

Investigating household behaviour towards recycling: A case study in the town of Vryheid- Bhekuzulu

CT Baron

 **orcid.org 0000-0003-1259-2763**

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Supervisor:	Dr C Roos
Co-supervisor:	Mr HJ Moolman
Assistant supervisor:	Prof SHH Oelofse

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ABSTRACT

This study aimed to investigate household awareness and willingness towards recycling. The study was limited to Vryheid and Bhekuzulu a small town situated in the Northern parts of Kwazulu-Natal. The empirical study investigated demographic variables such as gender, ethnicity, household size and income as it relates to current recycling participation as well as willing to participate in future recycling initiatives. The study aimed to be representative of most of the Vryheid and Bhekuzulu area and questionnaires have been handed out to low-, medium- and high-income households of each area. The number of respondents accumulated to 757 households in total. Sampling was stratified over the income spectrums (low, medium and high), and initially a grid was drawn to facilitate a random sampling procedure, however, during the execution of the study, questionnaires were delivered and received based on the availability of respondents. An extensive literature review was conducted on municipalities in the continents of Asia, Europe, North America and Africa to provide context to the current study. In certain cases, the results of this study have been similar to what was found elsewhere, but in other cases it has contradicted the results of other studies. Results found that all variables, except household size, have been statistically significant in current recycling participation. All variables pertaining to willingness of households to recycle, were statistically significant. The study area was generally characterised by low levels of awareness regarding recycling practices and initiatives.

Keywords:

Households, Income, Recycling, Awareness, Willingness, Variables, Vryheid

DEFINITIONS

The definitions provided below are given with specific reference to this study, and do not necessarily speak to the same words given in the literature review.

Awareness: Awareness alludes to the concept of whether residents have knowledge of recycling initiatives in their area or not.

Recycling: Recycling is somewhat used out of context, and does not refer to the actual process of materials being recycled, but rather households engaging in separation at source activities, which could help make the recycling process easier when it comes to that.

To pay the municipality: This term refers to a levy being paid by households to the municipality in order for them to start the “recycling “ process.

ACRONYMS AND ABBREVIATIONS

APBWRI	Ado-Ekiti Plastic Bag Waste Recycling Innovation
BBHRP	Blue Bag Household Recovery Programme
CCS	City collection system
DAEARD	Department of Agriculture, Environmental Affairs and Rural Development
DEA	Department of Environmental Affairs
DSWM	Department of Sanitation and Waste Management
GDP	Gross domestic product
GGP	Gross geographic product
GNP	Gross national product
HDI	Human Development Index
IBM	International Business Machines
IDP	Integrated development plan
IWMP	Integrated waste management plan
NEMWA	National Environmental Management Waste Act (59 of 2008)
NGO	Non-governmental organisation
NWMS	National Waste Management Strategy (2011)
SPSS	Statistical Package for the Social Sciences

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CHAPTER 1. INTRODUCTION TO THE STUDY AND PROBLEM STATEMENT

1.1 Introduction

Waste management in South Africa is swiftly becoming a key priority for sustainable development (Karani & Jewasikewitz, 2007:163). Eight of the seventeen Sustainable Development Goals relate either directly or indirectly to waste management and related challenges. According to Minn *et al.* (2010) due to population growth and change in consumer patterns, urban households contribute increasingly to the generation of solid waste in municipalities. The increased generation of domestic waste is a challenge for both developing and developed countries. Generally, developed countries generate more waste per capita than their developing counterparts, however developed countries have been more successful in mitigating the impacts of inadequate waste management (Ogwueleka, 2009:173). Irregular waste collection services, limited awareness and knowledge of waste management practices, improper guidelines and regulation, as well as a lack of skilled technical personnel are contributing factors to the waste management challenges that developing countries, including South Africa, are facing (Okalebo *et al.*, 2014).

This study will primarily focus on establishing the behaviour of households towards the recycling of household waste. *Behaviour* in the context of this study includes the determination of awareness of households regarding recycling options for municipal solid waste, the determination of the current participation of households in recycling practices, as well their willingness to engage in such initiatives in future. The study was conducted in the town of Vryheid and Bhekuzulu, located in the Abaqulusi local municipality in Northern KwaZulu-Natal (Abaqulusi IDP, 2016). Vryheid has a population of approximately 47 360 people (this includes the population of Bhekuzulu) and consists of about 12 640 households, as of 2011 (Stats SA, 2011).

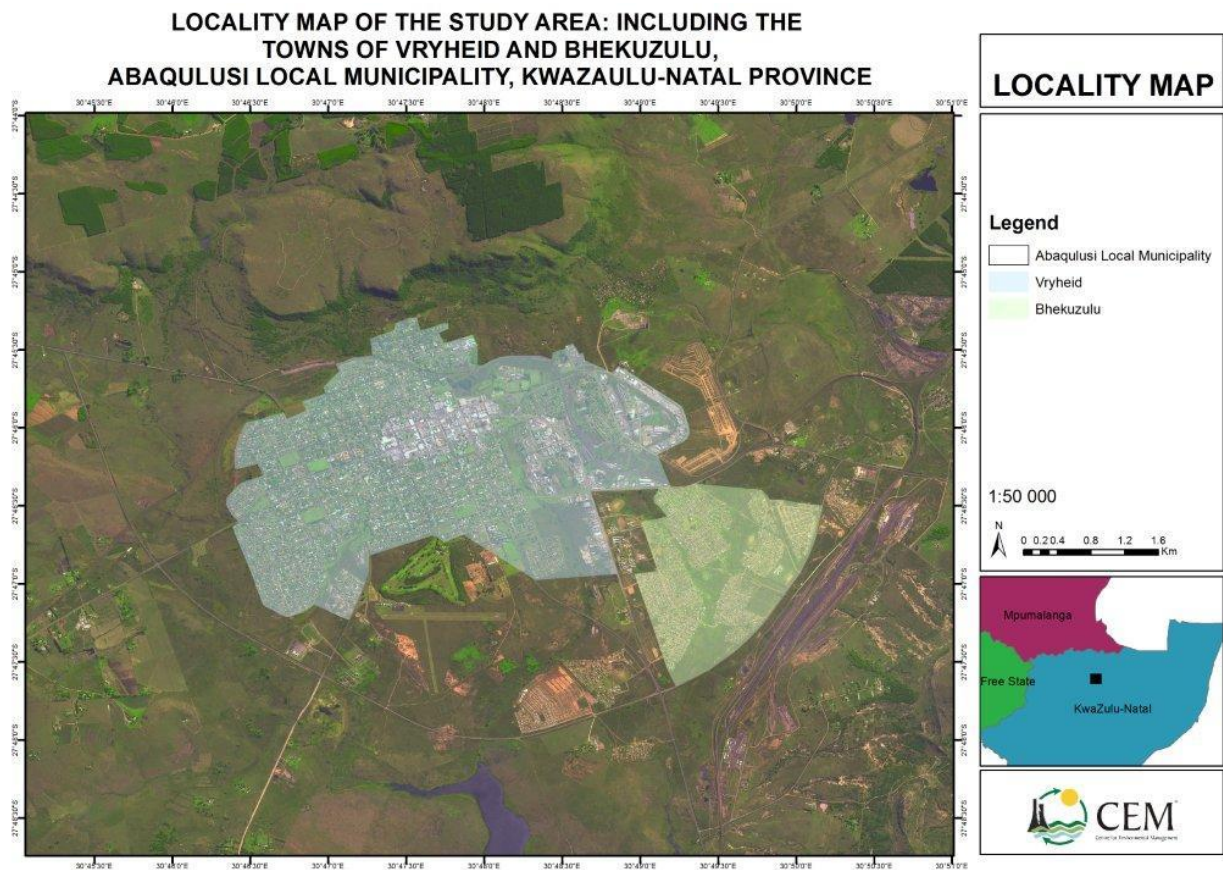


Figure 1. Outline of the study area. The green bordered polygon represents the Bhekuzulu area and the blue bordered polygon represents Vryheid (Google Earth, 2005).

1.2 The problem statement and rationale for the study

According to Sterner *et al.* (1999:473), the acquisition and management of landfill space for the disposal of household waste, including its hazardous components, are becoming a limitation for the sound management of waste. The waste management hierarchy, advocated in the National Environmental Management Waste Act (59 of 2008) (NEMWA) and supported by the National Waste Management Strategy (NWMS) of 2011, highlights the importance of diverting waste away from landfill sites, by means of implementing the minimisation, re-use, recycling and recovery of waste. Initiatives aimed at household recycling and waste management awareness play a key role in achieving the objectives of the waste management hierarchy (Gonzalez-Torre *et al.*, 2003:129).

In South Africa, waste management is characterised by inadequate waste collection services, illegal dumping, unlicensed waste management activities, over exploitation and mismanagement of landfill sites, insufficient implementation of the waste management hierarchy, as well as lack of information and poor legal compliance (Muzenda, 2013:79). In response to these issues the

NWMS was introduced to establish mechanisms for integrated waste management. Waste minimisation, together with waste recycling, is set out as a national goal.

Goal 1 of the NWMS places direct emphasis on the need to recycle. It is aimed at diverting 25% of recyclables away from landfill by, amongst others, initiating separation at source programmes by all metropolitan municipalities, secondary cities and big towns (DEA, 2011).

Recycling is generally perceived as a sustainable option for solid waste management, since it reduces the amount of waste being disposed, and also plays an important role in the conservation of resources (Bolaane, 2006: 731, Muttamara, 1996). Households play an important role in promoting recycling practices (Bolaane, 2006) and the importance of households in the effective implementation of waste management systems must not be underestimated.

Research focusing on households in the context of waste management, including recycling, is therefore necessary. Studies to establish the willingness of households to recycle waste have been undertaken by Kamara (2006) and Makau (2006) focusing on households in Tshwane and Stellenbosch, respectively. No such research has, however, been conducted in the study area of Vryheid, KwaZulu-Natal.

1.3 Aims and objectives

The aim of this study is to establish if household behaviour, focusing on awareness, participation and willingness, relates to the recycling of waste.

By reviewing existing literature on household behaviour towards waste management, [Kamara (2006), Makau (2006), Momoh & Oladebeye (2009), Sujaudinet *al.* (2007), Tadesse *et al.*, 2008, Vicente & Reis, 2007], it can be derived from their findings that demographic and socio-economic variables such as income, gender, education, household size, and nature of housing tenure, could play a role in the perceptions and willingness of households to engage in recycling practices.

For the purpose of this study the variables of income, gender, household size and ethnic background, as it relates to awareness of recycling and the willingness to recycle are investigated, as determined by literature (what others have found to have correlation).

1.3.1 Research question

1. How aware are households of recycling practices?
2. What are their current involvement in recycling practices?
3. How willing are households to participate in recycling practices, in the designated study area?

4. What is the significance of variables such as gender, household size, ethnic background and income, towards the awareness of waste recycling practices, participation in current recycling practices and the willingness to participate in recycling practices in future?

1.3.2 Aim

The aim of this study was to investigate the awareness of households regarding recycling practices, to establish their current involvement in recycling practices and to establish whether households are willing to engage in any form of recycling practices.

1.3.3 Objectives

The objectives of the study include:

- 1- To determine the awareness of households regarding current recycling practices and options;
- 2- To establish the current participation of households (at the time of the study) in recycling practices;
- 3- To establish the willingness of households to participate in recycling practices; and
- 4- To establish the significance of variables such as gender, household size, ethnic background and income, towards the awareness of waste recycling practices, participation in current recycling practices, and the willingness participate in recycling practices.

The study focuses on household awareness and willingness to recycle waste, in the waste management context. The intent of the study has not been to be an in-depth behavioural study and is, therefore, not designed as such. Apart from references included in the literature review, the study does not include any inputs from behavioural or social scientists.

1.4 Chapter outline

The dissertation consists of six chapters. Chapter 1 introduces the study with the problem statement, aims and objectives and research questions. Chapter 2 provides a literature review to provide context to the study. Background of the broader Abaqulusi Municipality is provided in Chapter 3 to provide context of the study area. The methodology followed is outlined in Chapter 4. Chapter 5 provides the results and discussion of the study, while Chapter 6 reports on the conclusions and recommendations.

1.5 Chapter summary

This chapter outlined the introduction to this study together with the rationale, which outlines the utmost need for research in this domain, and the imperative role that households can play in this particular domain of waste management. The questions asked and objectives of the study were also clearly outlined for the reader to have a good idea of what this study aims to investigate.

Chapter 2 will bring the reader a more holistic view of lessons that can be learned regarding this study in the international domain.

CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

Studies undertaken by Zurbrügg (2003) concluded that awareness and attitudes of the general public play an important role in their willingness to participate in established waste management practices, such as waste avoidance, re-use and recycling. The fact of being aware of the potential consequences that waste may have on the environment and human health, as well as being aware of various waste management options, allow households to make informed decisions regarding the management of waste.

This chapter reviews selected international as well as national literature on the awareness and perceptions of households regarding waste, as well as participation in recycling practices and the willingness of households to engage in recycling practices in future.

2.2 Waste-related research focus in developed countries *versus* developing countries

The United Nations divided countries into two categories, namely developed countries and developing countries. The classification is based on the country's gross domestic product (GDP), gross national product (GNP), per capita income, level of industrialisation and living standards (Surbhi, 2015). Troschinetz and Michelcic (2009) concluded that a definite contrast exists in waste recycling and management research and practices between developed and developing countries.

Section 2.2.1 of this study provides an overview of the focus of waste-related research in developed countries, while section 2.2.2 gives an overview on the focus of research in developing countries.

2.2.1 Research-focus in developed countries

The statistics supplied by the Human Development Index (HDI) rank countries according to their development. Countries which manifest high standards of living; high GDP; high child welfare; good health and medical care, transportation, communication and educational facilities; better housing and living conditions; industrial, infrastructural and technological advancement; higher *per capita* income; and an increase in life expectancy are known as *developed countries*. In developed countries, the industrial sector generates more revenue than the service sector, as these countries are characterised as having a post-industrial economy (Surbhi, 2015).

The developed world has implemented advanced recovery and recycling practices, which have been entrenched into waste management systems. Research in developed countries has shifted attention from understanding basic waste-related behaviour to focusing on governance models and tools, policy analysis such as command and control approaches, socio-psychological and economic incentives, and psychological and social-economic influences on human behaviour. Behaviour-based research efforts, generally, include assessments of attitudes toward recycling, as well as perceived *versus* actual behaviour (Troschinetz & Michelcic 2009:916).

2.2.2 Research focus in developing countries

Countries that are still in the initial stage of industrial development, along with low *per capita* income, classify as developing countries (Surbhi, 2015). Developing countries are often dependent on their first world counterparts to invest in and help establish industries. Characteristics of developing countries may include poor and dangerous living environments; a low HDI; low GDP; low illiteracy rate; poor education systems and poor medical facilities (Surbhi, 2015).

In the developing world, waste-related research is aimed at municipal solid waste management and institutional governance. According to Mwanthi *et al.* (1997:351) research in developing countries focuses on the more practical aspects of waste management and elements of the municipal solid waste management system, such as identifying local waste problems, and analysing existing waste management practices in the study area. Behaviour-based research is generally focused on understanding the practical implications of the actual behaviour of households, rather than understanding indirect behaviour and socio-psychological influences (Troschinetz & Michelcic 2009:916).

2.3 International lessons to be learned regarding waste management practices of households

This section provides an overview of some international examples and factors influencing waste management practices of households, including the awareness of and attitudes towards recycling, as well as the willingness of households to participate in recycling practices. The aim of this section is to provide the context of important considerations that need to be taken into account during the design and analysis of the current study to provide context to the results. The intent of this section is not to provide a full account of studies done elsewhere in the world, but rather to provide context to this study, with reference to comparable cases elsewhere in the world, such as Asia, Europe and Africa.

2.3.1 Lessons to be learned from households in Asia

According to a study done by Thanh *et al.* (2012:1448) in the Mekong delta region in southern Vietnam, waste management options for households in the area include:

- Delivering of waste to the local city collection system (CCS);
- Burning of waste as means of reducing the volume of waste;
- Dumping waste on the street;
- Discarding of waste into the river or canal; and
- Burying of waste in the backyard/garden.

Results indicated that the majority of surveyed households (51%), use the more conventional method of making use of the CCS. Thirty percent (30%) of households prefer to burn waste, while fourteen percent (14%) bury the waste in their backyard/garden. Respondents who choose to throw waste in rivers or canals, and leaving it on the street consist of only four percent (4%) and one percent (1%), respectively (Thanh *et al.*, 2012:1449). During the time that the surveys were done, the city did not have a formal and organised household separation system.

The same survey investigated the practices of households regarding the management of household wastes that have the potential to be composted or recycled (i.e. recyclable waste).

Results regarding the food waste stream are as follows:

- Forty percent (40%) of respondents delivered their food waste into the CCS;
- Thirty-six percent (36%) indicated that they use food waste to feed livestock;
- Self-composting and backyard/garden burying consisted of ten percent (10 %) each;
- Four percent (4%) replied that they dump food waste into the river.

When asked about the remaining recyclable waste streams (other than food waste), such as plastic, glass, cardboard, containers and packaging materials, respondents replied that it is either re-used by a member of the household; sold to the informal sector; delivered into the CCS; or burned in order to reduce its volume (Thanh *et al.*, 2012:1449).

Although households of the Mekong delta region had implemented some initiatives to divert waste away from landfill, such as using food waste to feed livestock, the implementation of waste management alternatives were limited, and recycling of waste was not considered as a preferred method for the management of household waste, at the time.

In 2015, a study was undertaken by Babaei *et al.* (2015) in Abadan in the west of Iran, and focused on knowledge of recycling, as well as attitudes and practices of households with regards to solid waste management. Results of this study concluded that residents possess little to no knowledge regarding alternative solid waste management practices, such as waste reduction, separation at source and waste recycling. However, more than ninety percent (90%) of respondents were *willing* to engage in separation at source activities. The study concluded that the willingness to participate in separation at source activities was mainly due to the fact that participating households had the prospect of receiving better public services and financial incentives.

A mere 1.7% of respondents indicated that they actually practiced at source separation (Babaei *et al.*, 2015:97) at the time of the study. The study concluded that the main reasons for limited participation in separation at source and recycling practices were the lack of access to recycling bins, limited knowledge about existing recycling programmes, and little to no economic incentives (Babaei *et al.*, 2015:97).

In 2008, Sujauddin *et al.* (2007) conducted a study in Chittagong, Bangladesh, to establish household waste characteristics and existing waste management practices. When the respondents (households) have been asked about their role in managing waste, the study concluded that only approximately twenty-nine percent (29%) of respondents were willing to practice separation of waste at source, should they be provided with the means to do so (receive bags/bins for separation), while twelve percent (12%) responded that they already recycled and re-used their waste in their own indigenous ways. Forty-three percent (43%) have answered that they were limited to disposing their waste into the municipal waste collection system and the remaining sixteen percent (16%) of respondents indicated that they could put in an effort to dispose of waste in the municipal waste collection system, only if they were asked to do so (Sujauddin *et al.*, 2007:1690).

In China's fifth largest city, Wuhan, a study on recycling has indicated that age, gender and household composition were the three main socio-demographic factors that influence recycling behaviour. The study has further concluded that elderly female residents who were in charge of households in low-income areas were said to be the most likely to recycle (Li, 2003). Additional factors influencing waste management practices of households in developed countries include socio-economic factors, such as income group and consumption patterns.

2.3.2 Lessons to be learned from households in Europe

A study undertaken by Martin *et al.* (2006) in Burnley, England has focused on the willingness and attitude of households towards domestic waste recycling. Part of the study has specifically

focused on households' willingness to participate in recycling practices for plastics, glass, paper, cans and cardboard. When asked about their current involvement in recycling practices, households were categorized into three groups, namely (1) non-recyclers (households which recycle none of the listed waste streams), (2) casual recyclers (households which recycle between one and four streams), and (3) full recyclers (those who recycle all listed waste streams). Seventeen percent (17%) of participants have indicated that they do not recycle, while twenty-eight percent (28%) have been categorized as full recyclers. The majority of participants (55%) have indicated that they participated in casual recycling practices. Approximately 80% of the total respondents recycled at least one waste type (mainly paper).

Martin *et al.* (2006:367) concluded that the attitudes of households towards recycling practices have been positive. Although respondents have been positive about recycling and willing to participate in recycling practices, actual historical data for Burnley indicate low recycling rates. Martin *et al.* (2006:367) suggests that low recycling rates may not be due to unwillingness by households, but could also be ascribed to resource and logistical factors that affect participation in a more direct way. Possible constraints identified during the study included the lack of storage space for recyclables, the socio-economic status of households, as well as inadequate waste services, rather than negative attitudes (Martin *et al.*, 2006:367).

A similar study conducted in the borough of Burnley in 2003 has indicated that the average recycling rate of the area was approximately 10%, which is significantly lower than the national average recycling rate of England (in 2003) of 17.8%. Inconvenience and limited availability of storage space were provided as the main reasons given by non-recyclers for not participating in recycling practices (Martin *et al.*, 2006:369).

In the east European country, Macedonia, in the city of Kratovo, a comprehensive study was undertaken to establish the willingness of households to contribute to an improved waste management programme (Finn, 2007). The study has also focused on the perceptions of residents regarding waste management practices. According to Finn (2007), most of the residents of Kratovo perceived the kerb-side collection system, which was the implemented system at the time of the study, as inadequate. Sixty-nine percent (69%) of households indicated that they are willing to recycle, should there be an improvement in the kerb-side collection system.

Finn (2007) concluded and made the following recommendations:

- Local government involvement is necessary to establish and support recycling practices;
- Communities play a vital role in the long-term success of the recycling projects; and
- Recycling initiatives, supported by awareness campaigns, are more likely to be successful.

When the respondents in the Kratovo study have been asked what they thought about awareness initiatives, 41% of households indicated that they were willing to participate in such initiatives (Finn, 2007).

A study undertaken in Portugal in 2007 focused on attitudes towards household recycling behaviour (Vicente & Reis, 2007). A cluster analysis was performed on 1807 cases based on three attitudinal variables driving recycling behaviour, namely, (1) environmental conservation, (2) pressure from society and (3) indifference towards recycling.

Cluster 1, consisting of 618 cases, agreed very strongly that recycling contributes toward serving the environment, they largely disagreed that pressure coming from society influenced them to partake in recycling, at the same time residents in this cluster scored highest of the three clusters, by indicating that they feel indifferent to recycling. Cluster 2, consisting of 643 cases, indicated that pressure of society and personal norms influence recycling behaviour, and indifference scored very low; while Cluster 3, consisting of 546 cases, disagreed strongly with the perception that recycling is used as a means to conserve the environment (Vicente & Reis, 2007:7).

The study has further investigated the number of households (percentage) from each cluster, participating in recycling practices at the time of the study (refer to Figure 2).

Cluster 2 was considered to be *the enthusiasts*, due to their positive attitudes towards recycling and high participation rate in recycling practices. Approximately 87% of respondents in cluster 2 participated in recycling practices at the time of the study and was regarded as the most cooperative segment (in terms of participation in recycling) of the study (Vicente & Reis, 2007:7). Of the cluster 2 participants, approximately 63% of households have indicated that they consider themselves as *“totally participative recyclers”* and stated that they were highly motivated by the recycling program implemented in their area. Ninety-two percent (92%) of the cluster 2 participants have stated that they were aware of the location of containers for the separation of waste at source in their area and 68% indicated that they have been informed by the recycling company on recycling programs through various mediums. (Vicente & Reis, 2007:7).

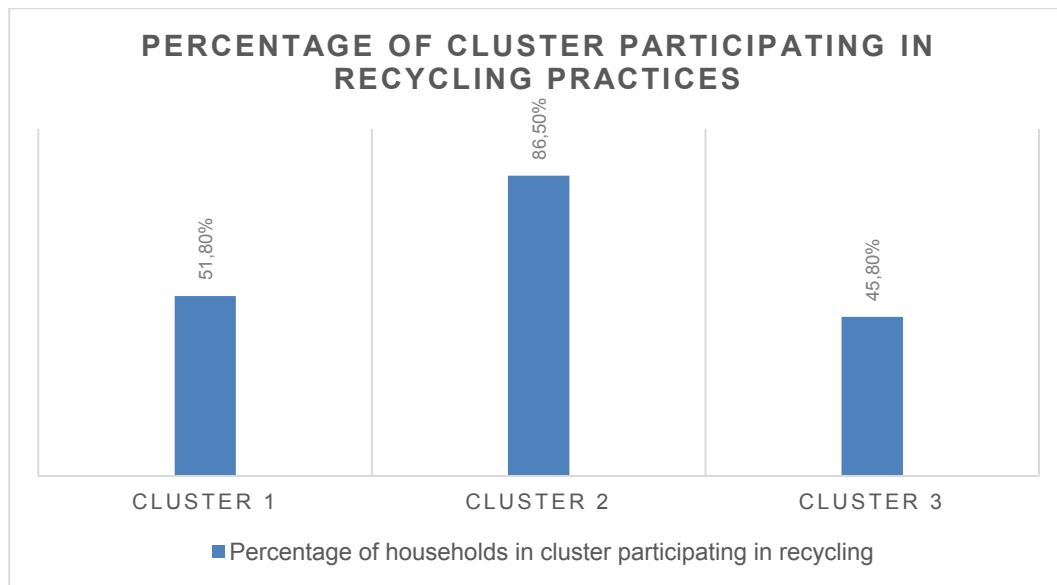


Figure 2. Recycling rates of respective clusters

Cluster 3 was considered to be the least cooperative in terms of participation in recycling practices at the time of the study. Approximately forty-six percent (46%) of respondents have indicated that they participated in separation of waste at source (Vicente, 2007:8). Seventy-two percent (72%) of respondents in cluster 3 have indicated that they were aware of the closest recycling facility, however only 34% have stated that they deposited their waste at the recycling facility. Twenty-five percent (25%) of households in cluster 3 have considered themselves as *total participants* in recycling practices. Cluster 3 participants were, generally, considered to be the “*Pessimistic non-participants*” because they did not see the benefits of recycling and they regarded incentives to participate in recycling as not being important (Vicente, 2007:8). Only about 26% of this segment have felt highly motivated to partake in the implemented recycling program. The cluster analysis indicated that cluster 3 have strongly disagreed that better conditions of recycling facilities, more information on recycling, and/or improved cooperation of others would have a positive effect on partaking in recycling practices (Vicente & Reis, 2007:8).

Just over half (51.8%) of households in cluster 1 have indicated that they separated waste at source. Seventy-five percent (75%) of cluster 1 respondents have indicated that they were aware of the location of the recycling point, however, only approximately thirty percent (30%) took their waste to the recycling facility. Twenty-five percent (25%) of households in cluster 1 have considered themselves as *total participants* in recycling practices. Cluster 1 was considered the “*contradictors*”, because they have argued that recycling is a means of conserving the environment, but when perceptions had to be changed into action, this segment contradicted itself. Only 26% of participants have felt motivated to participate in recycling and have indicated that they did not agree that incentives can encourage participation (Vicente & Reis, 2007:8).

The only significant variable influencing the cluster analysis was gender, where most of the cluster 2 participants were women. Other variables such as employment status, level of education, households with children and age were not considered as being significant in the cluster analysis (Vicente & Reis, 2007:9).

2.3.3 Lessons to be learned from households in Africa

A study undertaken in 2008, in the city of Mekelle, situated in the Northern part of Ethiopia, has investigated how households dispose of their waste. When asked about the method used by households to '*treat*' (or dispose) their waste, several waste management alternatives have been given, namely (1) disposal in municipal containers, (2) burning of waste, (3) use of tractor/trailer systems, (4) open dumping and/or (5) re-use and recycling of waste. The majority of the participants (82%) have indicated that they use municipal containers, six percent (6%) indicated that they re-use or recycle waste, five percent (5%) burned their waste, while four percent (4%) used the tractor-trailer system, and only three percent (3%) indicated that they dump waste (Tadesse *et al.*, 2008:2008).

Approximately seventeen percent (17%) of households have indicated that they participate in separation at source practices at some stage (however only 6% have indicated that they re-use/recycle waste). The study has indicated that the materials that were predominantly re-used or recycled by Mekelle residents included glass and plastic bottles, plastic containers, plastic shoes, clothing, shopping bags and food waste as forage for livestock. Because of the potential economic incentives/benefits of recycling, the study investigated the correlation between recycling practices and income/class. No significant correlation between income status and participation in recycling practices has been found. (Tadesse *et al.*, 2008: 2008).

The study, furthermore, has investigated the correlation between the perceptions and attitudes regarding waste and participation in recycling practices. An estimated fifty-eight percent (58%) of households were of the opinion that waste is useless, saying that it contains no financial benefits. Approximately thirty percent (30%) perceived waste as partly useful, and approximately twelve percent (12%) of households indicated that they regard waste as a valuable resource. On closer evaluation, results indicated no significant correlation between attitude and participation in recycling practices (Tadesse *et al.*, 2008:2008).

A study of the attitude, awareness and willingness of households to participate in recycling practices was undertaken in 2009 in Ado-Ekiti, Nigeria. The study focused on the inter-relationship between and significance of certain social-demographic characteristics and attitude, awareness

and willingness to recycle. Social-demographic characteristics included employment status, income level, housing tenure, and type of housing (Momoh & Oladebeye, 2009:98).

Questionnaires have been administered to residential areas in the northern, southern, eastern, western and central parts of the city. Using the chi-square test, it was concluded that no significant correlation existed between willingness to participate in recycling practices and residential area (Momoh & Oladebeye, 2009). The gender composition of the participants in the study were almost equal, with 52.7% of the participants consisting of male participants and 47.3% of participants being female. Gender was not considered a significant factor in the willingness of respondents to participate in recycling practices (Momoh & Oladebeye, 2009:98).

The correlation between age and willingness of respondents to participate in recycling practices was also regarded as insignificant. The study, however, revealed that households consisting of people aged between 22 and 50 were more willing to participate than the younger (18 to 21) and older (>50) respondents (Momoh & Oladebeye, 2009:99).

Education was also not considered to be a significant factor. Results however, have indicated that respondents with university degrees were the most willing to participate, followed closely by respondents who are in possession of a diploma/certificate of education (Momoh & Oladebeye, 2009:99).

Middle-sized households (consisting of five to seven people) were more willing to participate in recycling than households that comprised of fewer or more occupants. The correlation was, however, not statistically significant (Momoh & Oladebeye, 2009).

The study concluded that gender, income, housing tenure, type of housing and housing period had no significant relationship towards the willingness to participate in recycling practices (Momoh & Oladebeye, 2009). The only statistically significant variable found during the study was the employment status of respondents. The study has found that all of the student and applicant respondents (people who are unemployed, but have already applied for jobs), as well as the majority of the self-employed and civil servants, indicated willingness to participate in recycling practices (Momoh & Oladebeye, 2009).

Momoh & Oladebeye (2009:100) further investigated awareness and attitudes of respondents, in the context of the study meaning the *“extent to which households are aware of, care about and view household waste recycling in their areas”*. Only three percent (3%) of respondents have stated that they were aware of recycling activities in their area, indicating that the media, municipality and their neighbors were the main sources of recycling-related information.

When focusing on actual participation in recycling practices, at the time of the study, it was established that approximately fifteen percent (15%) of respondents were participating or used to participate in recycling practices, mainly by taking recyclables to recycling stations, separating recyclables for collection, or through composting (Momoh & Oladebeye, 2009:100).

When respondents were asked whether they would be willing to participate in the local recycling scheme [called the Ado-Ekiti Plastic Bag Waste Recycling Innovation (APBWRI)], seventy-six percent (76%) of respondents have indicated that they would be willing to partake in such a scheme. There was a statistically significant positive correlation between households that were willing to partake in the scheme and households that were willing to practice waste separation at source (75%) (Momoh & Oladebeye, 2009:100).

A qualitative method of investigation was used when respondents were asked to declare their reason for being willing or not being willing to separate waste at source. Reasons provided for being willing to separate waste at source included:

- For the purpose of recycling;
- For benefits to the natural environment, to avoid litter, and maintain cleaner and unpolluted surroundings;
- Because of environmental awareness; which emphasizes reduction of waste and recycling; and
- If the cost or charges that accrued to it is affordable.

Reasons for unwillingness to separate waste at source included:

- It is time-consuming; and
- It also requires some effort (Momoh & Oladebeye, 2009:101).

A study conducted by Bolaane (2006) in Gabarone, Botswana, investigated the perceptions of and attitudes towards recycling. To establish awareness of waste recycling, the following questions were posed to participants:

- Have you ever heard about recycling?
- Are you aware of the current (at the time of the study) beverage bottle deposit refund scheme, implemented by Segwana Ltd.?

The survey concluded that 97.1% of respondents have heard or read about recycling. Respondents indicated that awareness could mostly be ascribed to the action of a local NGO (Somarelang Tikologo), and the Department of Sanitation and Waste Management (DSWM), who have actively been involved in creating awareness by means of printed media and the radio.

Another contributing factor to awareness was the inclusion of environmental issues, such as recycling, in school curricula (Bolaane, 2006:736).

Approximately ninety-eight percent (98%) of the sampled households were aware of the local deposit refund scheme. This was mainly ascribed to the economic incentive of refunding returned beverage bottles (Bolaane, 2006:736).

To establish whether a relationship between awareness and actual recycling practices exists, the survey requested households to answer the following questions:

- Do you usually separate your recyclables from your other wastes for the purpose of re-use and recycling?
- What materials are set aside?
- Do you make use of the bottle refund scheme?

Survey results indicate that of the 97.1% of respondents who were aware of recycling, only 47% practiced separation of waste at source with the purpose for recycling. Of the respondents who indicated that they have not heard about recycling 2.1% have separated waste materials. The possibility exists that the actions of the “unaware” participants do not relate directly to recycling. Most of the participants (51%), set aside their glass bottles because of the bottle refund scheme (Bolaane, 2006:736).

The study concluded that a statistically insignificant (weak) relationship exists between awareness of waste recycling and actual participation in recycling practices, which suggests that factors other than awareness may contribute to the participation in recycling practices. The study suggests that a reason for the relatively low participation in recycling practices may be the location of existing (at the time of the study) recycling facilities which were not centrally located, with access only during business hours (08h00 – 17h00) (Bolaane, 2006:737).

Additionally, the lack of participation in separation at source activities could be ascribed to the lack of financial incentives. The study showed that fifty-one percent (51%) of households performing some kind of separation at source activity do it primarily because of the refund they receive when returning the bottles (Bolaane, 2006:737). Correlation between the awareness of the bottle refund scheme (98.1%) and the households who actually returned their bottles (76.3%) was statistically significant, which means that most of the people that are aware of the scheme actually make use of them (Bolaane, 2006:737).

2.3.4 Lessons learned from households in South Africa

This section provides an overview of the findings of two studies conducted in South Africa on the awareness of recycling by households and the willingness of households to recycle waste, one study conducted in Stellenbosch (Western Cape) and the other in the City of Tshwane (Gauteng).

2.3.4.1 Learning from households in Stellenbosch

Makau (2006) undertook a study in Stellenbosch investigating the attitudes of households towards their waste. *Attitude* in the context of the study by Makau alludes to the extent that households are aware of as well as their view of recycling in their communities. Questionnaires were administered to participants to determine demographics, attitudes, current participation in recycling and willingness to participate in the Blue Bag Household Recovery Programme (BBHRP). The BBHRP served as a pilot study to determine the long term viability of separation at source and recycling of all recyclable materials in Stellenbosch (Makau, 2006).

The objectives of the study by Makau (2006) were threefold:

- 1- To investigate household attitudes towards participation in an actual recycling programme;
- 2- To determine the willingness of households to partake in recycling; and
- 3- To provide recommendations on the possible implementation of a long term recycling programme (Makau, 2006).

2.3.4.1.1 Attitudes towards waste management

Respondents were administered with questionnaires focusing on investigating attitude as a predictor of recycling behaviour. Participants indicated that the pilot project of the BBHRP and informal trolley waste collectors were considered as active instruments for the recycling of household waste. It was indicated that perceived benefits of partaking in recycling activities included increased environmental awareness, ecological gains and financial incentives (Makau, 2006).

2.3.4.1.2 Participation in recycling practices

Approximately sixty percent (60%) of the respondents have indicated that they (at the time of the study) already were participating in recycling, in the form of separating waste at source or taking recyclable materials to recycle bins. When (non-recycling) respondents have been questioned about their reasons for not participating in recycling practices, the main reasons given included the lack of recycling facilities and lack of knowing how to recycle (Makau, 2006).

Respondents have replied that should they decide to participate in recycling, methods should be applied which demand minimum effort and costs. Sixty-eight percent (68%) of respondents preferred a kerb-side collection system to using community recycling bins (Makau, 2006).

2.3.4.1.3 Willingness to partake in recycling practices

Eighty percent (80%) of respondents indicated their willingness to partake in the BBHRP pilot programme. The study by Makau (2006) indicated that socio-demographic and socio-economic variables generally had no significant correlation to the willingness of households to participate. Results of the study indicated that home owners and middle-sized households were more likely to participate in waste recycling practices, with a statistically significant correlation.

The survey concluded that the willingness to separate waste at source was directly related to the participation of households in recycling programmes. Respondents indicated that barriers to participate in separation at source activities, included the perceptions of residents that it is the responsibility of the trolley collectors to separate waste at source and that separation activities are time consuming.

The survey indicated that there is no significant correlation between willingness to buy separate bins/containers for separation and willingness to partake in the BBHRP. Respondents that were unwilling to buy bags/containers for the separation of waste at source stated that it is because of lack of finances to purchase additional bags/containers and that they feel that the municipality should provide the additional bags/containers to them for free, and not because they are unwilling to separate waste (Makau, 2006).

2.3.4.2 Learning from households in Tshwane

Kamara conducted a study in 2006 to establish community participation in domestic waste disposal and recycling practices in the Tshwane Metropolitan Municipality. The designated study area included Lynnwood, Waterkloof, Sunnyside and Mamelodi. The aims of the study comprised the investigation of socio-economic/demographic variables such as location, income level and education on the participation of residents in waste disposal and recycling activities (Kamara, 2006:).

2.3.4.2.1 Attitudes towards waste management

Before exploring the degree of participation in recycling practices (at the time of the study), households were posed with the question: *“What do you think is the importance of sorting waste?”*

From the results it is clear that residents have different perceptions and opinions as to what the sorting of waste means to them. Twenty-three percent (23%) of respondents did not see any direct linkage between the sorting of waste and the environment. Approximately thirty-two percent (32%) of the respondents have had a perception that the sorting of waste lessens the amount of waste to be disposed of and subsequently reduces the cost burden of waste disposal. Twenty-three percent (23%) of respondents were of the opinion that the sorting of waste is good for something, but have not been able to relate waste sorting to the environment (Kamara, 2006).

2.3.4.2.2 Participation in waste disposal activities and waste recycling activities

According to the study by Kamara (2006), respondents with the highest participation rates in waste disposal activities reside in the Waterkloof and Lynnwood suburbs whilst participation levels significantly decreased in Sunnyside. Mamelodi households had the lowest participation in waste disposal services. Participation in waste sorting activities was the highest in the Waterkloof/Lynnwood area, where about fifty percent (50%) of respondents have indicated that they participate in separating at source activities. Participation in separation at source activities was significantly lower in the Sunnyside area, with only 15% of respondents partaking. The lowest participation rate was found in the Mamelodi area, where none (0%) of the participants have indicated that they separate waste at source.

Participation in domestic waste disposal and recycling practices significantly varied across different income levels. All of the high-income respondents (100%) indicated that they partake in waste disposal practices, seventy-nine percent (79%) of middle-income respondents have indicated some participation, while twenty-seven percent (27%) of low-income respondents have indicated that they partake in disposal activities. Participation in separation of waste at source had a similar pattern. Forty-four percent (44%) of high-income respondents have indicated active participation in waste sorting, while only eleven percent (11%) of middle-income respondents have indicated that they do participate. None of the respondents in the low-income category have indicated that they separate waste at source (Kamara, 2006).

The hypothesis that level of education has a significant relationship towards participation in waste disposal/recycling was confirmed during the study. According to the results, involvement in waste disposal and recycling practices is directly linked with level of education. Respondents who have received no education along with those who had primary education, indicated their non-involvement in waste sorting activities. Thirty-three percent (33%) of respondents with secondary education have indicated that they do participate in separating at source. Only eighteen percent (18%) of tertiary educated respondents have indicated that they participated in waste separation at source.

The findings of the study call attention to the need to diversify ways of reaching the less educated communities in the urban setting. Many uneducated individuals have trouble reading, or cannot read at all, and will subsequently not benefit from formal environmental education outreach or awareness programmes (Kamara, 2006).

2.4 Chapter summary

This chapter provided some context to the reader of what to expect regarding waste recycling awareness, recycling participation and willingness to participate in future recycling initiatives. These are not to be confused with trends amongst the different countries. This chapter merely considered a few municipalities in Asia, Europe, Africa and South Africa respectively, and how its households go about aspects of recycling, to provide context to the study, and to provide reference for the discussion of results (Chapter 5 of this study).

CHAPTER 3. CONTEXTUALIZATION OF THE BROADER ABAQULUSI MUNICIPALITY

3.1 Introduction

The aim of this chapter is to avail context of the study area within its broader setting. This chapter will outline characteristics of the Abaqulusi Local Municipality, demographic characteristics, opportunities and challenges it faces and the *status quo* of waste management services.

3.2 An overview of the study area

Vryheid is located in the Abaqulusi Local Municipality and forms part of the bigger Zululand District Municipality which is located in the northern parts of KwaZulu-Natal. Abaqulusi is one of five local municipalities in the Zululand District Municipality and is characterised as the main hub for the district, because of its local economy and its strategic position, sharing borders with all four of the other local municipalities (Abaqulusi IDP, 2016).

It is estimated that the municipality covers approximately 4185km² of land, making it spatially one of the largest municipalities in the province, with an estimated population of about 211 060 people (Stats SA, 2011). Abaqulusi has been characterised by a steady growth in population of 20 041 people from 2001 to 2011.

The local municipality consists of both urban and rural settlements located in mainly in Vryheid, Louwsburg, eMondlo, Hlobane and Corronation.

3.3 Challenges and opportunities

Section 3.3 provides an overview of the challenges and opportunities faced by the Abaqulusi Local Municipality, some directly and others indirectly related to waste management.

3.3.1 Challenges faced within the municipality

According to the IDP (2016), the main challenges faced by the Abaqulusi Local Municipality include, but is not limited to:

- Spatial planning;
- Decline of economic sectors;
- High rate of illiteracy and lack of skills;
- Inadequate access to social facilities;

- Service backlogs; and
- Inadequate or insufficient housing.

The remainder of section 3.3.1 provides an overview of each of these challenges.

3.3.1.1 Spatial planning and infrastructure

According to the Abaqulusi Local Municipality's integrated development plan (IDP) (2016), it is evident that the local region 'fell' victim to Apartheid. With Vryheid as its main hub, the rural areas surrounding the town have been heavily neglected, lacking adequate housing, clinics, schools, and other essential services. Presently, the redress process has had a positive impact on the local municipality in terms of providing its people with services in the rural areas. Through planning and communicating with various government departments, initiatives and provision of funding, the municipality is in the process to redress the issues of the past.

3.3.1.2 Economic sectors declining

With Vryheid as the main commercial, business and industrial hub of the Zululand District Municipality, it has a relatively well-developed infrastructure. Vryheid is located in the centre of major transport routes that traverse the region. The region has, however, over the last few years been marked by a significant decline in its economy, mainly due to the closing down of many mines, located in and around Vryheid. Mining was the main primary economic activity in the area during the 1980s and 1990s. Due to the closing of many mines in the late 1990s, a lot of people were seemingly unemployed and the town became deserted and neglected. The effects are still evident today in Hlobane, Vaalbank and Corronation. As a result, the municipality is under additional pressure to provide adequate and sustainable services to these areas (Abaqulusi IDP, 2016).

3.3.1.3 High rate of illiteracy and lack of skills

Areas within the local municipality are characterised by low levels of formal education, with twenty-two percent (22%) of the populace not having formal education. Approximately 60.15% of people have or had some form of education (primary or secondary), and only 2.54% of the population have had tertiary education, which has led to a high rate of illiteracy in the municipality. The impact manifests itself in employability and type of job offers that can be sought. The urban centre (Vryheid), however, has higher education levels, due to the schools and infrastructure provided in the town, but generally speaking the base of skills is low, within the municipality (IDP, 2016).

3.3.1.4 Inadequate access to social facilities

Urbanised areas within the boundaries of the municipality are reasonably well presented in terms of social facilities and services. The area is characterised by the migration of households from rural settlements to more urban areas. The standard and access status of social facilities needs to be maintained and facilities must expand to maintain adequate access to the urban population. Challenges surrounding social facilities lie in the provision of such facilities in rural areas. Once facilities are provided to them and these are easily accessible, social uplifting and improved socio-economic circumstances are usually achievable (Abaqulusi IDP, 2016).

3.3.1.5 A bid service backlog

One of the main elements of social and economic wellbeing is having access to basic municipal services (Alexander, 2010:37; Turpie, *et al.*, 2008:789). According to the IDP the provision of quality infrastructure for services and infrastructure such as roads, water, sanitation and electricity is one of the major challenges that the municipality faces. These problems are found across urban and rural areas within the municipality, with urban areas facing problems to maintain quality service delivery and rural areas are faced with virtually non-existing basic services (Abaqulusi IDP, 2016).

3.3.1.6 Housing

According to IDP (2016), the municipality is still faced with a significant housing backlog. While the municipality has delivered some housing to the population, it is not done in a consistent rate that will solve the problem. The backlog can be ascribed to:

- The lack of suitable land, due to most of the land being privately owned;
- The purchase of land being a long process, because the municipality does not have the necessary funds to purchase the land; and
- The municipality not possessing the ability to effectively execute its housing functions.

3.3.2 Opportunities within the municipality

The municipality is in a position where it presents opportunities in tourism, property development, agriculture, mining, regional access, as well as consolidation and expansion of Vryheid.

3.3.2.1 Tourism

Tourism in KwaZulu-Natal is unique, with foreign tourists visiting sites like Ithala game reserve, just north of Louwsburg, for its climate, wildlife and landscape. The study area has potential to exploit/investigate opportunities in this sector. Furthermore, the Ngome forest in the more rural areas has a unique setting, with 84 indigenous fern species and it offers various activities to tourists. Game farms are an attraction to tourists, and attract approximately 20% international and 80% national tourists. Labour forces required for game farming is lower than that required for the agricultural sector and is seen as an advantage with regards to the new land and labour legislation (Abaqulusi IDP, 2016). Cultural tourism, with regards to the battlefield grounds and the so-called *Rainbow Route* has not yet been exploited to the maximum. The IDP (2016) has identified tourism as a potential growth category for the municipality.

3.3.2.2 Property development

According to the IDP (2016), few new developments have been established in the last few years in Vryheid, despite an economic boom which has characterized urban settings elsewhere in the province, like Richards Bay, Pietermaritzburg and Newcastle. Subsequently, Vryheid has received limited new investments over the past few years. However, the municipality has taken note of this trend and has identified areas in town, which are ready for expansion or new development. These will play a key role in the economic survival of the town itself. The council has identified the following investment injection projects:

- Expansion of the current hospital (Vryheid);
- The building of High Street bridge, which allows for an additional entry to the northern part of town (Vryheid);
- The construction of a new private hospital to increase capacity of the current health care system (Vryheid); and
- Revamping of the taxi rank (Gluckstad).

3.3.2.3 Agriculture

The agricultural sector currently provides the highest proportion towards the gross geographic product (GGP). Studies however, have indicated that the highest agricultural capacity of the region lies at a mere 15,19%. The area is characterised by extensive, but not intensive, processing/utilizing of land. Typical products that are currently produced are timber, livestock and field crops. Timber is mostly exported to areas outside the boundaries of the municipality, and

this industry has experienced an increase in production in the last five years. Maize, soya beans, fruit, sorghum, sunflower and groundnuts, are the crops that are currently being grown in the area. Cattle farming has had a very positive effect on the local economy, but is currently under strain due to the rising cattle theft and input costs. A Vryheid economic regeneration study has identified this sector as a potential growth sector. The challenge, however, manifests itself in the fact that little industrial activity takes place in the area, which subsequently fails in taking direct advantage of the strong agricultural base. The processing of agricultural substances mainly takes place outside the municipal bounds (Abaqulusi IDP, 2016).

3.3.2.4 Mining

Mining was the main primary economic activity that drove the local economy in Vryheid in the past. However, a decline in the sector has had a negative impact on the local economy, due to the closing down of many coal mines in the late 1990s. Regeneration is currently taking place in the area and the mining of coal is slowly returning to again dominate the local economy. Because of a high demand for coal in the country, and a high coal availability in the region, the area is currently encumbered with prospecting applications (Abaqulusi IDP, 2016).

3.3.2.5 Regional access

Due to the municipality's location, it plays a pivotal role in access to northern KwaZulu-Natal. Abaqulusi as sub-region within the larger provincial context has over time developed a peripheral economy, largely due to its great distance from main provincial markets such as the N3 highway connecting Durban with Gauteng, and N2 connecting Durban to Richards Bay. The municipality, however, possesses a secondary corridor that is seen as being of national significance. The Abaqulusi municipality is in possession of an extensive rail and road network as a result of the coal line corridor, which runs all the way from Richards Bay through Ulundi, Paul Pietersburg and Vryheid connecting to the coal mines in Mpumalanga. Another corridor or passage that possesses national significance is the location of the Vryheid town, which lies directly in the middle of major transport routes such as the R34 and R69, which connect areas within the province. All the road networks in the area make Vryheid a connecting hub to smaller places like Pongola, Nongoma, Paul Pietersburg and Ulundi. Another improvement will be added to the area with the construction of the P 700 road that will link main hubs in KwaZulu-Natal with Gauteng (Abaqulusi IDP, 2016).

3.3.2.6 Expansion and consolidation of Vryheid town

Due to the attributes of Vryheid it is seen as Zululand's infrastructural hub. It is well located in conjunction with traversing roads. The need for development of this area is a main concern and highly listed on the agenda of the municipality, largely because of a great scarcity of shopping

centres exists between Richards Bay and Gauteng. The region was at the forefront of growth with Vryheid posing as a service centre for surrounding areas, as well as its increased interaction with rural areas. The surrounding, much smaller towns have developed a great dependence on Vryheid, in an economic sense. Businesses in town are largely locally owned, and its client base is largely from within the municipal bounds. Vryheid has an established education system, which by far supersedes surrounding areas, and subsequently attracts many learners from the surrounding towns of Nongoma, Ulundi, Dundee and Paul Pietersburg (Abaqulusi IDP, 2016).

3.3.3 *Status quo* of waste management in the study area

According to the Department of Agriculture, Environmental Affairs and Rural Development (DAEARD) (2012) no Zululand District integrated waste management plan (IWMP) exists however a Zululand solid waste management plan was developed in 2002. The then town planner has also indicated in a report that there was no plan to develop an IWMP for the region. The Abaqulusi Local Municipality has in fact drafted an IWMP (developed by Mphebotho Enviro Link in 2011). The draft was, however, not accepted by council nor DAEARD. More pressing matters such as water and sanitation were higher priorities for the district municipality than developing a waste management plan. A provincial waste management strategy was commissioned and completed for Kwa-Zulu Natal. The plan incorporated the following aspects:

- Revision of waste related legislation,
- The future of all existing waste disposal sites was discussed and determined, and
- The erection of a few new facilities has been discussed and these issues were also a discussion point.

However, no recycling possibilities or programmes were identified or discussed as part of the strategy.

According to Stats SA (2011) the *status quo* of waste management in the Abaqulusi area indicates that a large portion of the population does not receive proper waste services, and are forced to use alternative measures to deal with the waste. Households receiving refuse removal services consisted of thirty-six percent (36%) in 2001 and decreased to thirty-two percent (32%) in 2007. In 2011 a small improvement was seen and it increased to forty-two percent (42%).

Table 1. Access to waste removal services by households in the Abaqulusi area

Access to refuse Service	Census		
	2001	2007	2011
Removed once a week from private company/municipality at least once a week	13 264 (36%)	12 921 (32%)	17 985(42%)
Removed less often	345 (1%)	2657 (7%)	434 (1%)
Have a communal refuse dump	171 (0%)	799 (2%)	511 (1%)
Own disposal	18 218 (49%)	14 821 (37%)	20 764 (48%)
No disposal	5062 (14%)	8668 (22%)	2728 (6%)
Other	1 (0%)	0 (0%)	878 (2%)

According to the IDP (2016), both Vryheid and Bhhekuzulu are serviced once a week in terms of waste collection by the municipality. The removal of waste is outsourced to a private company. Vryheid was the only formal landfill site in the Abaqulusi region that had been issued with a licence.

3.3.3.1 Current options for waste recycling in Vryheid and Bhhekuzulu

According to DAEARD (2012) an informal recycling programme that has not been formalised or advertised adequately, currently exists (also refer to Figure 4 for statistics on awareness of the current recycling programme), and is on-going, according to a councillor of the municipality that wanted to remain anonymous. The informal recycling programme sees waste being delivered by residents, sorted or unsorted to the landfill site and a quick scan is done to see if recyclables are present. Should recyclables be present, the transporter is then directed to a designated area at the landfill site (usually where informal waste pickers sort the waste according to their streams). At the end of each day the person in charge of the waste pickers collects all the bags with recyclables, which then once a week is transported to a recycling site in Johannesburg (Anon, 2017). The relationship between the recycler and municipality is unknown as this was not disclosed in the interview.

3.4 Chapter summary

This chapter does not bring value to the research itself, but rather provide the context in which the research was done, to give the reader a sense of what the communities of Vryheid and Bhhekuzulu are bound to in terms of challenges and opportunities that are presented within the

local municipality. The following chapter will be important as it will illustrate how the researcher went about the research methodology.

CHAPTER 4. RESEARCH METHODOLOGY

4.1 Introduction

To achieve the objectives of the study, both primary and secondary data were used. Primary data collection was done by means of an empirical study, while secondary data was acquired by means of a thorough literature review, which included research done in Asia, Europe, Africa, and more specifically, South Africa. This chapter provides an overview of the methodology followed during the study.

4.2 Literature review

The collection of secondary data consisted of an extensive literature review to understand the trends in waste management practices related to recycling, awareness around recycling and willingness to participate in recycling practices. The literature review (Chapter 2) has focused on research done on households in Asia, Europe, Africa and South Africa.

The purpose of the literature review has been to provide the international context for the current study, to establish the research methodology and research questions asked in similar studies, and to establish trends, which can be used to compare against the results of the current study.

The content of the review has focused mainly on establishing trends from the results of research based on the subjective views of households on how they currently go about disposing their waste; their awareness of recycling initiatives/practices; and willingness to engage in such activities in future. Academic articles published in journals, dissertations and books were mainly utilised for acquiring the secondary data. Databases that have been used included the North-West University library database, EBSCO-Host, Google Scholar, Science Direct and other sources available on the internet.

4.3 Empirical study

This study has employed a quantitative approach to research. Quantitative research can be described as a method in which predetermined instruments, in this case structured questionnaires, are employed to gather information from respondents, which are then subjected to statistical analysis (Cresswell, 2003; Boeren, 2018). According to Matveev (2002), quantitative research holds the following advantages:

- It is the most suitable for acquiring demographic data, for example, age, gender and income;
- The inexpensive nature is very favourable;

- Tabulating and analysing of information, using statistical programmes are relatively easy;
- Specifying both the independent and the dependent variables under investigation, is clear and specific; and
- Reliable data is obtained due to the controlled nature of data gathering.

Structured questionnaires have been administered to a sample of the household population of Vryheid and Bhhekuzulu. The sample included households from low-, medium- and high-income areas.

According to Rossi *et al.* (2013) sample survey research is known to be an important basic research method in the social science domain and acts as an important tool towards applied purposes in the public and private domain. Furthermore, sample surveys are aimed at collecting data from households, individuals or larger organised entities by means of questions, through systematically identified samples of households or individuals. Data from surveys can also be used for explanatory purposes (Babbie, *et al.*, 2000).

This study has focused on household awareness and willingness to recycle waste, in the waste management context. The intent of this study has not been to be an in-depth behavioural study and was, therefore, not designed as such. Apart from literature review, this study did not include any inputs from behavioural or social scientists.

4.3.1 Developing the questionnaire

The questionnaire used during the study has been divided into two sections (refer to *Annexure A* of this document). The first section has dealt with questions pertaining to the knowledge of respondents regarding recyclable wastes, as well as their willingness to participate in recycling practices and their awareness of recycling initiatives. The second section has dealt with the socio-demographic/economic characteristics of each respondent to determine the correlation between awareness and willingness to recycle, and socio-demographic/economic characteristics. The questionnaire consisted only of closed-ended multiple choice questions, in order to help with the analysing of the received data.

The questionnaire development was assisted by similar questionnaires that have been distributed elsewhere in the county, during earlier studies done by the CSIR (Oelofse, 2017). A cover page was added to the questionnaire, thanking each respondent for their participation and elaborating on the need and purpose of this study, as required by the Ethics Committee of the Research of Environmental Sciences and Management of the NWU. The contact details of the researcher

have been made available in the cover letter, should participants be interested in the outcome of the study. A pilot testing phase has been done on ten respondents to verify whether the information can be analysed and used to achieve the aims and objectives.

The same questionnaire was used for low-, medium- and high-income households.

4.3.2 Determining income thresholds

No formal document on providing thresholds for income classes in the study area currently exists. The researcher has used his own discretion in determining thresholds (refer to Table 2), using data that was acquired from the 2011 Census survey (refer to Figure 3).

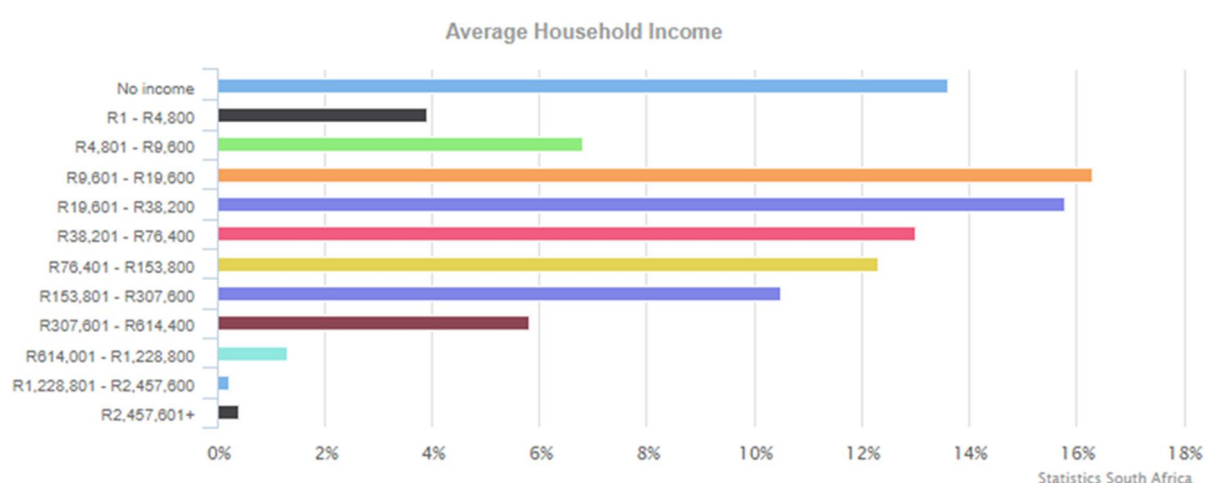


Figure 3. Average household income (From: Stats SA, 2011)

The Census data provided an indication of the annual income range of households, for example 6.8% of households generate an annual income of between R4,801 to R9,600 (refer to Figure 3). The income threshold ranges outlined in Table 2 were used to calculate the sampling size for low- medium- and high-income households to be included in the study.

Table 2. Income thresholds used to determine the sampling size for low- medium- and high-income households for inclusion in the study

Income classes (households)	Income thresholds (per month)
No income	NA
Low income	R1 to R12,816
Medium income	R12,817 to R51,200
High income	R 51,201+

4.3.3 Selecting the sampling size and sampling method

The Abaqulusi Local Municipality has not had up-to-date information on the number of households in the municipality at the time of the study. The IDP of the municipality, based on census data from 2011 (Stats SA, 2011) was used to acquire the number of households. For the purpose of this study, the same census data was used to determine the number of households in Vryheid and Bhekuzulu. There are approximately 12 642 households in the designated study area (Stats SA, 2011).

A sample size was selected to have a confidence level of 95% (standard for quantitative research) and a margin of error of 5% was obtained. In a more simplified manner, the term confidence interval (margin error) refers to the plus or minus figures in opinion poll results. An example hereof is if 50% of the sample selection indicate that they are aware of recycling practices and the margin error stands at 5% the researcher can be quite 'sure' that between 45% (50-5) and 55% (50+5) would have selected that answer. Confidence level refers to the degree of certainty. In the latter statement it is said that the researcher could be '*sure*' or *confident* about the answer provided (Roasoft, 2004).

The online calculator (Raosoft; Creative Research Systems) was also utilized to calculate the sample size of the study, based on a 95% confidence level. Probability sampling was initially set to be used in this study, with stratified- and random sampling as types of probability sampling.

Table 3. Sampling of the households to their income groups

Income group	Total households in Abaqulusi Local Municipality	% of total households	Sample size (95% confidence level)	Questionnaires distributed and received during the study
No income	1719	13.6%	NA	0
Low income	8609	68.2%	368	368
Medium income	2061	16.3%	324	324
High income	240	1.9%	148	148

4.3.4 Data collection

Data had been collected during two sessions. Data has first been collected from 17 December 2017 to 31 January 2018, during which half of the high-income households were surveyed as well as all of the low-income households. The second data gathering session commenced on 29

March 2018 and was finally concluded on 4 April 2018, with all the households included in the sample size, being surveyed. Respondents have not been targeted according to assumed income class. The income class of respondents has been determined during the interviews, where respondents had to indicate their level of income on the research questionnaire. The results of the study have indicated that the medium and high income households mostly resided in the town of Vryheid, while the respondents who indicated that they belonged to the low-income category were mostly from the Bhhekuzulu area (Figure 1).

The questionnaire has been distributed door to door to households in Vryheid and Bhhekuzulu by the researcher and his assistant. A pre-determined random grid was considered to identify households to be included in the study, based on the spatial location of households to provide for an equal opportunity to be included in the study. Upon inception of the study, this method was, however, not deemed to be feasible due to the availability and presence of households at the time of the study. The household selection and questionnaire distribution processes were then amended to include the total sample size determined for each household, based on the *availability and presence* of households at the time of the survey.

Door to door distribution of questionnaires was necessary to obtain the highest response rate possible. Questionnaires have personally been delivered to respondents and collected after a few hours. In some cases, the researcher has personally asked the questions to avoid any confusion from respondents. Upon delivery of the questionnaire the first question posed was to establish who the head of the households was, meaning the person in charge of running the household. As far as possible, the questionnaire was completed with inputs from the head of the household.

All of the questionnaires completed by respondents residing in the Bhhekuzulu area were done in Zulu, the predominant native language in the area, and have been distributed by the research assistant. Responses were then translated from Zulu to English, before data analysis commenced.

The response rate of participants was 100%.

4.3.5 Data analysis

The data obtained during the study was analysed to determine the awareness of households regarding recycling, the current participation in recycling practices and the willingness of households to participate in recycling practices. A secondary analysis was done to determine the relationship of socio-demographic and socio-economic variables to the awareness and willingness of households in the context of waste recycling.

The data analysis was supported by Statistical Support Services of the North-West University. The program used was the IBM SPSS® software package. The IBM SPSS® software platform offers advanced statistical analysis, a vast library of machine-learning algorithms, text analysis, open-source extensibility, integration with large data and seamless deployment into applications (IBM SPSS platform).

Statistical significance was determined by the Pearson chi-square test, a tool which is utilized in order to extract valuable information from research data. It enables the researcher to test his/her hypothesis about the variables the intended study wants to research and their potential relationships. The results are, however, more reliable when it is followed by a random sampling procedure (McHugh, 2013:149), which in this case, it was not, due to the availability of households at the time of the study.

A small p -value (a value smaller than 0.05) is perceived as enough evidence that the result is in fact statistically significant. Statistical significance tests tend to yield small p -values, values that indicate significances, as the size of the incoming data increase (Ellis & Steyn, 2003). In many cases researchers are forced to consider their results obtained as a sub-population of the target population due to the weak response of the planned random sample. In other cases, data obtained from convenience sampling are erroneously analysed as if it were obtained by random sampling. Such data should be considered as small populations for which statistical inference and p -values are not relevant. Statistical inference draws conclusions about the population from which a random sample was drawn, using the descriptive measures that have been calculated. Instead of only reporting descriptive statistics in these cases, effect sizes can be determined. Practical significance can be understood as a large enough difference to have an effect in practice (Ellis & Steyn, 2003).

According to Murphy & Myors (1998) Cramer's V -value refers to effect sizes or in other words measures of association. It reveals differences in the obtained data regardless of how big or small the sample size was. Cramer's V demonstrates practical differences, rather than statistical differences. Cramer's V is thus thought of as a measurement of the scale of impact an independent variable has on the dependent variable. An example hereof is, depending on the effect size, whether gender, ethnicity, household size or income is a significant factor in who is more willing to recycle waste.

In the case of this study, a sufficient random sampling procedure was not followed, due to the unavailability of the pre-selected, random sample of households. Thus, in essence, the p -value of this study is of little concern, but will nonetheless be provided after a thorough analysis of the data presented, for the sake of comprehensiveness.

4.4 Summary of this chapter

The researcher had an interesting time during the data collection period, it was quite an experience to briefly encounter residents from all walks of life. Initially a random sampling method was to be executed, but upon collection it became very apparent that not all households, randomly selected by the pre-determined grid, were available. The study went on and households were targeted on an availability basis. How the sampling size was initially identified has been illustrated together with the data collection process and how the data was eventually analysed.

In the next chapter the reader will find an outline of the results, which were led to by the aims and objectives of this study.

CHAPTER 5. RESULTS AND DISCUSSION

5.1 Introduction

In this chapter, the results captured in the surveys regarding household awareness of recycling initiatives and practices, and the willingness of households to participate in future recycling practices, in the town of Vryheid and Bhekuzulu, are presented and explained. The first section presents household awareness of recycling and the *status quo* of current (at the time of the study) household recycling frequencies, and a discussion of whether these two concepts are related. The second section deals with willingness of households to participate in future recycling initiatives, and whether socio-economic and socio-demographic variables, such as income, gender, household size and ethnic background have any significance in this regard.

The following needs to be taken into consideration when interpreting the results:

- Recycling does not refer to the actual recycling process (where waste go through a process to change the characteristics of the waste and form a new product), but rather to households engaging in separation of waste at source. The term “recycling” was used, because it is a familiar term used by South African households, when referring to separation at source activities. The term “recycling” was, however, explained to participants as being “the separation of waste at source”.
- It should also be noted that some households initially indicated that they are not aware of what “recycling”, however, indicated that they did participate in “recycling” practices, when asked later during the interview process. The reason for this is that many participants do not necessarily “recycle” (or separate waste at source) intentionally, as a waste reduction mechanism, but they do, for instance, remove glass bottles and sell/deposit it for immediate financial incentive. This must be taken into consideration when interpreting the results provided in Chapter 5, which shows that 57% of households indicated that they are not aware of recycling, but 13.8% of them indicated that they do participate in recycling.
- When reference is made to awareness of recycling initiatives and participation in waste recycling it is important to remember, that reference is being made to “recycling” (or separation at source) in the general sense and that it does not necessarily refer to a recycling scheme or initiative.

5.2 Awareness and participation current recycling practices

This section of the document outlines the results related to the awareness of households of waste recycling initiatives and provides the results on whether waste recycling awareness in the study area is linked to participation in actual waste recycling practices.

5.2.1 Awareness regarding recycling initiatives

In order to establish whether the broader community of Vryheid has been aware of the current recycling practices and opportunities in the area, a simple question was posed: *Are you aware of the recycling programmes in the Vryheid area?* As presented in Figure 4, 435 of the households (57%) indicated that they have not been aware of current recycling practices, and 322 of the households (43%) have in fact been aware that a current recycling initiative does exist.



Figure 4. Awareness of households regarding recycling practices in the study area

The study did not investigate *how* respondents have become aware of the recycling practices (i.e. reasons for awareness). An informal interview has been conducted with the person who currently manages the recycling programme. The interview concluded that participants in the recycling programme were mainly limited to local businesses and a few households in town. It was indicated that the majority of recyclables processed at the recycling facility, were collected at the Abaqulusi local municipal landfill site, situated north-east of the town, where informal recyclers reclaim recyclables from the mixed waste stream. After the waste has been sorted by recyclers at the landfill site, the recycling company would collect the waste and recyclers would be paid accordingly, after which recyclables would be transported to Johannesburg, once a week, for further processing (Anon, 2017).

5.3 Household participation in recycling practices

Question 5 of the questionnaire posed the following question to respondents: *Do you recycle your households waste?* Only 16.1% (122) of the 757 respondents have indicated that they recycled waste, while 83.9% of respondents have indicated that they did not at the time of the study participate in recycling practices.

From the results it can be observed that non-participation in recycling initiatives dominate household behaviour.

Contrary to this study, the Burnley study concluded that more than 80% of respondents recycle more than one type of waste. The study done in Portugal applied a cluster analysis of 1807 cases, where recycling participation was significantly present with the 3rd cluster having at least a 45% participation rate in household recycling. Cluster 1 and 2 have had a participation rate of 51,8 % and 86% respectively. Demographic attributes such as employment, households with children, age, gender and education levels have also been investigated. The only variable of significance was gender, where women were more prone to participate in recycling than men.

The study done in the Northern part of Ethiopia has also been characterized by low household participation in recycling. A mere 6% of households have indicated that they recycle waste and the dominant means (82% of households) of waste management is disposal through the municipal collection system. The rest of households resort to burning pits and open dumping.

5.3.1 Cross tabulating awareness of recycling initiatives and participation in recycling

It can widely be assumed that awareness of recycling practices and opportunities may prompt households to recycle their wastes. It is important to understand whether awareness of a recycling initiative is significant to participation in such practices. The importance of awareness and participation, lies in whether it is solely awareness playing a role in participation, or whether there are other characteristics that play a role.

The results of the cross-tabulating awareness of recycling practices to current participation in recycling practices are outlined in Table 4.

Table 4. Cross tabulating awareness of recycling initiatives and participation in recycling practices at the time of the study

Awareness of households in recycling	Currently participating in recycling practices
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		Yes	No	Total
Yes	Frequency %	62 19,30%	260 80,70%	322 100%
No	Frequency %	60 13,80%	375 86,20%	435 100%
Total	Frequency %	122 16,10%	635 83,90%	757 100%

Considering the entire sample of 757 households included in the survey, a total of 16.1% of the households have indicated their involvement in recycling practices. Only sixty-two (19.3%) of the 322 respondents who have indicated that they were aware of a recycling initiative in town indicated that they participate in some form of recycling. Of the 435 cases who have indicated that they were not aware of recycling initiatives, sixty respondents (13.8%) engaged in current household recycling.

A p-value of $p = 0,043$ was obtained when determining the statistical significance of awareness of waste recycling practices on actual participation in recycling practices, using the Pearson chi-square test. This determined that the statistical correlation between the awareness of a recycling initiative/programme and household recycling has been considered to be statistically significant for the study area. A slight difference was noted in *aware* versus *non-aware* households, where 19,3% of respondents who have been aware recycled, versus the 13,8 % who were not aware, but did recycle. Regarding the practicality of the comparison, Cramer's V of 0,073 has been obtained which indicated insignificance or a small effect outcome, from a practical perspective.

To respondents who indicated their non-participation in recycling practices, a follow-up question was asked to determine the reasons for non-participation. Three options have been provided to choose from, namely: (i) not convenient, (ii) don't know the recyclable materials and (iii) don't receive refuse bags.

As indicated in Figure 5, the most dominant feature that manifests itself in the results, is that recycling is not convenient to most households, since 457 of the 635 (75%) respondents indicated that inconvenience was the main reason for not recycling. A further ninety-eight (15,4%) households have indicated that their non-participation is linked to their inability to effectively identify household recyclable wastes. The remainder of the respondents, accounting for 61 (9,6%) households, have indicated that they do not receive refuse bags for the separation of different types of waste, and were, therefore, unwilling to participate. The respondents did not have the option to indicate any other reasons for not participating in recycling.

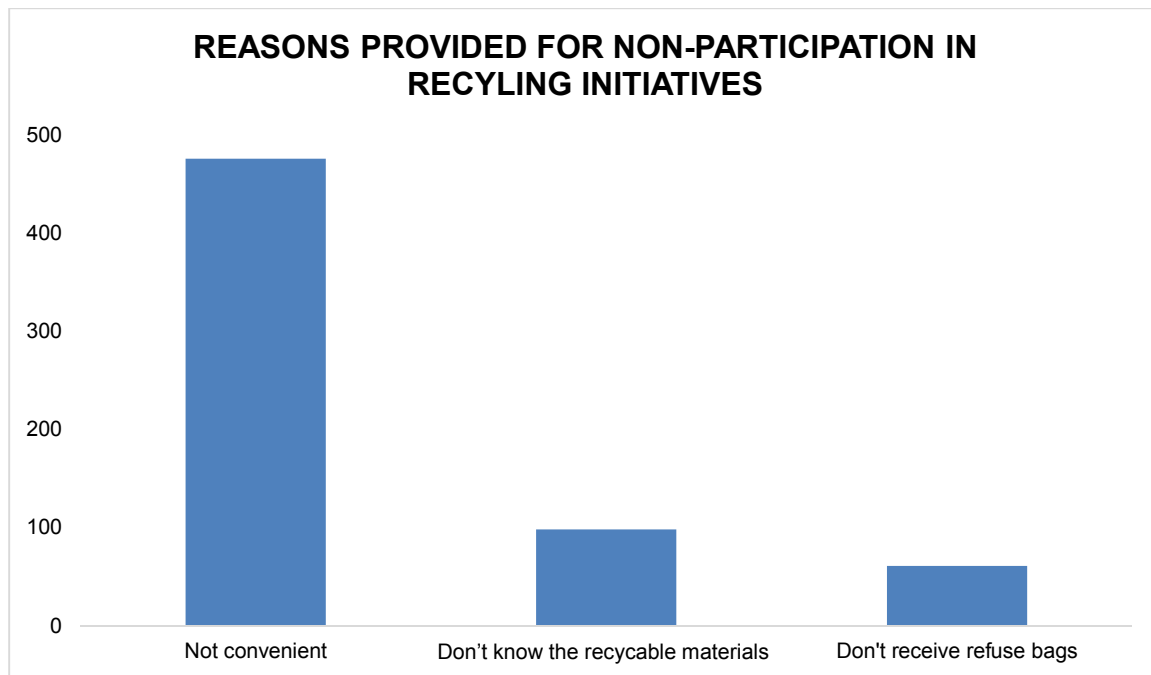


Figure 5. Responses of households for non-participation in recycling practices

The Abaqulusi Local Municipality has recently identified a refuse bag program, where the council appointed a contractor with the mandate to distribute refuse bags among the households of Vryheid. Three differently coloured refuse bags have been provided to each household in the Vryheid area per week: one black bag for normal rubbish, one orange/yellow bag for glass and a white bag for garden refuse. The council has recently run into a dispute with residents, because many households complained that they did not receive any refuse bags or that they would only sporadically receive refuse bags. The fact that residents have not received refuse bags was one of the reasons provided by respondents for non-participation in recycling. This survey has indicated that 114 (15%) of the surveyed households have never received refuse bags from the municipality, while 226 (30%) households indicated that they have received refuse bags during some months and 417 (55%) households have indicated that they did receive refuse bags every month.

During the fieldwork session conducted by the researcher, it has come to light that delivery of refuse bags was not specifically bound to certain geographical areas. In the same street, one household has received refuse bags monthly, while the neighbouring household indicated that they have not received any refuse bags at the time of the study. This was not an isolated occurrence and has been observed at many of the other households included in the study.

5.4 Understanding variables influencing participation in recycling practices of households

This section argues the relationship of variables such as gender, ethnicity, household size, and income level to the current participation of households in recycling practices, at the time of the study.

5.4.1 Gender and current participation of households in recycling practices

One of the variables this study has investigated was whether gender has a practical significance when it comes to current household recycling.

This study has included a sample of 440 (58%) households which were indicated as headed by men, and 317(42%) households which were indicated as headed by women. Of households headed by men, 14.8% (65 households) have indicated that they participated in recycling practices. In female headed households, it has been indicated that 18% (57 households) participated in recycling practices at the time of the study.

Table 6. Relationship between gender and the participation in household recycling practices

Gender		Currently participating in recycling practices		
		Yes	No	Total
Men	Frequency %	65 14.8%	375 80,70%	440 100%
Woman	Frequency %	57 18%	260 82,2%	317 100%
Total	Frequency %	122 16,1%	635 83,9%	757 100%

A slight difference was observed, with female headed households prone to participate more in recycling (3.2% more participation, where compared to male headed households). In the process of determining the significance thereof from a statistical and practical perspective, the following was observed: A p-value of 0.02 was obtained, which indicates significance from a statistical perspective. Cramer's V value of 0.04, which, however, indicates that there is no significant correlation from a practical perspective, was found.

5.4.2 Ethnicity and current participation of households in recycling practices

South Africa is a country with diverse backgrounds and cultures, hence the name Rainbow Nation. According to Stats SA data pertaining to the 2011 census survey, Vryheid is pre-dominantly occupied by black South Africans (84.5%), followed by White- (12.1%), Indian (1.3%) and Coloured/Asian (1.6%) residents. This study has investigated whether any relationships exist between ethnicity and current participation in household recycling practices. This study has included the entire spectrum of ethnic groups in the sampled households. Seventy percent (70%) of the households surveyed were black-, 18% were white-, while 6% consisted of coloured-, and 6% of Indian/Asian respondents (Table 5).

Table 5. Relationship between ethnic group and the participation in household recycling practices

Ethnicity		Currently participating in recycling practices		
		Yes	No	Total
Black	Frequency %	69 12.9%	465 87.1%	534 100%
White	Frequency %	38 28.1%	97 71.9%	135 100%
Coloured	Frequency %	7 15.9%	37 84.1%	44 100%
Indian/Asian	Frequency %	8 18.2%	36 81.8%	44 100%
Total	Frequency %	122 16,1%	635 83,9%	757 100%

Sixty-nine (12.9%) of black African households have indicated that they did participate in recycling practices, at the time of the study. In the white ethnic group, 38 (28.1%) of the households have indicated that they did engage in recycling. Approximately seven (16%) of the Coloured households and eight (18%) of the Indian/Asian households have indicated that they did participate in recycling practices at the time of the study. A Pearson chi-square value of $p=0.01$ was obtained, again indicating a significant correlation between ethnic background and current household recycling. A Cramer's V value of 0.157 was observed indicating that from a practical perspective, ethnic group is insignificant, or has a very small effect on participation in recycling practices.

5.4.3 Household size and current participation of households in recycling practices

In this study household size was divided into four groups, namely (1) households with one resident, (2) households with two to three residents, (3) households with four to five residents, and (4) households with six or more residents.

Table 6. Relationship between household size and the participation in household recycling practices

Household size		Currently participating in recycling practices		
		Yes	No	Total
1	Frequency %	4 16.7%	20 83.3%	24 100%
2-3	Frequency %	33 23.6%	107 76.4%	140 100%
4-5	Frequency %	33 15.3%	183 84.7%	216 100%
6 and more	Frequency %	52 13.8%	325 86.2%	377 100%
Total	Frequency %	122 16,1%	635 83,9%	757 100%

Twenty-four respondents consisted of households with only one occupant. Only four (16,7%) out of these households have indicated their involvement in household recycling, at the time of the study. Households with two to three occupants were considered the most participative in recycling practices with thirty-three (23.6%) of the 140 households being involved in recycling practices, at the time of the study. Of the 216 households consisting of four to five occupants, only 33 (15.3%) households indicated that they were actively recycling their household waste. The lowest participation was observed in households with six or more occupants. Of the 377 in this category, only fifty-two (13.8%) indicated their involvement in current household recycling practices. From a statistical significance perspective, the Pearson chi-square value of $p = 0.06$, indicated no statistical significance between household size and current household recycling practices. From a practical point of view, the Cramer's V value of 0.1, has also indicated that in practice no significant correlation exists between household size and current recycling practices, or that household size has a very small effect.

5.4.4 Income level and current participation of households in recycling practices

In 2006, a study had been conducted by A.J Kamara in the city of Tshwane, where one segment of the study focused on the sorting of waste as means of participating in recycling practices. Households have been categorized into three groups, namely: wealthy, middle-class and poor. The results observed during the data analysis stage in the study done by Kamara has indicated that 44% of wealthy households sorted their garbage, 11% of the middle-income households sorted their garbage and lastly none of the poor households sorted their wastes for recycling. This study also divided households in low-, medium- and high-income classes.

Question 13 of the questionnaire posed the question of whether respondents fall in either low, medium or high income classes, the thresholds have also been provided. Results of the study have indicated that respondents indicating that they belong to the “low income group” resided mostly in the township of Bhekuzulu and lower laying parts of the town itself. The respondents indicating that they belong to middle- and high-income households have mostly been scattered over town and could not be pin-pointed to specific areas. The yielded results have been quite similar to the study conducted by (Kamara, 2006).

Table 7. Relationship between income level and the participation in household recycling practices

Income		Currently participating in recycling practices		
		Yes	No	Total
Low	Frequency %	30 9.8%	275 90.2%	305 100%
Medium	Frequency %	56 18.4%	248 81.6%	304 100%
High	Frequency %	36 24.3%	112 75.7%	148 100%
Total	Frequency %	122 16.1%	635 83.9%	757 100%

Results of the survey have indicated that high-income households were more inclined to participate in recycling practices than medium- and low-income households. The lowest participation frequency was observed in low-income households with thirty (9.8%) of the 305 households indicating that they have been active in recycling domestic waste. In the medium-income class, the percentage almost doubled with fifty-six (18.4%) of the 304 households indicating that they have been actively recycling their household waste. The peak was reached

within the high-income class with thirty-six (24.3%) of the 148 households indicating that they have recycled waste (Table 7). The Pearson chi-square value of $p=0.01$ was obtained, which indicated statistical significance. Practically, no significant correlation was observed with a Cramer's V value of 0.15.

5.5 Household willingness to participate in recycling practices

This survey has further investigated the willingness of households to participate in recycling practices, should they be aware of it. Question 7 of the questionnaire asked: *Should the municipality initiate a recycling program, of which you are aware, would you be willing to participate?*

Willingness in this regard means willingness to participate in a municipal initiative to facilitate recycling, such as separation of waste at source. Only 28% of the 757 surveyed households have indicated that they would be willing to participate, while 72% have indicated that they would be unwilling to participate.

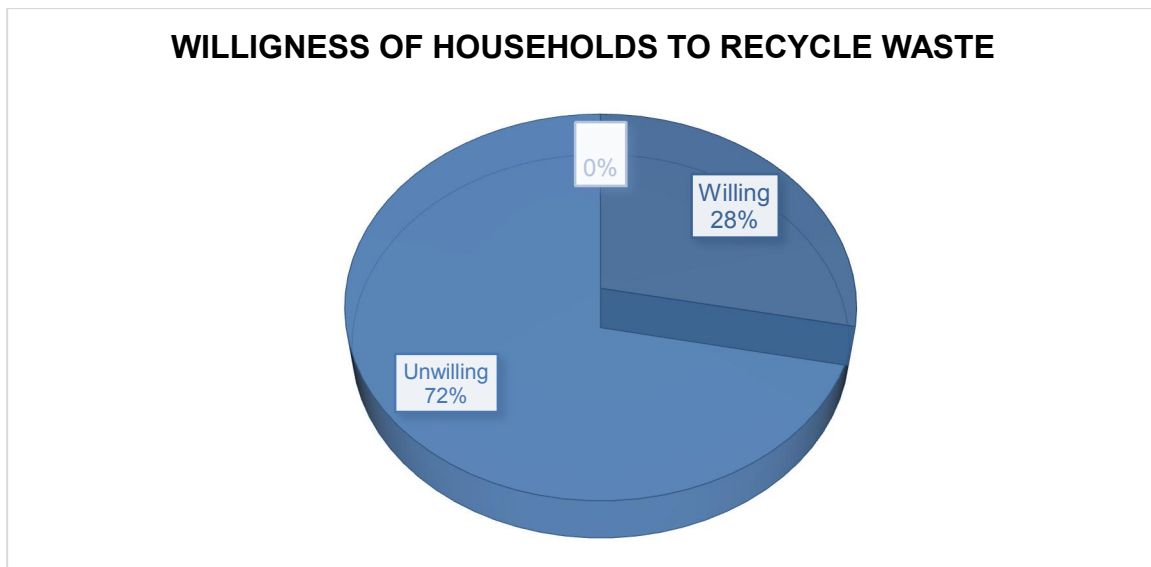


Figure 6. Willingness of households to engage in recycling initiatives by the municipality

A study conducted in Iran was characterized by low awareness levels pertaining to reduction and recycling of waste. However, more than 90% of respondents were willing to participate in future separation at source schemes, due to incentives. The current lack of separation at source observed in the study was due to a lack of access to infrastructure, limited knowledge and lack of incentives (Babaei *et al.*, 2015). In the Bangladesh study a mere 29.3 % of households have indicated willingness to participate in recycling should they be issued with relevant toolkits (Sujauddin *et al.*, 2007).

A study conducted in Nigeria, found that gender, age and education are insignificant indicators towards willingness to recycle. However, people aged 22-50 were slightly more willing than their younger and older counterparts. Significance was however found when it came to household size, where households with occupants ranging from 5-7 have been more willing. Variables such as income, housing tenure, housing type and period of observation were all concluded insignificant (Momoh & Oladebeye, 2009).

Willingness of households in Vryheid and Bhekuzulu have been relatively low in comparison to study conducted by Makau (2006) where 80% of the households have indicated that they would be willing to engage in recycling practices. The Kamara (2006) study done in Tshwane has yielded similar results, where 50% of high income households indicated willingness, with 15% of medium income households indicated willingness and 0% of low income households.

This study, furthermore, has investigated the manner in which willing households would want to participate in recycling practices (Table 8), as well as the reasons of unwilling households not being willing to participate in recycling practices (Figure 7).

Table 8. Manner in which willing households would want to participate in recycling practices

Manner	Frequency	Percentage
Separation at source	137	64.3%
Pay extra to the municipality in order for them to recycle the waste	76	35.7%
Total	213	100%

These were the two options given to respondents, purely to gain an understanding of whether households will go through the effort to “recycle” (if options were available) or whether they would want to utilize their fiscal abilities to transfer those efforts or responsibilities over to the municipality, should they actively become involved in the process. Respondents were, however, urged to first answer *whether they will be willing to recycle in the future*, after answering yes, they needed to choose their preferred option (from the latter) indicating their preferred method of participation.

The majority of respondents have indicated that they would be willing to participate in the separation of waste at source, with 137 (64.3%) of the 213 indicating as such. Seventy-six (35.7%) of the 213 households have indicated that they would be willing to “*pay the municipality extra*” for recycling services.

When analysing the use of financial mechanisms (paying extra) to participate in recycling, 38% of willing participants were from high-income households, 36,7% from medium-income households, and 30% from low-income households, with no significant difference between the income groups.

When households have been asked to select one of three responses, indicating why they were unwilling to participate in recycling, the main reasons provided were a lack of time; and because recycling was too much of an effort; followed by 'because they were uneducated about recycling'. These three limited options were given to respondents to choose from, as the first two options were also used as main reasons in a previous study (Momoh & Oladebeye, 2009:101). The third option was added because a lack of knowledge is often provided as the reason for households not participating in recycling practices.

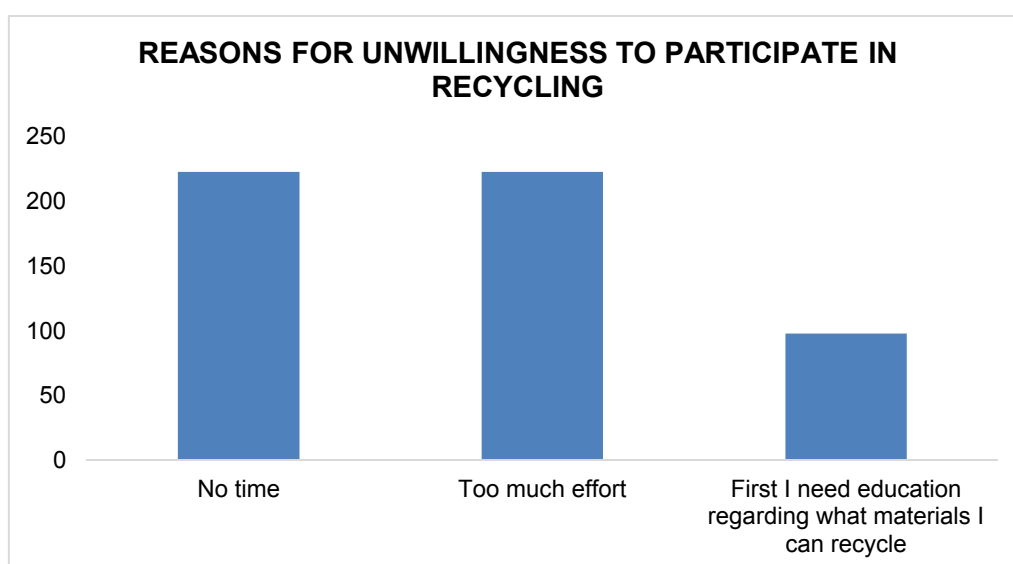


Figure 7. Reasons provided by households for not being willing to participate in recycling practices

The majority of households (72%) have indicated that they would be unwilling to participate in a recycling initiative. Reasons provided by households for not being willing to participate in recycling included that they did not have time or considered it too much of an effort to recycle. Thirty percent (30%) of households, respectively, have indicated that too much time and effort were the reasons for not participating. Ninety-eight (17.9%) households have indicated that they would first like to be educated on what materials could be of a recyclable nature. Respondents have however, not been given an open-ended question regarding their unwillingness.

5.5.1 Cross tabulating current participation in recycling practices and willingness to recycle

The current study has indicated that a portion of the households currently participating in recycling practices, were in fact, reluctant to be part of a future recycling initiatives, as initiated by the municipality. The majority of the households (62.3% or 76 households) participating in recycling practices at the time of the study, have indicated that they would want to play a part in a future recycling scheme. The remaining 37.7% (46 households) have, however, not been willing to engage in future recycling initiatives. Of the households indicating that they have not been participating in recycling practices at the time of the study, 21.6% have indicated that they would be willing to engage in future recycling activities (Table 9).

Table 9. Current recycling households and the willingness to recycle in future

Currently recycling		Willing to recycle		
		Yes	No	Total
Yes	Frequency %	76 62.3%	46 37.7%	122 100%
No	Frequency %	138 21.6%	497 78.4%	635 100%
Total	Frequency %	214 16,10%	543 83,90%	757 100%

Further investigative questions to understand the unwillingness of currently participating households to partake in future recycling initiatives have not been asked during the study. However, one could assume that their current way of recycling may be more convenient than the options of separation at source or payment to the municipality. The possibility could also exist that, should these households be given more options to how they could participate in recycling, a more accurate indication of willingness to participate may be seen. None of the respondents have answered the open-ended question provided in the questionnaire. Statistically, a significant correlation between current recycling and willingness to recycle in future was obtained, with the Pearson chi-square value of $p=0.01$. A Cramer's V value of 0.3 was observed, meaning that a practical visible significant association, or a medium effect was found.

5.6 Understanding variables influencing the willingness of households to participate in recycling practices

This section discusses the relationship of variables such as gender, ethnicity, household size, and income level to the willingness of households to participate in recycling practices in future.

5.6.1 Gender and willingness to participate in recycling practices

Studies relating to gender and willingness to recycle waste have contradicted each other. Schultz *et al.* (1995) and Hunter *et al.* (2004) have both found that females were in fact more likely to be willing to recycle waste than men. However, studies conducted by Gamba & Oskamp (1994), Werner & Makela (1998), Domina & Koch (2002), and Do Valle *et al.* (2004) have detected no relationship between gender and recycling. This study on the other hand has concluded that female participants were, generally, more willing to engage in recycling initiatives than men, with 34% of female respondents being willing to recycle in future, and 24% of male respondents being willing to recycle (Table 10).

Table 10. Relationship between gender and willingness to recycle waste

Gender		Willing to recycle		
		Yes	No	Total
Men	Frequency %	106 24%%	334 76%%	440 100%
Women	Frequency %	108 34%	260 66%	317 100%
Total	Frequency %	214 28%	543 72%	757 100%

Upon analysing statistical and practical significance, the Pearson Chi-Square value of $p = 0.003$ and Cramer's value of 0.1 was obtained. From a statistical perspective, the results have been considered significant, whilst in a practical sense, a minimal practical relationship has been observed.

5.6.2 Ethnicity and willingness to participate in recycling practices

The group that has indicated that they are most willing to participate was the White population group, with 47,4% of households indicating their willingness to recycle. The Coloured and Indian/Asian population groups have indicated that 31,8% and 36,4% of households, respectively, were willing to take part in recycling initiatives in future. In the Black African population group,

22,5% of households have indicated their willingness to participate in recycling practices (Table 11).

Table 11. Relationship between ethnic group and willingness to recycle waste

Ethnicity		Willing to recycle		
		Yes	No	Total
Black	Frequency %	120 22.5%	414 77.5%	534 100%
White	Frequency %	64 47.4%	71 52.6%	135 100%
Coloured	Frequency %	14 31.8%	3068.2%	44 100%
Indian/Asian	Frequency %	16 36.4%	28 63.6%	44 100%
Total	Frequency %	214 28%	543 72%	757 100%

The Pearson Chi-Square value of $p > 0.01$ was obtained, showing a very strong statistical significance, which means there is a statistical difference in ethnic groups and willingness to participate in recycling. A medium practical applicable value of 0.2 was concluded.

5.6.3 Household size and willingness to participate in recycling practices

In a study conducted in 2009 by Momoh and Oladebeye, willingness of households to engage in a kerb-side recycling scheme was investigated. Variables such as gender, household size, income, employment status have been investigated. The study has found that there was no significant statistical correlation between willingness and household size and concluded that middle sized households consisting of five to seven occupants were more prone to be willing to engage in such a scheme.

The results of this current study indicate that medium-sized households of two to three occupants have been more willing to participate in recycling than the rest of the household groups, with 49,3% of households responding positively. Households with only one occupant numbered to 24 households, of which 41,7% has indicated their willingness to participate in recycling. This was followed by households with four to five occupants indicating that 33% of them have been willing to participate in recycling willingness. Households with six or more occupants have been the least

willing, with a mere 16,7% of households consisting of six people indicating that they would be willing to recycle (Table 12).

Table 12. Relationship between household size and willingness to recycle waste

Household size		Willing to recycle		
		Yes	No	Total
1	Frequency %	10 41.7%	14 58.3%	24 100%
2 to 3	Frequency %	69 49.3%	71 50.7%	216 100%
4 to 5	Frequency %	72 33%	144 67%	44 100%
6 and more	Frequency %	63 16.7%	314 83.3%	377 100%
Total	Frequency %	214 28%	543 72%	757 100%

The Pearson chi-square value of $p < 0.01$ has indicated statistical significance. Practically, there seems to be a medium effect across household size, with the Cramer's V value of 0.3.

5.6.4 Income level and willingness to participate in recycling practices

Nearly 50% of high-income households, 32.2% of medium-income households and 14.5% of low-income households were willing to participate in recycling practices in future (Table 12).

Table 13. Relationship between income level and willingness to recycle waste

Income		Willing to recycle		
		Yes	No	Total
Low	Frequency %	45 14.5%	260 85.5%	305 100%
Medium	Frequency %	98 32.2%	206 67.8%	304 100%
High	Frequency %	71 48%	78 52%	148 100%
Total	Frequency %	214 28%	543 72%	757 100%

The relationship between income level and willingness to recycle were both statistically ($p=0.01$) and practically significant Cramer's $V = 0.28$.

5.7 Summary of the chapter

The study did not particularly look at extensive reasons as to the aspect of why households are not aware or why they do not recycle, but rather focused on their current recycling practices, their awareness of recycling and their willingness to participate in recycling practices in future. The last chapter consolidates and concludes all of the results found during this particular study, and provides suggestions for further research in this particular field.

CHAPTER 6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter provides conclusions of the study conducted in the Vryheid and Bhekuzulu areas, which has primarily focused on establishing the awareness of households of recycling practices, understanding their current participation in recycling practices, and establishing their willingness to participate in recycling practices in future. The chapter further concludes that the variables, such as gender, household composition, income class and ethnic group may influence the awareness and willingness of households to recycle, as well as their current participation in recycling practices. The chapter concludes by providing suggestions for future studies.

6.2 Revisiting the problem statement and objectives of the study

The National Waste Management Strategy (NWMS) stresses the need for waste recycling, and directs its focus toward metropolitan cities and large towns. Studies have found that the participation of households, as far as the diversion of waste away from landfill is concerned, is essential in achieving success.

The following aims and objectives have been identified for this study:

The aim of the study has been to investigate the awareness of households regarding recycling practices and to establish whether households were participating in recycling practices. The study has further aimed at establishing their willingness to engage in any form of initiatives aimed at recycling.

The objectives of the study have been:

- 1- To determine the awareness of households regarding current recycling practices and options;
- 2- To establish the participation of households in recycling practices (at the time of the study);
- 3- To establish the willingness of households to participate in recycling practices (in future); and
- 4- To establish the significance of variables such as gender, household size, ethnic background and income, towards the awareness of waste recycling practices, participation in current recycling practices, and the willingness participate in recycling practices.

The study has been conducted by means of a thorough literature review of existing national and international research to provide context, as well as an empirical study where data was collected from households in Vryheid and Bhhekuzulu.

6.3 Conclusions

Section 6.3 provides the conclusions on the research questions.

6.3.1 Awareness of households of waste recycling

Results pertaining to the awareness of local residents regarding recycling programmes has concluded that 57% of households were in fact not aware of the current private recycling initiative in Vryheid. According to these results, awareness of the existing recycling initiative, has in fact also had a negligible effect on whether households recycle or not. The study has indicated that 19% of respondents who were aware of the initiative, do some sort of recycling, whereas 14% of the ignorant households in fact do recycling. A p-value of 0.043 was obtained when determining the statistical significance of the awareness of recycling practices on actual participation in recycling, showing statistical significance. However, from a practical point of view it was deemed to be insignificant due to the Cramer's V-value of 0.073.

6.3.2 Participation of households in waste recycling practices at the time of the study

This study has indicated relatively low levels of participation in current recycling practices, with only 122 (16%) out of the 757 households recycling. When asked about their reasons for non-participation, the majority of respondents (457) have indicated that recycling is currently not convenient. Another reason provided for not participating in recycling practices, was the fact that residents have not received refuse bags for the separation of waste at source. Regarding the receiving of refuse bags, the study has concluded that the majority (84%) of all respondents do receive refuse bags for disposal, however an infrequent trend has been observed regarding frequency and distribution of the bags. Of the 643 households which indicated that they did receive refuse bags, only 417 households have received refuse bags on a monthly basis. The distribution was also not bound to geographical areas, for example in many instances households would in fact receive and next door neighbours have not received any refuse bags.

One of the aims of this study was to establish households' participation in recycling, and to establish whether a significant trend does exist across gender, ethnicity, household size and income level. Considering the impacts of gender, it is concluded that women-headed households have been more involved in recycling waste than households headed by men, with women

indicating 18% participation and men 14.8%, respectively. The relationship between gender and participation was statistically significant, but was insignificant from a practical perspective. From an ethnic point of view, 28.1% of White households have indicated participation in recycling, followed by 18.2% of Indian/Asian households, 15.9% of Coloured households and 12.9% of Black African households. Results have been statistically significant, but from a practical point of view it has held little to no significance. Results pertaining to household size have shown no significance from a practical as well as a statistical perspective. Results have, however, concluded that small to medium households (with two to three occupants) tend to be more involved in recycling practices, while households with more than six occupants were the least involved in recycling practices. When investigating income and current recycling participation, an interesting trend was noted, that is also supported by the study done in Tshwane. High-income households have been the most involved in recycling, followed by medium-income and low-income households. Statistical significance was established with a low or insignificant practical significance.

6.3.3 Willingness of households to participate in waste recycling practices

The third and final part of the study has focused exclusively on the willingness of households to participate in future recycling practices/initiatives. Results obtained pertaining to overall willingness to participate in recycling practices has been characterised mostly (similarly to current recycling participation) by low household participation. Twenty-eight percent (28% or 213) of all households have indicated their willingness to participate in future recycling practices. This was slightly higher than the number of households (16%) currently participating in recycling practices. When asked about the manner in which future participants would like to participate in recycling, 64% of households have indicated that they would participate by means of separation at source, while the remainder has indicated that they would participate by paying the municipality more so that they would collect the waste. Respondents have also been asked the question of why they wanted to refrain from participating. The majority of respondents (223) 30% have indicated that they did not have time for recycling, and that it was too much of an effort to recycle respectively. Ninety-eight (17.9%) of the participating households have indicated that they would first like to receive education about what materials were in fact recyclable. A statistical significance and practical significance were both found in participation in current recycling and willingness to recycle.

Part of the study has focused on establishing whether significance exists across gender, ethnicity household size and income as it relates to the willingness of households to participate in recycling. It was concluded that female-headed households have been more willing to participate in recycling in future than male-headed households, with 34% of female-headed households

indicating willingness to recycle, versus 24% of male-headed households. Both statistical and practical significance have been obtained in this regard. In terms of significance related to ethnicity, a strong statistical and medium practical significance was found, with white households being most willing, followed by Indian/Asian, Coloured and Black African ethnic groups. Significance was found from a statistical and practical point of view, with households having two to three occupants being the most willing and households with six and more occupants being the least willing to participate in recycling. When establishing the significance of income level on the willingness to participate in recycling, both statistical and practical significance were found, with high income households being the most willing to participate in recycling waste in future, followed by medium- and low-income households.

6.4 Limitations encountered during the study

The following limitations have been encountered during the study:

- Availability of members of households during the study. The initial sampling plan could not be followed, due to household members that have been unavailable, thus the collection of data commenced with household members that were available at the time.
- Language limitations have been encountered as a result of the residents in the Bhhekuzulu area mainly speaking Zulu. With regards to communicating with respondents, the researcher could not directly communicate with respondents because of the difference in language and an interpreter was used to facilitate communication.
- Closed questions with limited options (based on literature) have been provided, where respondents had to choose a response which best indicated their motivation for participating in recycling etc. Respondents have not been provided an opportunity to elaborate on reasons or add their own responses to questions.

6.5 Recommendations and future research

The following sections provide recommendations as far as policy and practice are concerned.

6.5.1 Policy

Households' participation is imperative to make a recycling scheme work. By looking at the results according to awareness, current- and future recycling, it can be recommended that the municipality (or municipalities in general) should implement awareness campaigns as well as campaigns which highlight the need to recycle, concurrently with providing the population with the necessary infrastructure. A future mandatory recycling scheme could also be recommended, since recycling is currently only done on a voluntary basis.

6.5.2 Practice

A further study needs to be done in order to establish why residents lack the will to recycle and whether there are other characteristics playing a role in residents' willingness to participate in future recycling initiatives.

It is recommended that in the near future there should be a formalised recycling structure be put in place for residents and businesses. The necessary structures to establish such a scheme may be researched further.

It is also imperative to take into consideration the means by which residents would like to participate (Separation at source, or paying an extra amount in order for the municipality to sort the waste). Further research may be conducted to understand the preferred means of participation.

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ANNEXURE A

English questionnaire followed by the Zulu Questionnaire

English questionnaire

Questionnaire on household recycling									
Please answer all the questions listed below									
<i>Please note that the head of the household must fill in the questionnaire</i>									
Please note: this is a correct example of how the questionnaire should be answered:									
Tick the box with a X where applicable									
X									
<u>Do you know what types of waste are recycable?</u>									
I know all the recycable waste					I know some of the recycable waste				
I don't know which wastes are recycable									
<u>Are you aware of the recycling program in the town of Vryheid?</u>									
Yes					No				
<u>Does your household receive the white, yellow and black bags for refuse?</u>									
Yes,					No				
<u>If answered yes, when last did you receive?</u>									
I receive every month					I only receive some months				
<u>Does your household recycle waste?</u>									
Yes					No				

<u>If answered no in the above question, please specify why?</u>			
It's not convenient		I don't know what materials are recycable	
I don't receive refuse bags			
<u>Should the municipality initiate a recycling program, where you are aware of, will you participate?</u>			
Yes		No	
<u>If answered yes in the above question, in what way will you participate?</u>			
Seperation of waste at home		Pay extra to the municipality in order for them to recycle the waste	
Other:			
<u>If answered no, please indicate why</u>			
No time		Too much effort	
First I need education on what materials are recycable			
<u>Indicate your gender</u>			
Male		Female	
<u>From which ethnic background are you?</u>			
Black	White	Coloured	
Indian	Other		
<u>How many occupants do your household have?</u>			
1		2 to 3	
4 to 5		6 and more	
<u>In which income class does your household fall?</u>			
<i><u>This is per household and not individual</u></i>			
Low Income R1- R 12,816 per month			
Medium Income R12,817- R51,200 per month			
High Income R 51, 200+ per month			

The Zulu questionnaire

Uhla lwemibuzo ngemfucuzo ezisopdinda zisetshenziswe			
Phendula imibuzo yonke engezansi			
<u>Qaphela umphathikhaya kumele aphenidule lemibuzo</u>			
Qaphela: isibonelo sokuphendula kahle			
Beka x ngokutshengiswa			
X			
<u>Uyazazi izinhlobo zemfucuzo eziphindwe zisesethenziswe na?</u>			
Ngiyazazi zonke		Ngiyazazi ezinye zazo	
Angizazi eziphindwe zisetshenziswe			
<u>Uyazi lapho kuphindwe kukhandwe khona izinto eziphindwe zisetshenziswe eVryheid na?</u>			
Yebo		Qha	
<u>Ngabe umndeni uyathola amaplastic amhlophe, aphuzi namnyama okufaka imfucuzo na?</u>			
Yebo		Qha	
<u>Uma waphendula 'Yebo', wacina ukuwathola na?</u>			
Ngiyawathola inyanga ngenyanga		Ngiyawathola kanye ngezinyanga ezimbalwa	
<u>Umndeni uphinde usebenzise imfucuzo yini?</u>			
Yebo		Qha	
<u>Uma waphendula "cha", chaza kungani?</u>			
akukho obala		angazi izinto eziphindwe zisetshenziswe	
angiwatholi amaplastic okufaka izibi			
<u>Ngabe umasipala uzibandakanaya ohlelweni lwemfucuzo eziphindwe zisetshenziswe, uma wazi, kukhona lapho ungabakhona ingxenywe na?</u>			
Yebo		Qha	

**Uma waphendula "Yebo", ungaba yingxenye
ngayiphi indlela na?**

Ukuhlukanisa imfucuza ekhaya

Ukukhokha ngaphezulu
kumasipala ukuze akwazi
aphinde akusebenzisele imfucuza

Okunye (chaza)

Uma waphendula "cha", chaza kungani

Angi nasikhathi

umzamo mkhulu kakhulu

ngidinga ukufundiswa ngemfucuza ezinga phindwa phindwa zisesetshenziswe kuqala

Ubulili bakho

Indoda

Owesifazane

Ungowaluphi uhlanga

Mnyama

Mhlophe

Coloured

Mandiya

Omunye

Ngabe nibangaki emndenini wenu?

1

2 to 3

4 to 5

6 and more

Ngabe abasekhaya bahola malini bebonke

Low Income

R1- R 12,816 ngenyanga

Medium Income

R12,817- R51,200 ngenyanga

High Income

R 51, 200+ ngenyanga