastic bottles, tins and glass are usually separated from the non-recyclable waste and put in the same container for recycling. Source separation is distinguished from “commingled separation” where all recyclables are kept together after separation from non-recyclables (Spencer 1994; Noehammer & Byer 1997). Respondents were also asked (C5) to give their preferred method of sorting their waste. The results are shown in Figure 3.15 and a brief discussion follows.

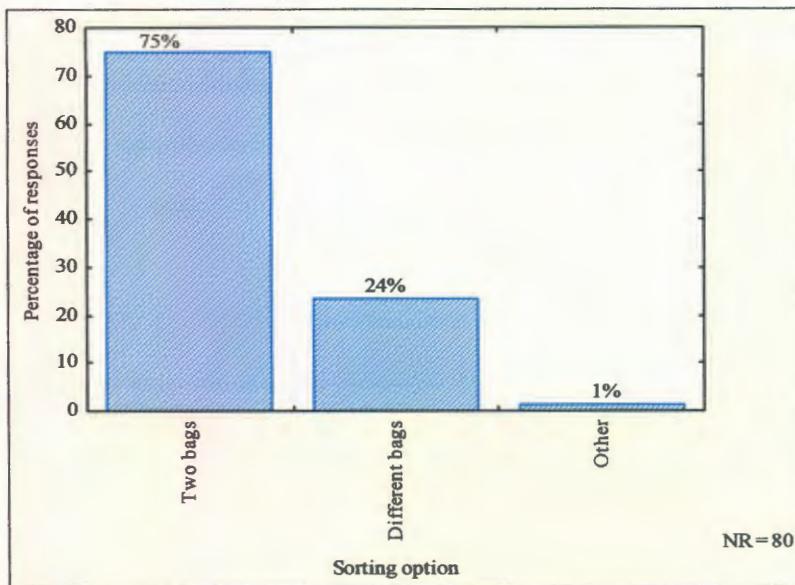


Figure 3.15: Household solid waste sorting preferences, Stellenbosch 2004

Waste separation and sorting are actually the first steps in waste recycling, hence respondents were asked to state the sorting options they prefer, namely sorting into two bags, one for recyclables and one for non-recyclables, or sorting waste into different bags, one for each of the various recyclables and non-recyclables. The overwhelmingly preferred method is the former. This method is probably easy and does not require much effort from the householder. It is called the commingled method (Noehammer & Byer 1997). On the other hand, only a quarter preferred to sort their waste into different bags for different recyclables. This is not surprising, since this method requires households to devote some time and effort to sort waste into different containers. This aversion to devoting time and effort to recycling activities is becoming clear in this study. Other preferences mentioned were to separate waste into two differently coloured plastics bags, one for recyclables and one for non-recyclables in order to avoid confusion of bags by householders and waste collectors, or even more colours for households preferring to sort into more than two different bags.

3.7.2 Personally taking recyclables to the community bins

One third of responses showed that recyclable waste is personally taken to the community recycling bins and depots. In essence, this shows that in Stellenbosch the drop-off system for recyclables does exist. Drop-off centres are centralised locations where residents may voluntarily bring certain recyclable materials (Spencer 1994). Spencer (1994) further showed that drop-off centres can be small capacity containers that temporarily store the material for regular pick-up and transportation

to a central consolidation facility itself. There are three buy-back centres in Stellenbosch, namely CL Waste and Scrap located near Du Toit railway station, Captain Waste and Store Metals in Ida's Valley, where residents can hand in recyclables in exchange for money. The types of recyclables that residents take to buy-back centres are bottles, cardboard, tins, metal and newspapers. There are also recycling bins placed in the CBD for paper and tins.

3.7.3 Composting

Composting is a method of handling and processing organic wastes that, at a domestic level, can produce a humus-like material, which may be used as a soil-conditioner for gardens or as a top-dressing for lawns (Judais 1986). The practice is not very common as only one quarter of responses showed that compost is made from their organic waste. This is not surprising, since only 10 per cent (see Figure 3.9) of responses mentioned that respondents' household waste contained organic material.

3.8 Summary

This chapter has presented the different ways and degrees of participation and the inhabitants' attitudes towards participation, in household waste recycling in Stellenbosch. Table 3.7 summarizes the findings in this chapter. It illustrates the type of data analyzed, factors used to describe the householders' attitudes towards and participation in solid waste recycling in Stellenbosch.

Table 3.7: Attitudes towards and participation in solid waste recycling: Summary of findings

Type of data used	Factors used to describe data	Findings
Attitudinal data Attitudes towards solid waste recycling	<ul style="list-style-type: none"> Collection method of recyclables 	<ul style="list-style-type: none"> Up to two thirds of the respondents preferred curbside collection Trolley collectors, self-delivery to the community recycling bins or recycling company and municipality are reported as prevalent agents of household waste collection First preference of household waste collector is the municipality, second is recycling company and third is trolley collectors
	<ul style="list-style-type: none"> Reasons for choice of method of household solid waste collection 	<ul style="list-style-type: none"> The paramount reasons are less effort by households, convenience and cheapness of method of collection
	<ul style="list-style-type: none"> Collection frequency of household waste 	<ul style="list-style-type: none"> Collection is reported to occur three times a week from only two suburbs, two times from seven and once from the other seven surveyed suburbs Nearly three quarters of the respondents preferred once a week and one quarter twice weekly collection Same-day collection of recyclables and non-recyclables preferred by four out of five respondents
	<ul style="list-style-type: none"> Reasons for preferred frequency of household waste collection 	<ul style="list-style-type: none"> Two out of five respondents do so to keep the collection system simple One third and one fifth prefer so to make it easy for householders and waste collectors respectively
Participatory data Participation levels in solid waste recycling	<ul style="list-style-type: none"> Knowledge about and awareness of solid waste recycling, activities and facilities 	<ul style="list-style-type: none"> More than one third of the responses showed awareness of BBHWRP, about one third indicated awareness of trolley collectors and least awareness of recycling bins in the study was shown by 13% of the responses
	<ul style="list-style-type: none"> Participation in solid waste recycling 	<ul style="list-style-type: none"> Three out of five respondents practice recycling
	<ul style="list-style-type: none"> Reasons for practicing recycling 	<ul style="list-style-type: none"> Ecological arguments have been cited as the foremost reason, secondly environmental concerns and thirdly economic considerations
	<ul style="list-style-type: none"> Reasons for non-participation 	<ul style="list-style-type: none"> Lack of recycling facilities; lack of knowledge about recycling; effort-requiring and time-consuming practice
	<ul style="list-style-type: none"> Ways to recycle 	<ul style="list-style-type: none"> Two out of five responses indicated that they practice waste separation Three quarters of the responses preferred two segregations—recyclables and non-recyclables and one quarter preferred sorting waste into different bags for different recyclables One third responses cited personally taking recyclables to community recycling bins Composting not commonly practiced—only one quarter practice composting

as a problem in their localities, hence recycling as a resolution is gaining attention. In the next chapter the respondents' willingness to participate in the BBHWRP as a local recycling scheme is described. The exercise is to further address the study's second objective, namely to gauge and explain the potential willingness to take part in a household solid waste separation and recycling scheme.

CHAPTER 4: HOUSEHOLDERS' WILLINGNESS TO PARTICIPATE IN A DOMESTIC SOLID WASTE RECYCLING PROGRAMME IN STELLENBOSCH

4 INTRODUCTION: WHAT DOES IT TAKE TO BE A RECYCLER?

Household recycling and separation schemes are used to divert recyclable waste from entering landfills. Such schemes require separation of waste into recyclable and non-recyclable waste. Recyclable wastes constitute all material outputs of human production-consumption activities that are considered useful; wastes that have reached the limit of their usefulness form non-recyclable waste (Judais 1986). Recycling and separation schemes require households to separate their recyclable waste from the non-recyclable waste. The greater part of the success of these schemes depends on households' willingness to participate, and their co-operation and support. The Blue Bag Household Waste Recycling Programme (BBHWRP) is a pilot programme being run on a voluntary basis with the aims of (i) exploring the feasibility of a household waste recovery system for Stellenbosch town, (ii) finding a way of controlling and discouraging informal collection activities, and (iii) strengthening opportunities for entrepreneurship in waste. A recovery project of the exact same design specifications has not yet been conducted anywhere in South Africa, so the co-operation and support of the chosen pilot households as well as all the town's residents are of utmost importance to make the initiative a success (Dittke pers com. 2004).

The aim of this chapter is to determine and explain the willingness of the surveyed residents of Stellenbosch to participate in BBHWRP. The sample population of the survey comprised people who are included in the pilot project and those who are not. The BBHWRP covers only 1 000 households in three pilot study areas, namely Brandwacht, Ida's Valley and Cloetesville. Unfortunately, the response from the pilot project areas was poor, so that only 18 per cent of the respondents (C1) in the study are participants in the pilot project. The analysis will therefore not distinguish between the participants involved in the proposed household recycling programme and those who were not.

The willingness and unwillingness of the respondents to participate in BBHWRP are used to explain the motives as well as barriers for respondents to participate in a local solid household waste recycling scheme. Secondly, bivariate frequency distributions and the chi-square test will be used to describe the relationship between willingness to participate in the BBHWRP and

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4 INTRODUCTION: WHAT DOES IT TAKE TO BE A RECYCLER?

Household recycling and separation schemes are used to divert recyclable waste from entering landfills. Such schemes require separation of waste into recyclable and non-recyclable waste. Recyclable wastes constitute all material outputs of human production-consumption activities that are considered useful; wastes that have reached the limit of their usefulness form non-recyclable waste (Judais 1986). Recycling and separation schemes require households to separate their recyclable waste from the non-recyclable waste. The greater part of the success of these schemes depends on households' willingness to participate, and their co-operation and support. The Blue Bag Household Waste Recycling Programme (BBHWRP) is a pilot programme being run on a voluntary basis with the aims of (i) exploring the feasibility of a household waste recovery system for Stellenbosch town, (ii) finding a way of controlling and discouraging informal collection activities, and (iii) strengthening opportunities for entrepreneurship in waste. A recovery project of the exact same design specifications has not yet been conducted anywhere in South Africa, so the co-operation and support of the chosen pilot households as well as all the town's residents are of utmost importance to make the initiative a success (Dittke pers com. 2004).

The aim of this chapter is to determine and explain the willingness of the surveyed residents of Stellenbosch to participate in BBHWRP. The sample population of the survey comprised people who are included in the pilot project and those who are not. The BBHWRP covers only 1 000 households in three pilot study areas, namely Brandwacht, Ida's Valley and Cloetesville. Unfortunately, the response from the pilot project areas was poor, so that only 18 per cent of the respondents (C1) in the study are participants in the pilot project. The analysis will therefore not distinguish between the participants involved in the proposed household recycling programme and those who were not.

The willingness and unwillingness of the respondents to participate in BBHWRP are used to explain the motives as well as barriers for respondents to participate in a local solid household waste recycling scheme. Secondly, bivariate frequency distributions and the chi-square test will be used to describe the relationship between willingness to participate in the BBHWRP and

(i) respondents' socio-demographic characteristics (gender, age, number of persons in household and education); (ii) respondents' socio-economic characteristics (employment status, gross income, type of housing and housing tenure); and (iii) residential location and willingness to take part in the BBHWRP. Thirdly, the same statistical procedures are performed to explain the relationship between respondents' willingness to participate in the BBHWRP and its operational factors, namely (i) waste sorting at household level by householders; and (ii) the use of two waste containers for recyclables and non-recyclables. Finally, a summary of the results according to their relationship with willingness to participate in the pilot programme will be given. A five per cent level of p-value was used as a guideline for determining the significance of relationships. When the value of $p>0.05$, there is no significant relationship, and when $p<0.05$, there is some significant relationship between a particular variable and willingness to participate in the BBHWRP.

4.1 Willingness to participate in the BBHWRP

In order to explain respondents' willingness to take part in a household waste recycling project, respondents were asked whether they are willing to participate or not (C2) and whether they are already doing so (C1). They were also asked to give reasons for their answer to C2 (see C2(a)); hence motives for and barriers to participation in a local household solid waste recycling will be identified. The results are shown in Figures 4.1 and 4.2 followed by brief discussions.

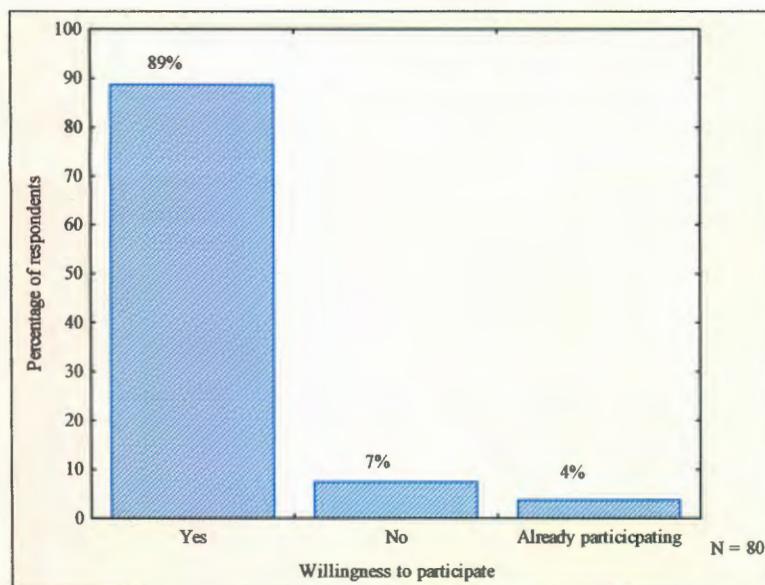


Figure 4.1: Householders' willingness to participate in the BBHWRP in Stellenbosch, 2004

Nearly 90 per cent of the respondents indicated that they are willing to take part in the recycling programme and four per cent affirmed that they are already participating. Less than 10 per cent are unwilling to take part in the programme. These findings are promising, indicating that the implementation of a local household solid waste recycling programme may be widely supported. The following section looks into the reasons for the respondents' willingness or unwillingness to take part in the project.

4.1.2 Reasons for respondents' willingness and unwillingness to participate in the BBHWRP

The motives for households' willingness to participate are similar to those given for households' participation in household waste recycling in general (see Section 3.5), namely ecological, environmental and economic reasons, and some others (see Figure 4.2).

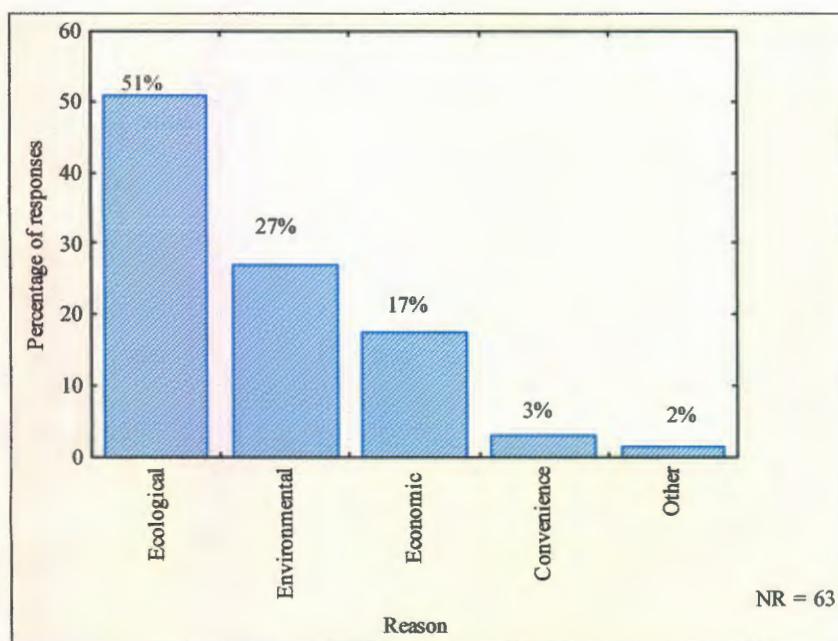


Figure 4.2: Reasons for householders' willingness to participate in the BBHWRP, Stellenbosch 2004

The respondents have concerns for the natural environment which urge them to want to recycle. Natural environmental concerns encompass the conservation of resources and habitats, and the maintenance of clean and unpolluted surroundings. In this study the recycling of solid waste was seen not only as an advantage to the natural environment but also as providing a survival strategy for the poor, hence its economic value. Responses that consider convenience of the recycling programme as a motive for willingness to participate, show that respondents will be willing

provided it is convenient to do so. Other reasons given were cost, where responses show willingness to participate if no additional costs accrue over and above the municipal service charge for refuse removal. The respondents who were unwilling to participate in the BBHWRP cited reasons of lack of time and too much effort required from households.

4.2 Willingness to participate in the BBHWRP: Socio-demographic explanations

The literature records that demographic factors are significant determinants of waste control practices (Corral-Verdugo 2003). According to Schultz, Oskamp, & Mainieri (1995), the four most often reported demographic variables in studies on recycling behaviour are gender, age, income, and education. This section focuses on the interrelationships between the socio-demographic characteristics (gender, age, education and number of persons in household) of respondents and their willingness to participate in the BBHWRP. Willingness to participate is cross-tabulated with the explanatory socio-demographic variables and the chi-square test is used to determine significance.

4.2.1 Gender

The respondents' gender was cross-tabulated with willingness to participate in order to see whether men or women are more inclined to participate in the recycling programme. Although a greater proportion of men noted a willingness, the chi-square test ($p = 0.66$) indicated that respondents' willingness to recycle is not significantly related to their sex (see Table 4.1).

Table 4.1: Gender and willingness to participate in the BBHWRP, Stellenbosch 2004

Willingness to participate	Gender		Row totals
	Male	Female	
Yes	92	85	89
No	5	10	7
Already	3	5	4
Column totals	47	53	100

N = 80; column percentages; $p = 0.66$

Women tend to be less willing, but they are already more engaged in recycling. Elsewhere Stern, Dietz & Guagnano (1995) and Mohai & Twight (1987) discovered that women recycle more than men, while males engage significantly more in littering behaviour than females (Meeker 1997).

4.2.2 Age

The ages of respondents were categorized into young (18-21 years), middle aged (22-50 years) and aged (older than 50) and cross-tabulated with willingness to participate in the BBHWRP. No significant relationship between respondents' willingness to participate and age exists (see Table 4.2). It appears that the middle-aged and young-aged respondents are most willing to participate in the BBHWRP and older respondents less so. Young respondents stand out as the participants in the BBHWRP. Semoli (1998) found that in Stellenbosch elderly people (above the age of 51) participate more than young respondents (below 30 years).

Table 4.2: Age and willingness to participate in the BBHWRP, Stellenbosch 2004

Willingness to participate	Age			Row totals
	Young (18-21)	Middle age (22-50)	Old age (>50)	
Yes	90	95	86	89
No	0	5	10	7
Already	10	0	4	4
Column totals	12	24	64	100

N = 80; Column percentages; p = 0.54

It has been documented elsewhere that age shows a relationship to recycling behaviour. However, there are conflicting findings about this relationship which have led to the conclusion by some writers that age has no predictive value for recycling behaviour (Barr 2002). For instance, Ball & Lawson (1990) found in Scotland that younger people were least likely to participate in recycling programmes, while McDonald & Ball (1998) state that in Glasgow a disproportionate number of elderly people tend to recycle plastics. In some instances it has been found that young people recycle more when they receive money in exchange for recycling products (De Young 1991). However, Oskamp, Harrington, Edwards, Sherwood, Okuda & Swanson (1991) maintain that recycling or waste management behaviour cannot be seen as just one type of action but a number of actions. Despite these findings, some writers (e.g. Cooper 2002; Taylor 2004) argue that geographical location and level of development may have an impact on the way people of different ages participate in recycling.

4.2.3 Education

Research on the impact of an individual's formal education on environmental behaviour, has shown mostly positive correlations implying that higher education equates with enhanced behaviour (Barr 2002). Scott & Willits (1994) found that educational level is a determinant of responsible consumption, with people having higher education levels investing greater effort in recycling activities. The results of the Stellenbosch enquiry are indicated in Table 4.3.

Table 4.3 Educational status and willingness to participate in the BBHWRP, Stellenbosch 2004

Willingness to participate	Educational status			Row Totals
	Low	Middle	High	
Yes	100	92	86	89
No	0	4	10	7
Already	0	4	4	4
Column totals	9	30	61	100

N = 80; Column percentages; p = 0.77

Respondents' educational status was categorized as low (grade 7 or lower), middle (grades 8 to 12) and high (diploma, degree). The p-value of the chi-square test shows that respondents' willingness to participate in BBHWRP is not significantly dependent on educational level. The literature records some inconsistencies in studies of the relationship between recycling and education level in which no relationship was found in some studies (Hooper & Nielson 1991; Gamba & Oskamp 1994), but a direct relationship was found in others (Vining & Ebreo 1990; Lansana 1992) cited in Schultz, Oskamp & Maineri (1995). The disparate results were due to the range of education levels included in the samples. Surprisingly, in Stellenbosch the respondents with low education levels are most willing to participate and those with higher education levels the least. It is notable that the high level education category tend to be the most unwilling to participate.

4.2.4 Size of household

The number of persons in the household was investigated vis-à-vis the willingness to participate in the recycling programme. Household sizes were categorized as small, middle, large and very large families. The chi-square test and cross-tabulation results are shown in Table 4.4.

Table 4.4: Size of household and willingness to participate in the BBHWRP, Stellenbosch 2004

Willingness to participate	Size of household				Row totals
	1-2 Small	3-4 Middle	5-6 Large	>6 Very large	
Yes	84	95	85	50	88
No	12	2.5	15	0	8
Already	4	2.5	0	50	4
Column totals	32	49	17	2	100

N = 78; Column percentages; p = 0.02

Unlike the other socio-demographic variables, the p-value of less than 0.05 indicates a significant relationship between the number of persons in respondents' households and willingness to participate in the pilot recycling project. Middle-sized families seem to be more willing to participate in the BBHWRP than large and small families. The very large families are the ones already engaged in the BBHWRP. Larger families with many children have been found to be less inclined to recycle than smaller families where there are few children (Hooper & Nielson 1991).

The analysis of socio-demographic variables and their relationship to willingness to participate in the pilot programme has provided mixed findings. Overall gender, age and education are not significantly related to willingness while size of household does show a degree of significant relationship. The following section attempts to relate respondents' socio-economic characteristics to their willingness to participate in the blue bag pilot programme.

4.3 Willingness to participate in the BBHWRP: Socio-economic relationships

The respondents' employment status, income, housing tenure and type of housing were investigated as socio-economic variables that may determine the willingness to participate in the BBHWRP. The results are set out below.

4.3.1 Employment status

The categories used to define the employment status of the respondents are working full-time, seeking work, student and retired. The chi-square test and cross-tabulation results are displayed in Table 4.5.

Table 4.5: Employment status and willingness to participate in the BBHWRP, Stellenbosch 2004

Willingness to participate	Occupation				Row totals
	Working full-time	Seeking work	Student	Retired	
Yes	88	100	100	89	90
No	10	0	0	5.5	7
Already	2	0	0	5.5	3
Column totals	57	10	7	26	100

N = 70; Column percentages; p = 0.88

The majority of the respondents in this question were full-time working and retired persons. The p-value of the chi-square test indicates that the relationship between employment status and willingness is insignificant. All of the students and job seekers surveyed and the majority of the retired persons and those working full-time, are highly willing to participate in the BBHWRP. It has been found that recyclers are generally likely to be unemployed (not working) or retired people (Waste Watch 1998).

4.3.2 Income

Income earned by respondents was classified into three categories: low, middle and high (see Table 4.6). More than half of the respondents were earning high gross monthly incomes while the low- and middle-income groups are represented by equal proportions. The chi-square test shows that there is no significant relationship between income and willingness to participate in the BBHWRP.

Table 4.6: Income and willingness to participate in the BBHWRP, Stellenbosch 2004

Willingness to participate	Income			Row totals
	Low	Middle	High	
Yes	94	75	93	89
No	6	19	5	8
Already	0	6	2	3
Column totals	22	22	56	100

N = 72; Column percentages; p = 0.37

The majority of respondents in all three groups are willing to participate but, interestingly, it is the low- and high-income earners who tend to be more willing to participate than middle-income earners. The latter group showed the greatest degree of unwillingness to participate but also the highest proportion of households already participating in the project. It is notable that none of the

low-income respondents are already involved in the project, yet they are the most willing group. Contrastingly, Vining & Ebreo (1990) and Gamba & Oskamp (1994) found that income and recycling behaviour do have a direct relationship, showing that people who earn more money are more likely to recycle than people who earn less money.

4.3.3 Housing tenure

A useful socio-economic factor for explaining recycling behaviour is the issue of tenure, which is sometimes coupled with type of housing or/and household composition (Oskamp *et al.* 1991). Tenure denotes the status of a household's ownership of their dwelling. In this study home-owners predominated (see Table 4.7).

Table 4.7: Housing tenure and willingness to participate in the BBHWRP, Stellenbosch 2004

Willingness to participate	Housing tenure		Row totals
	Owner	Tenant	
Yes	92	50	90
No	5	25	6
Already	3	25	4
Column totals	95	5	100

N = 79; Column percentages; p = 0.02

The chi-square test indicates a significant relationship between households' willingness to recycle and housing tenure. The cross-table shows that home-owners show a greater willingness to participate in the BBHWRP than do tenants. It is notable that the few tenant respondents have markedly greater proportions of respondents who are not willing or are already participating compared to the owners. The literature records that tenure is a significant variable for predicting both recycling and other environmental behaviour. Oskamp *et al.* (1991), Lansana (1992), Berger (1997) and Daneshvary, Daneshvary & Schwer (1998) all reported that owners are more likely to recycle than tenants. Furthermore, Watts & Probert (1999) found in Swansea that home-owners were more likely to participate in curbside recycling schemes than private tenants.

4.3.4 Housing type

The types of housing were classified into house or brick structure on a separate stand or yard, flat in a block of flats, townhouse, house or flat in a backyard and informal dwelling (shack) not in a backyard (A8). These types of housing were cross-tabulated with the willingness to participate and

the results are displayed in Table 4.8. Brick houses on a separate stand dominated in the study. All respondents in all types of housing said that they are willing to participate.

Table 4.8: Type of housing and willingness to participate in the BBHWRP, Stellenbosch 2004

Willingness to participate	Housing type				Row totals
	Brick house on a separate stand	Town- house	Brick house in backyard	Shack	
Yes	87	100	100	100	89
No	9	0	0	0	8
Already	4	0	0	0	3
Total	89	2.5	2.5	6	100
Columns					

N = 80; Column percentages; p = 0.97

The chi-square test shows that the willingness to participate is not dependent on the type of housing. It has been reported that people in smaller dwellings tend not to participate compared to those living in big houses (Coggins 1994). In this study respondents from all four types of housing reported a high degree of willingness to participate. Only the respondents who stay in brick houses on separate stands reported already participating and less than ten percent showed an unwillingness to participate.

According to the above analyses respondents' socio-economic characteristics do not relate to their willingness to participate in the BBHWRP. Hence the situation indicates that the overwhelming 89 per cent (see Figure 4.1) of respondents who reported that they are willing to participate in the household waste recycling pilot programme said so regardless of their socio-economic characteristics except for housing tenure which showed a significant relationship between respondents' housing tenure and their willingness to participate.

The variation of respondents' willingness to participate in the BBHWRP according to suburb is analyzed next. The residents' social, economic and demographic status differs greatly in the suburbs of Stellenbosch, hence it is necessary to relate willingness to recycle with the suburb where a respondent lives. Coggins (1994) has shown that residential location and street layout can determine recycling participation since they can be influencing factors in waste generation.

4.4 Willingness to participate in the BBHWRP: Spatial variations

Respondents' (sub)urban place of residence was cross-tabulated with willingness to participate in the BBHWRP (questions C2 and A6). Respondents' willingness to participate and where they live show no significant relationship. A p-value of 0.57 was obtained. Figure 4.3 illustrates the proportions of respondents per suburb who said they are willing to participate, unwilling and are already participating. Twelve (67%) of the 18 suburbs reported 100 per cent willingness to participate, while willingness to participate ranged between 50 and 95 per cent in the other six suburbs. Six suburbs (33%) reported some unwillingness to participate which ranged between 5 and 50 per cent, and only two suburbs (11%) reported that they were already participating.

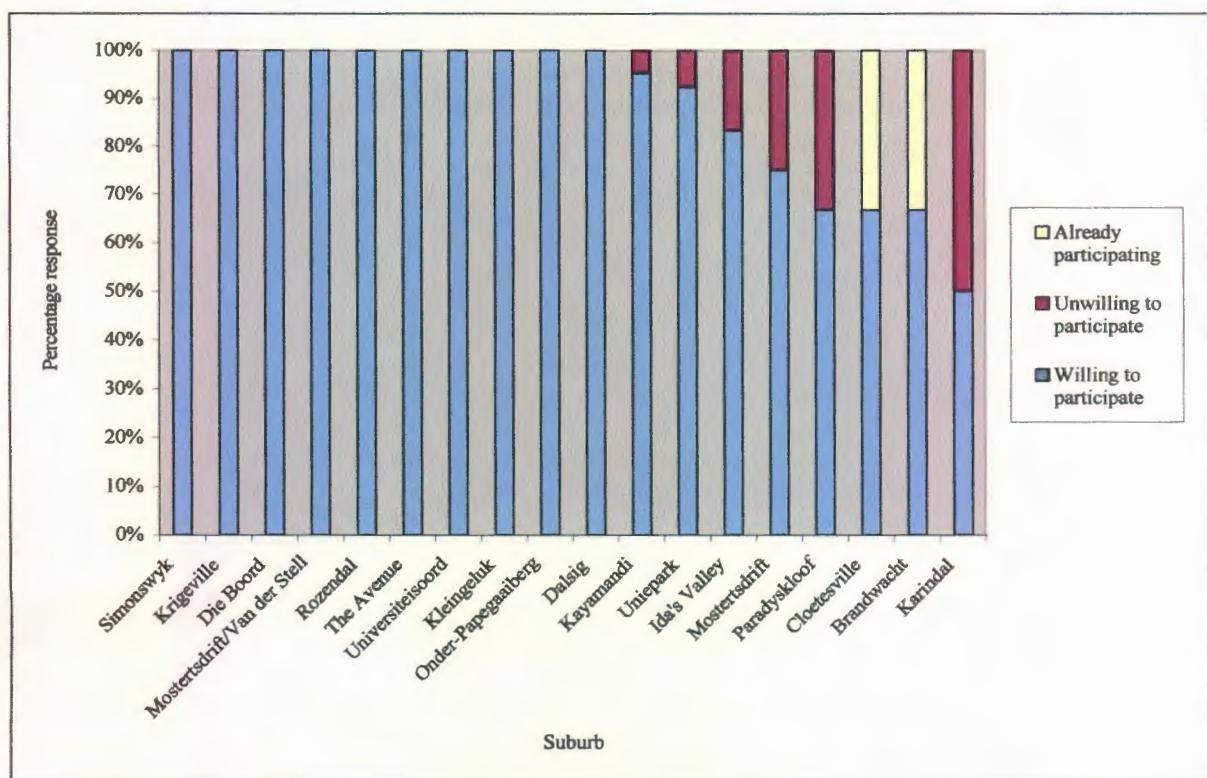


Figure 4.3: Willingness to participate in the BBHWRP by suburb, Stellenbosch 2004

The suburbs that reported a 100 per cent willingness to participate are former White high-income suburbs. Cloetesville and Ida's Valley, Coloured areas, show different levels of willingness to participate. Ida's Valley shows more willingness to participate than Cloetesville but the latter also has a contingent of respondents who are already participating. It seems that the BBHWRP will receive greater support in Cloetesville than in Ida's Valley. Both Cloetesville and Ida's Valley and the African suburb Kayamandi are characterized as low socio-economic status neighbourhoods of

Stellenbosch (McKechnie 1997). Kayamandi, shows a high (95 per cent) willingness to participate. Interestingly, Karindal showed a 50 per cent willingness and 50 per cent unwillingness to participate, while the rest have shown more willingness than unwillingness. It has been found that respondents practice solid waste recycling for ecological, environmental and economic purposes. In areas of high socio-economic status people tend to recycle for ecological and environmental reasons over economic purposes, while in areas of medium to low socio-economic status recycling may be practiced for economic reasons such as selling recyclables to get money to survive. De Necker & Van Lill (2001) earlier found that waste collectors in Stellenbosch are poor people who find a means of survival from collecting and selling waste.

The spatial distribution of the respondents' willingness to participate in the BBHWRP is shown in Figures 4.4 to 4.6. Figure 4.4 shows the varying degrees of willingness to participate. The suburbs that show a high degree of willingness do not take any spatial pattern, thus they are evenly distributed across Stellenbosch town.

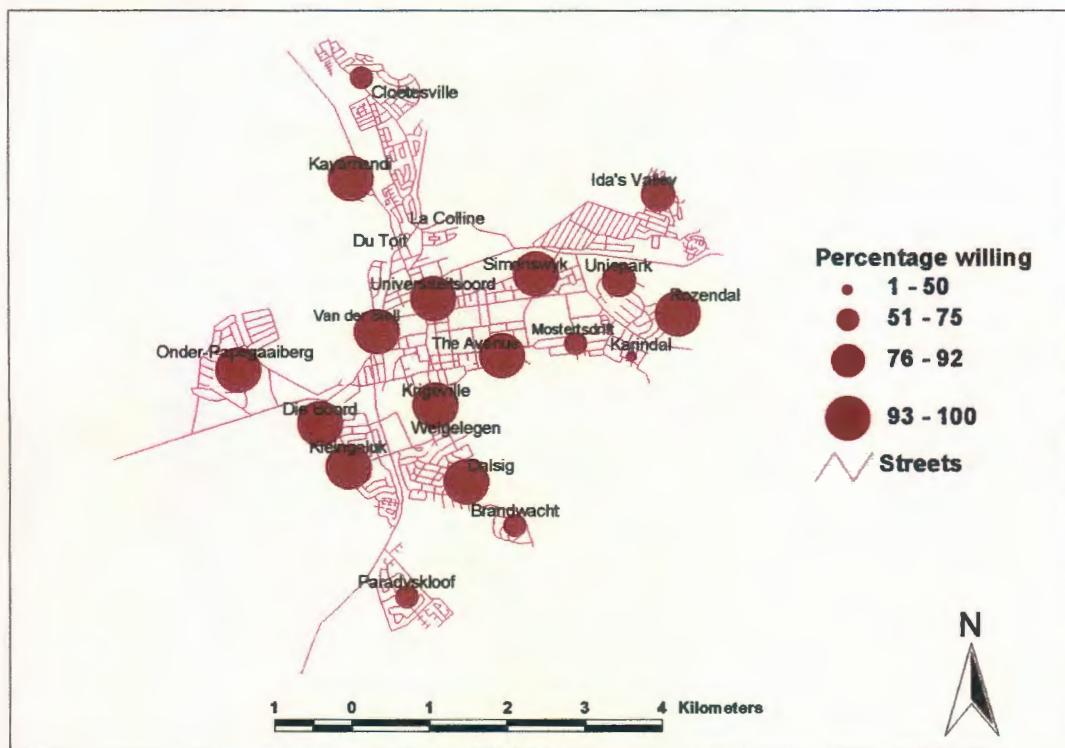


Figure 4.4: Spatial distribution of willingness to participate in the BBHWRP, Stellenbosch 2004

The spatial distribution of the respondents' unwillingness to participate in the BBHWRP is shown in Figure 4.5. These suburbs are former White areas with high socio-economic status, namely

Paradyskloof, Karindal and Mostertsdrift (McKechnie 1997). Kayamandi and Ida's Valley, areas of low/medium and low socio-economic status, showed low unwillingness to participate. Uniepark stands out as an area of high socio-economic status area (McKechnie 1997) but a low percentage of unwillingness which means that respondents in low or high socio-economic status areas are both supportive of household solid waste recycling despite their social status and spatial location.

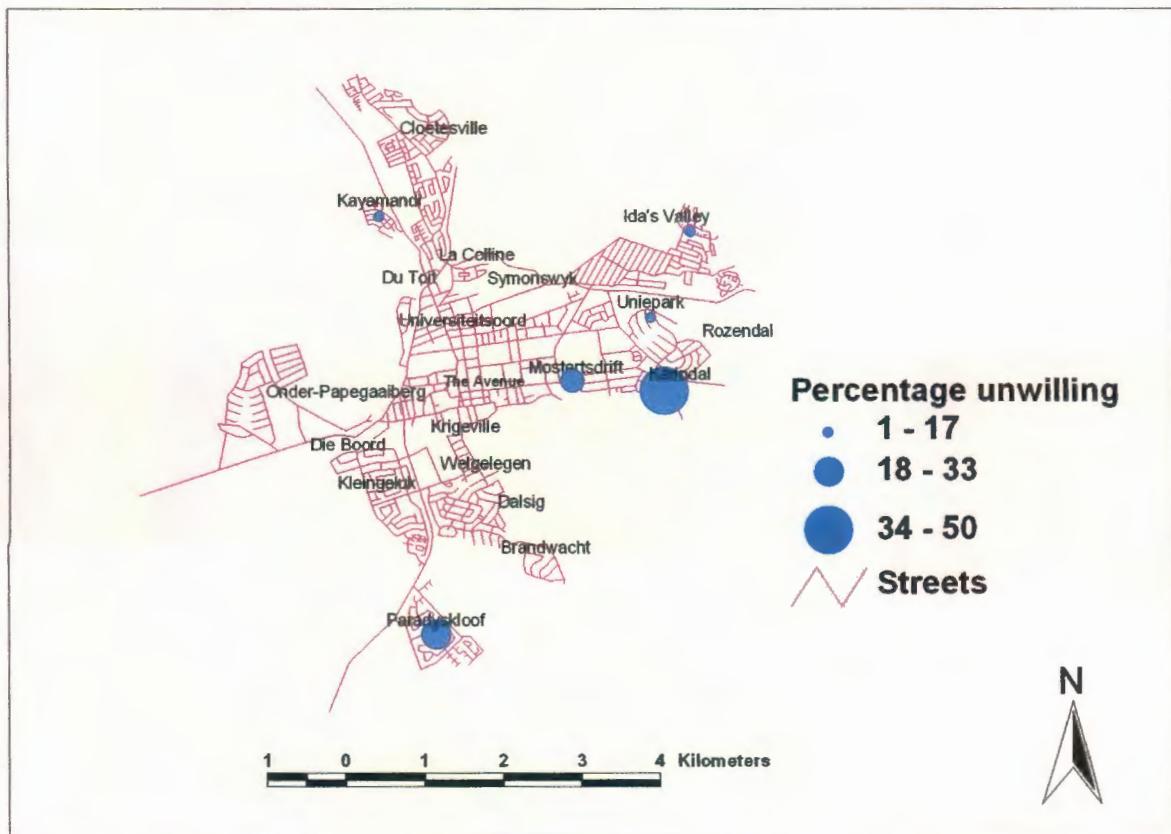


Figure 4.5: Spatial distribution of unwillingness to participate in the BBHWRP, Stellenbosch 2004

Figure 4.6 represents the areas which have reported that they are already participating in the pilot domestic solid waste recycling programme (BBHWRP). Although the pilot project areas are Ida's Valley, Cloetesville and Brandwacht, only Ida's Valley and Brandwacht respondents recorded this in their responses.

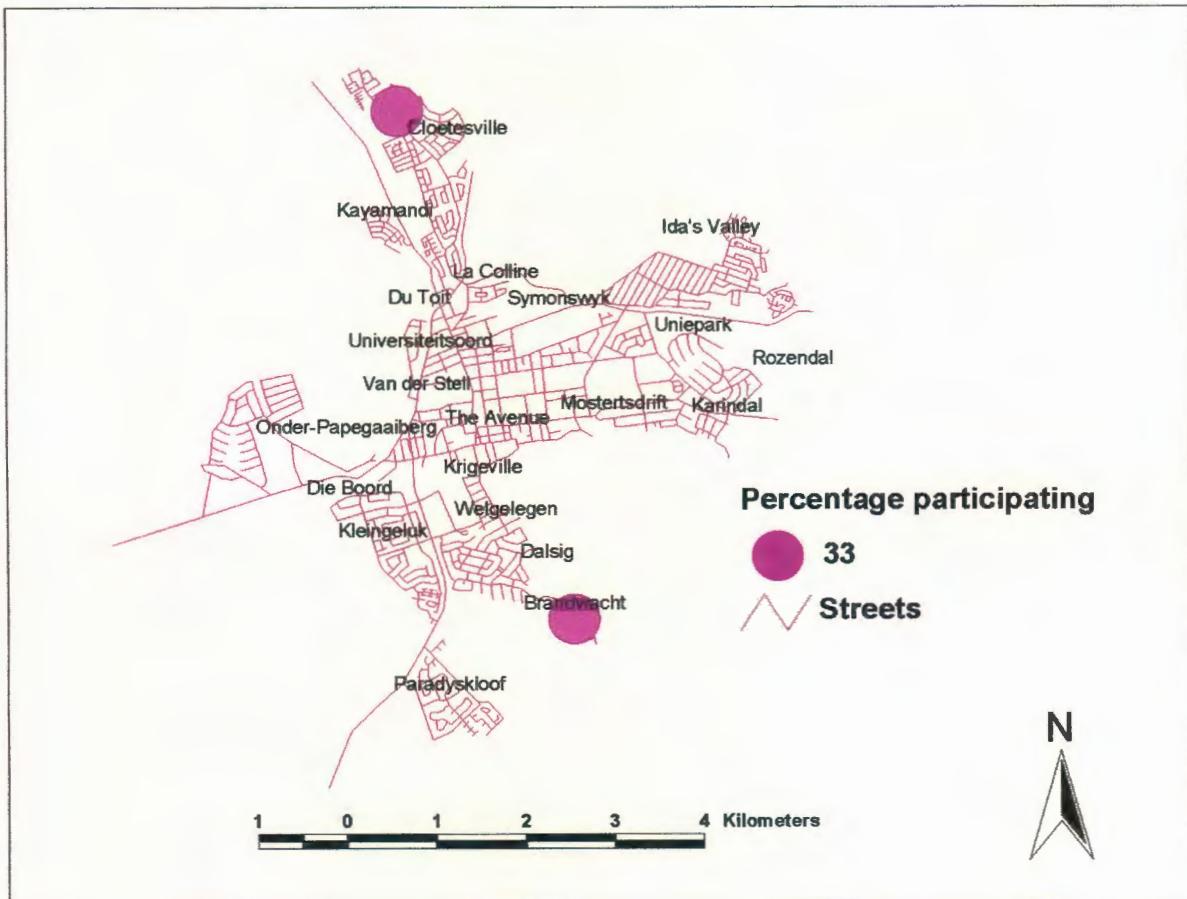


Figure 4.6: Spatial distribution of participation in the BBHWRP, Stellenbosch 2004

These results show that respondents from all the suburbs showed a positive response towards participation in a domestic solid waste recycling in their suburbs. However, as shown previously, a p-value of 0.57 indicates no significant relationship. In the next section the willingness to participate is related to the operation of the pilot recycling programme.

4.5 Willingness to recycle: BBHWRP operational variables

The BBHWRP pilot project solely encourages sorting and separation of household solid waste at home by householders. The programme requires that participating householders separate their household waste into two categories—recyclables and non-recyclables. Collection of both recyclables and non-recyclables is done on the same day. The pilot project supplies each household with four blue bags per month. In time, the goal of the project is to include all the suburbs in the town and households will be expected to use two separate waste bags, one for recyclables and one for non-recyclables. In this section, the respondents' willingness to participate in the programme is

tested against their willingness to sort their waste and to provide an additional rubbish bag to the black bag they already use. The reasons for willingness to sort will be analyzed in order to identify the barriers and motives for respondents' willingness to sort household solid waste.

4.5.1 Sorting and separation of waste

The BBHWRP can rightly be called a household solid waste separation and recycling programme. As a separation and recycling programme participants are expected to sort household waste at home. The respondents' willingness to sort was cross-tabulated with willingness to participate in the programme as shown in Table 4.9. A clear majority of respondents who are willing to sort are also willing to participate in the programme.

Table 4.9: Willingness to sort household waste by willingness to participate in the BBHWRP, Stellenbosch 2004

		Willingness to sort household waste		
Willingness to participate	Yes	No	Totals	
Yes	91	33	88	
No	5	67	8	
Already	4	0	4	
Total	96	4	100	

N = 77; Column percentages; p = 0.0005

The results of the chi-square test indicate that there is a statistically significant positive relationship between respondents' willingness to sort household waste and willingness to participate in the BBHWRP. Thus the respondents who are willing to participate in BBHWRP are also willing to sort their household waste. As expected, those who are already participating showed a willingness to sort their household waste. Two thirds of the respondents who are unwilling to take part in the programme, are not prepared to sort their waste.

Respondents were asked (C4 (a)) to provide reasons why they are willing or unwilling to sort household waste into recyclables and non-recyclables (see Figure 4.7). Reasons for willingness to sort waste are (i) for the purpose of recycling, (ii) willingness to sort if separate bags for recyclables and non-recyclables are provided, (iii) willingness to sort for benefits to the natural environment to avoid litter and maintain cleaner and unpolluted surroundings, (iv) because of environmental awareness which emphasizes reduction of waste and recycling, (v) willingness to

sort is dependent on the cost or charges that accrue to it, and (vii) if a separate container/bag is provided for recyclables. Collectively 61 per cent of the responses show that willingness to sort domestic waste is done for the purpose of recycling, for the benefit of the environment and as an indication for environmental awareness in their areas. Few responses (4.5%) point to respondents being willing to sort household waste to aid waste collectors. Interestingly, two of the reasons given are conditions (if the additional bag for recyclables is provided and if it is not going to increase the charges of the waste collection service) under which respondents said they will be willing to sort their household waste.

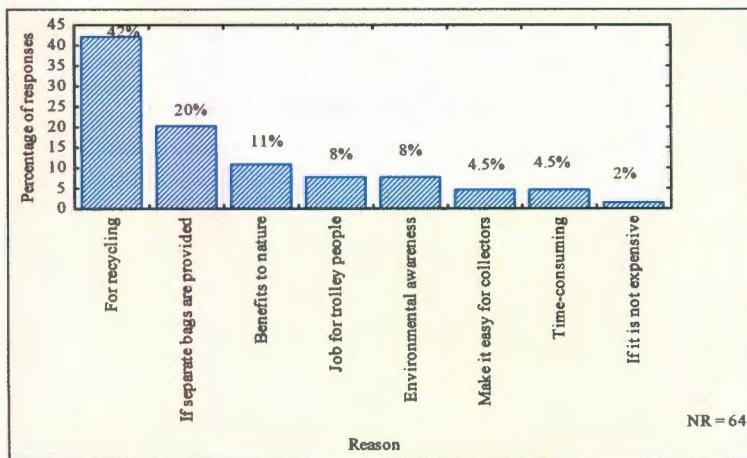


Figure 4.7: Reasons for householders' (un)willingness to sort domestic solid waste, Stellenbosch 2004

The other reasons given can be classified as reasons for *unwillingness* to sort household waste, namely job for trolley people (respondents regard sorting to be trolley people's job) and that sorting is time-consuming.

4.5.2 Willingness to provide household waste containers/bags

One waste container for recyclables and one for non-recyclables are required in the BBHWRP. Respondents were asked if they were willing to buy the two household waste containers/bags needed for sorting their household waste into recyclables and non-recyclables. Their answers are cross-tabulated with their willingness to participate in Table 4.10.

Table 4.10: Willingness to buy two household waste containers/bags by willingness to participate in the BBHWRP, Stellenbosch 2004

Willingness to participate	Two bags for sorting		Totals
	Yes	No	
Yes	89	89	89
No	5.5	11	7
Already	5.5	0	4
Totals	67	33	100

N = 79; Column percentages; p = 0.32

The chi-square test ($p>0.05$) indicates no significant relationship between willingness to provide two waste containers and willingness to participate in the recycling programme. In other studies, it has been discovered that a positive correlation between the provision of a free container and participation is a feature in voluntary programmes as opposed to mandatory programmes (Folz 1991). It has also been found that the factor most cited for increased participation in recycling programmes is not the provision of the container itself, but factors such as increased convenience, a visual reminder to recycle, and peer pressure, since the absence (at curbside) of a recycling container identifies non-recyclers (Everett & Pierce 1993). In order to increase recycling participation in the BBHWRP as a voluntary programme, provision of blue bags would be advisable for residents in which to sort their household waste. Respondents were asked (C6(a)) to give reasons if they are unwilling to buy two household waste containers, one for recyclables and one for non-recyclable waste. The answers are given in Figure 4.7.

Responses show that the cost of the additional household waste container/bag for recyclables is the major reason for unwillingness, one fifth saying that they do not have money to purchase a waste container/bag for recyclables. More than one third of the responses indicate that respondents are not willing to buy a container for recyclables because the municipality should provide blue bags to the community as part of the refuse removal service. The other reason is that there is already a service levy for the collection and removal of waste.

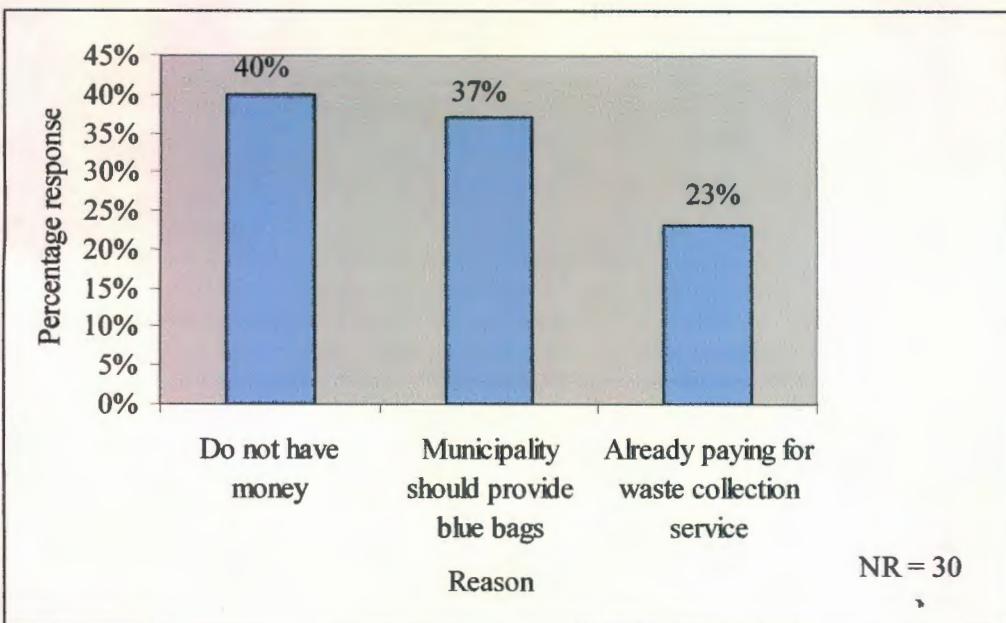


Figure 4.8: Reasons for unwillingness to buy household waste containers/bags for recyclables and non-recyclables, Stellenbosch 2004

It is clear that additional costs on top of the charges paid for waste removal in Stellenbosch are not advisable. It appears that the community expects the municipality to provide a waste removal service to the people, perhaps because they pay for the services or because they have the right to such a service.

4.6 Summary

The relationships between socio-demographic and socio-economic characteristics of communities and recycling activities and environmental management help to understand and explain recycling behaviour. In this chapter the chi-square test was used to determine the significance of the relationships between respondents' willingness to participate in the BBHWRP and their socio-demographic and socio-economic features as well as operational factors of the programme. The chi-square test revealed that there was generally no significant relationship between respondents' willingness to participate in the programme and most of the socio-demographic and socio-economic variables. Only the number of persons in the household, housing tenure and willingness to sort household waste at home showed any degree of significant relationship to respondents' willingness to participate in the BBHWRP. Given that the majority (89%) of respondents are willing to participate in the BBHWRP regardless of their socio-demographic and socio-economic

characteristics one must be wary of using the variables as predictors of participation rates. Table 4.11 summarizes the findings.

Table 4.11: Willingness to participate in the BBHWRP: Summary relationships with explanatory variables

Variable	Relationship with willingness to participate
Gender	<ul style="list-style-type: none"> • No significant relationship
Age	<ul style="list-style-type: none"> • No significant relationship
Education level	<ul style="list-style-type: none"> • No significant relationship
Size of household	<ul style="list-style-type: none"> • There is a relationship where middle-sized families tend to show more willingness to participate
Employment status	<ul style="list-style-type: none"> • No significant relationship
Income	<ul style="list-style-type: none"> • No significant relationship
Housing tenure	<ul style="list-style-type: none"> • There is a relationship whereby home-owners show more willingness to recycle than tenants
Type of housing	<ul style="list-style-type: none"> • No significant relationship
Suburban location	<ul style="list-style-type: none"> • No significant relationship
Willingness to sort	<ul style="list-style-type: none"> • Directly related; respondents who are willing to sort tend to be willing to participate in the BBHWRP
Willingness to provide two containers	<ul style="list-style-type: none"> • No significant relationship
Respondents' suburbs	<ul style="list-style-type: none"> • No significant relationship

Interestingly, the reasons for willingness to participate in the programme are the same as the motives for practising recycling in the area. In this chapter it became clear that recyclers in Stellenbosch can not rightly be described by socio-demographic, socio-economic or by the recycling programme operational characteristics. Instead, motives behind willingness to becoming a recycler are triggered by their pro-environmental behaviour or environmental awareness. On the other hand barriers to willingness to recycle can be cost, misunderstanding or lack of knowledge about the purpose of recycling such that people may believe that recycling and separation at home of waste is not their responsibility but that of trolley people. However, there are a minority who understand that recycling is every citizen's responsibility. Recyclers are likely to be home-owners

who understand the environmental benefits of recycling. In the final chapter, the successfulness in achieving the objectives of the study is assessed and recommendations for an effective household solid waste recycling programme for Stellenbosch are provided.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5 INTRODUCTION

This chapter looks at the extent to which the purpose and the objectives of the study have been achieved. It begins with an evaluation of how successfully the objectives have been addressed, then lists some limitations of the study, and concludes with recommendations.

5.1 Achievement of the objectives

The expressed aim of this study was to investigate the potential implementation of a household solid waste recycling scheme in Stellenbosch town. In order to achieve this objective a household survey was conducted to (i) investigate householders' attitudes towards and actual participation in household recycling; (ii) gauge and explain the willingness to take part in the household solid waste separation and recycling scheme; and (iii) provide recommendations on the implementation of a household solid waste recycling programme. The following sections evaluate whether these objectives have been won.

5.1.1 Attitudes towards and participation in solid waste recycling

The attitudes of respondents were analyzed as predictors of recycling behaviour of the respondents. Attitudes were used to indicate the extent to which people are aware of, care about and view household waste recycling in their localities. This objective was successfully reached by showing the degree of participation in and the recycling of solid waste recycling in Stellenbosch, the respondents' knowledge, awareness about and attitudes towards recycling, barriers to and motives of participation in household solid waste recycling. Knowledge about and awareness of household solid waste recycling activities in Stellenbosch are gradually gaining attention. The BBHWRP and trolley waste collectors were frequently mentioned as active agents in household waste recycling. There is a positive attitude towards recycling in Stellenbosch with an inclination towards a pro-environmental attitude and ecological and economic motives for participation. Sixty per cent of the respondents practise recycling. Separation of household solid waste at home and personally taking recyclables to recycling bins were two main ways the respondents participate in recycling. The main barriers to participation were lack of facilities for recycling and lack of knowledge about ways to recycle. The main reasons for the preferred methods of domestic solid waste collection were methods which demand less effort from households and are convenient, cheap and reliable.

Sixty-eight per cent of the respondents preferred curbside collection to the collection of household waste at a particular point such as community recycling bins. Hence the municipality and recycling companies were preferred to do the household solid waste collection over other methods of collection such as by trolley collectors and self-delivery.

5.1.2 Willingness to participate in the BBHWRP

Willingness to participate in the BBHWRP was used to gauge the potential for householders to commit to a household solid waste recycling programme. The BBHWRP, as a pilot household solid waste programme methodology, finds favour among the majority of the respondents with some 80 per cent recording a willingness to participate in the pilot programme. Willingness to participate in the pilot programme is not reliably explained by socio-demographic and socio-economic variables, however, middle-sized families and home-owners showed a significant relationship with both groups being more willing to participate. Willingness to sort household solid waste at home by householders is directly related to participation in the programme. Most commonly mentioned motives for respondents' willingness to sort household waste were for recycling purposes, the provision of blue bags for recyclables and for the benefit of the natural environment. A few responses cited barriers to waste sorting, i.e. it is for trolley people and it is time-consuming. Willingness to buy two waste containers, one for recyclables and one for non-recyclables showed no significant relationship to willingness to participate in the BBHWRP. Despite this, unwillingness to buy two separate household waste containers/bags for recyclables and non-recyclables was mostly because of not having money to purchase an additional household waste container for recyclables, and that respondents expect the municipality to provide bags for recyclables over and above the black bags already provided for household waste. The respondents' willingness to participate in the BBHWRP was meaningfully explained and it is clear that in order to achieve a high participation rate by households, the BBHWRP should consider free provision of an additional bag for recyclables to the households and also encourage bigger families and tenants to participate.

5.1.3 Recommendations about household solid waste recycling in Stellenbosch

The successful implementation of a household solid recycling scheme in Stellenbosch rests upon community co-operation and commitment. Judging by respondents' awareness, participation and willingness to participate it can be recommended that the municipality should increase recycling facilities and infrastructure in Stellenbosch. Current participation in recycling in Stellenbosch

primarily involves citizens who recycle voluntarily. The municipality should seek to create a mandatory recycling programme and set achievable goals in terms of diversion of waste from the landfill. In order to create a mandatory scheme the municipality should (i) emphasize the importance of recycling as a process to achieve environmental and resource conservation and not as a goal in itself; (ii) allocate funds to improve recycling infrastructure and facilities; and (iii) introduce and enforce the by-laws and regulations which the community should abide by in household solid waste recycling. Until such time, voluntary recycling will continue to be the primary method for diverting waste from disposal. Hence, the Stellenbosch municipality should focus on providing all the necessary means and incentives to improve voluntary recycling. Regular monitoring and evaluation of the household solid recycling programme in Stellenbosch must take place. Given the findings of this study, the municipality should provide a house-to-house educational campaign about recycling and its importance. Bigger families and tenant households should be targeted specifically to encourage them to participate in household solid waste recycling. The household solid waste recycling programme should provide households with both household waste containers, preferably black and blue bags for non-recyclables and recyclables respectively.

5.2 Limitations of the study

The major limitation in this research relates to the collection of primary data. The database from which the sample was randomly selected was not representative of all households in some residential areas since it was a list of property owners and not residents. Thus, for example, it did not include flats or university residences where many young people live. As a result the sample included only a small percentage of young people and a large percentage of older people. The postal survey method of data collection was not attractive to people because they had to take time to return questionnaires.

5.3 Recommendations: Making recycling work by understanding the community

While it is necessary for people to acquire the right attitude towards the value of recycling before they participate in a recycling programme, it appeared that there is no strong link between the right attitude and participatory behaviour in Stellenbosch. It is necessary to address the question why certain people may hold a positive attitude towards recycling but do not act and some hold a negative attitude yet they act. With a strong pro-recycling attitude in Stellenbosch, the recycling programme characteristics, such as the collection frequency and method of collection should be further investigated as to how they influence participation in recycling. Over and above

understanding the community, making informed decisions when designing a domestic recycling programme in Stellenbosch requires review of policies governing waste management and the formulation of regulations and by-laws concerning recycling. Further research is needed in order for decision makers to formulate suitable policies and regulations that will encourage the Stellenbosch community to increase participation in domestic solid waste recycling programmes in the future. In order to achieve a sustainable urban solid waste management scheme there is a need for behavioural change by both the authorities and the public. Padgett & Petzelka (1994) point out the prerequisites for such behavioural change as awareness of a problem, knowledge of alternatives, motivation for change and resources for change. The challenge to the local government and people of Stellenbosch is to meet these conditions.

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PERSONAL COMMUNICATIONS

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APPENDICES

APPENDIX 1: Distribution of sample population among the suburbs

Suburbs	Number of households	Percentage of total households	Sample size	Percentage of sample
Die Boord/De Oewer/ Kleingeluk	750	9.0	25	9.1
Cloetesville	1441	17.3	48	17.5
Ida's Valley/ The Ridge	1523	18.3	50	18.2
Kayamandi	1053	12.7	35	12.8
La Colline/ Kromrivier/Prins Park	128	1.5	4	1.5
Onder-Papegaiberg	395	4.7	13	4.7
Paradyskloof	584	7.0	19	6.9
Simonswyk	143	1.7	5	1.8
Uniepark/ Rozendaal/ Jonkerspark	316	3.8	10	3.7
Welgelegen/ Dalsig/ Brandwacht/ Krigeville	561	6.7	19	6.9
Banhoek/ Merriman/Bird St.	24	0.3	1	0.4
The Avenue	93	1.1	3	1.1
Die Laan	102	1.2	3	1.1
Mostertsdrif/Karindal/ Van der Stell	318	3.8	10	3.7
Universiteitsoord	322	3.9	10	3.7
DuToit/Alexander/ Bergzicht	578	7.0	19	6.9
Totals	8331	100	274	100

APPENDIX 2: Questionnaire

Dear Respondent (preferably head of household)

Mafalla Makau, a master's student in the Department of Geography and Environmental Studies at the University of Stellenbosch, is doing thesis research on the inhabitants' willingness to participate in a waste separation and recycling scheme in Stellenbosch. Currently the Blue Bag Household Waste Recovery Program (BBHWRP) is being run by a team headed by EnviroSense CC as a pilot project on a voluntary participation basis in selected Stellenbosch areas in order to determine the feasibility of a household waste sorting system for the whole of Stellenbosch. Mafalla's research is investigating the public's awareness of and attitudes towards participation in the recycling of household solid waste.

Recyclable material, (tins, glass, metal, plastic, paper, cardboard, newspapers, magazines, books) will be sorted daily at one central place and be sold to manufacturers for reprocessing. Jobless people will be given the opportunity to work for payment under supervision at the sorting site.

The thesis research is being undertaken in collaboration with the Stellenbosch Municipality and the BBHWRP project team.

The questionnaire is to be filled in anonymously. The information you provide will be used for academic purposes. The findings and recommendations of the research will be given to the municipality and project team to inform their decisions.

Please fill in this questionnaire as requested. It should not take more than 15 minutes. The questionnaire is available in English and Afrikaans.

PLEASE POST THE COMPLETED QUESTIONNAIRE IN THE PREPAID ENVELOPE PROVIDED. Please send back the questionnaire as soon as possible.

Address enquiries to:

Student: Ms Mafalla Makau

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QUESTIONNAIRE: Household solid waste sorting and recycling in Stellenbosch

Please answer the questions by making a cross in the appropriate box (es) and, where applicable, write the answer in the blank space provided.

SECTION A: GENERAL INFORMATION ABOUT RESPONDENT**1. Gender**

Male	<input type="checkbox"/>
Female	<input type="checkbox"/>

2. Age

18-21	<input type="checkbox"/>
22-50	<input type="checkbox"/>
Older than 50	<input type="checkbox"/>

3. Highest educational qualification obtained

Grade 7 or less	<input type="checkbox"/>
Grades 8-12	<input type="checkbox"/>
Diploma	<input type="checkbox"/>
Degree	<input type="checkbox"/>

4. Occupation (e.g. teacher, clerk, student).....**5. Gross income per month**

Less than R500	<input type="checkbox"/>
R501- R1 000	<input type="checkbox"/>
R1 001- R2 000	<input type="checkbox"/>
R2 001- R2 500	<input type="checkbox"/>
R2 501- R5 000	<input type="checkbox"/>
R5 001- R7 500	<input type="checkbox"/>
R7 501- R10 000	<input type="checkbox"/>
More than R10 000	<input type="checkbox"/>

6. Name of the suburb in which you live.....**7. Since when have you been living here?.....****8. Type of housing**

House or brick structure on a separate stand or yard	<input type="checkbox"/>
Flat in a block of flats	<input type="checkbox"/>
Townhouse	<input type="checkbox"/>
House or flat in back yard	<input type="checkbox"/>
Informal dwelling (shack) not in back yard	<input type="checkbox"/>
Informal dwelling (shack) in back yard	<input type="checkbox"/>

9. How many people are there in your household?.....

10. Are you the

Owner?	<input type="checkbox"/>
Tenant?	<input type="checkbox"/>
Other (please specify).....

SECTION B: PARTICIPATION IN AND ATTITUDE TOWARDS SOLID WASTE RECYCLING

1. Are you aware of any household recycling initiatives in Stellenbosch?

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

1(a) If Yes, briefly describe them.....

.....

2. What sources of information do you use to learn more about recycling in Stellenbosch (mark where applicable)?

The media (television, radio, newspapers)	<input type="checkbox"/>
Municipality	<input type="checkbox"/>
Public meetings	<input type="checkbox"/>
Other (please specify).....

3. Do you recycle your solid household waste?

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

3(a) Please give reason(s) for your answer.....

.....

3(b) If Yes, how do you participate in recycling (mark where applicable)?

Separate waste into different recyclables for collection	<input type="checkbox"/>
Make compost	<input type="checkbox"/>
Take recyclables to community recycling bin(s)	<input type="checkbox"/>
Other ((please specify)).....

4. Who collects recyclables in your area (mark where applicable)?

Individuals/trolley collectors	<input type="checkbox"/>
Recycling company	<input type="checkbox"/>
Take them to the community bin(s) yourself	<input type="checkbox"/>
Other (please specify)	<input type="checkbox"/>
.....	

5. How are recyclables collected in your area?

Collection per individual household	<input type="checkbox"/>
Collection at a particular point	<input type="checkbox"/>
Other (please specify)	<input type="checkbox"/>
.....	

6. On what day(s) of the week are recyclables collected in your suburb?

Monday	<input type="checkbox"/>
Tuesday	<input type="checkbox"/>
Wednesday	<input type="checkbox"/>
Thursday	<input type="checkbox"/>
Friday	<input type="checkbox"/>
Saturday	<input type="checkbox"/>
Sunday	<input type="checkbox"/>

7. How much do you pay for waste (recyclables and non-recyclables) removal per month? (specify “0” if you do not pay).....

SECTION C: WILLINGNESS TO PARTICIPATE IN HOUSEHOLD RECYCLING

1. Are you participating in the BBHWRP (BLUE BAG HOUSEHOLD WASTE RECOVERY PROGRAMME)?

Yes	
No	

2. Are you willing to participate in the BBHWRP?

Yes	
No	
Participating already	

2 (a) Please give reasons for your answer.....

.....

3. Which of the following types of recyclables does your waste contain (mark where applicable)?

Newspaper	
Glass	
Metal/tins	
White paper	
Cardboard	
Organic waste	
Books and magazines	
Plastic	
Other (please specify)	
.....	

4. Would you be willing to sort your recyclables into separate containers?

Yes	
No	

4 (a). Please give reason(s) for your answer.....

.....

5. Which one of the following sorting options would you prefer?

Sorting into two bags, one for recyclables and one for non-recyclables	
Sort into different bags, one each for plastic, white paper, metal/tins, glass, books/magazines, organic waste, cardboard	
Other (please specify)

6. Would you be prepared to buy two different containers – one for recyclables and one for non-recyclables?

Yes	
No	

6(a) If No, please give reason(s).....

.....

7. How would you prefer your recyclables to be collected (mark where applicable)?

By individuals/trolley collectors	
The municipality	
Recycling companies	
Take them to sorting site yourself	
Take them to community recycling bin(s) yourself	

7(a) Please give reason(s).....

.....

8. How often would you prefer your recyclables to be collected?

Once week	
Twice a week	
Once a month	
Other (please specify)

9. Would you prefer your recyclables to be collected on a different day to other waste being collected?

Yes	
No	

9(a) Please give reason(s) for your answer.....

10. Would you be prepared to pay an extra on the amount for the collection of your recyclables?

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

11. Please give reason(s) for your answer

.....

12. Please give comments you may have about the BBHWRP.....

.....

Thank you for your time and cooperation. PLEASE POST THE COMPLETETED QUESTIONNAIRE TO THE RESEARCHER USING THE PREPAID ENVELOPE SUPPLIED AS SOON AS POSSIBLE.

APPENDIX 3: The Stellenbosch municipality refuse guide July 2004-July 2005

Day of collection	Suburb
Monday	Arbeidslus, Uniepark, Rozendaal, Aanhouwen, Karindal, Mostertsdrift, Simonswyk, Universiteitsoord, Van der Stel
Tuesday	Kayamandi, Tennantville, Central Stellenbosch, Krigeville, Welgelegen, Bo-Dalsig, Brandwacht, Annesta, Eden, Leiberheim, Paradyskloof, Fairways, Kleingeluk, Die Boord, Onder-Papegaaiberg, The Avenue
Wednesday	Ida's Valley, Lindida
Thursday	Cloetesville

Source: Muni-Ads (2004)