



**AN INVESTIGATION OF COMMUNITY RECEPTIVENESS TO
CURRENT RECYCLING INITIATIVES: THE CASE OF THE
WESTCLIFF (CHATSWORTH) DISTRICT IN THE ETHEKWINI
MUNICIPALITY**

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Submitted in fulfilment of the academic requirements for the degree of

Master of Science in Environmental Sciences

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ACKNOWLEDGEMENTS

Thanks, and Glory, be to God for blessing me with this opportunity and giving me all I needed to complete my dissertation.

I would like to deeply thank my supervisor, Dr Fathima Ahmed, for the opportunity she gave me, her constant support, invaluable recommendations, observations, and guidance through the research process of this master's dissertation. Her knowledge and insight have been invaluable to my growth. Moreover, I express gratitude to the household residents and key informants of the community studied, who have keenly shared their valuable time during the process of questioning. I give heartfelt thanks to the Govender family for hosting me during my data gathering and being so supportive. I also express gratitude to the Chatsworth Youth Centre for allowing me to host my discussion on their premises. I would like to give thanks to my mother, partner, and grandparents for supporting me throughout the completion of this research, keeping me positive and focused as well as helping me persevere in my research, I will be eternally grateful for all your support and love. To all my other family I have not named, thank you so much for all you have done, this dissertation could not be done alone, and all your support and help are deeply appreciated.

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ABSTRACT

The increase in urbanization and unabated rise in consumption of goods has created a similar rise in the quantity of waste that is generated, thus waste management has become one of the challenges facing the global society. Currently, waste has been projected to astronomical figures in years to come. For this reason, a keen interest has developed in understanding integrated waste management systems such as recycling waste. This dissertation investigates the receptiveness of Westcliff residents to participate in waste recycling initiatives that have been provided by the municipality and businesses. To analyse this, residents' recycling behaviours, attitudes and beliefs were studied. Additionally, the external stakeholders that provide these services were also examined due to the interconnectedness of waste management. The study used the Theory of Planned Behaviour as its conceptual framework to assess the various areas of an individual's planned or physical behaviour. It was found that investigating the factors that influence recycling behaviour could lead to more successful and efficient community recycling programmes, in conjunction with reducing the waste pressure on landfills and preventing environmental degradation. A mixed methodology was followed through a case study and descriptive research design. The quantitative and qualitative tools used to gather the data were surveys, focus group discussions, key informant interviews and visits to the site. Key findings in the research were that residents were willing to use recycling initiatives but lacked knowledge of recycling on multiple levels. It was established that the method of dissemination of recycling information was ineffective, as the method chosen had limited penetration with the residents. Moreover, residents found that their curbside recycling was unreliable and felt a lack of motivation to then support this initiative with any conviction. Residents show interest in initiatives such as the reverse vending machine but still voiced that curbside pickup would be the best solution. Participants showed a willingness to utilise these avenues of recycling and the concept of being rewarded was further motivation. Information from the key informants was invaluable but one notion stood out, while every household should recycle for the betterment of the environment, a societal shift is needed from a linear economy to a circular economy, because if every household did recycle, there will be pressure in the production line if the recycled material is not fed back into the production line. The study recommends further studies (perception and experimental) with the full range of stakeholders in recycling, to monitor barriers and changes at community levels.

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List of Abbreviations

ABC	Attitude, Behaviour, Condition
ABS	Acrylonitrile Butadiene Styrene
CE	Circular Economy
CSIR	Council for Scientific and Industrial Research
DEA	Department of Environmental Affairs
DEFF	Department of Environment, Forestry and Fisheries
DST	Department of Science and Innovation
DSW	Durban Solid Waste
EERE	Energy Efficiency & Renewable Energy
EPR	Extended Producer Responsibility
FIFA	Fédération Internationale De Football Association
FGD	Focus Group Discission
IPA	Interpretative Phenomenological Analysis
IRRA	Inter-Rater Reliability Agreement
IRR	Inter-Rater Reliable
IWMS	Integrated Waste Management Systems

KII	Key Informant Interview
NEMA	National Environmental Management Act
NOAA	National Oceanic, And Atmospheric Administration
NWMS	National Waste Management Strategy
OECD	Organisation for Economic Co-operation and Development
PA	Polyamide
PEB	Pro Environmental Behaviour
PET	Polyethylene Terephthalate
PETCO	Polyethylene Terephthalate Company
PPP	Polluter Pays Principle
PRA	Participatory Rural Appraisal
RVM	Reverse Vending Machine
SDG's	Sustainable Development Goals
SST	Sustainable Seas Trust
STATSSA	Statistics South Africa
SWM	Solid Waste Management
TGRC	The Glass Recycling Company

TWB	The World Bank
TPB	Theory of Planned Behaviour
UNEP	United Nations Environment Programme
US EPA	United States Environmental Protection Agency
WM	Waste Management
WMH	Waste Management Hierarchy
WMP	Waste Management Practices
WMS	Waste Management Services

CHAPTER ONE: INTRODUCTION

1.1 Preamble

This study examines the receptiveness of residents to participate in waste recycling initiatives that have been provided by the eThekweni Municipality and recycling businesses. This receptiveness was analysed with specific reference to the community of Westcliff (Chatsworth), within the eThekweni Municipality in Durban, South Africa. The eThekweni municipality currently offers a recycling programme throughout many of the residential areas in the city (Marange, 2020), providing residents with orange and clear coloured bags into which they can place their recyclable (paper, plastic, glass, and cans) waste for curbside collection. Moreover, private recycling company initiatives, such as: drop-off points and reverse vending machines (RVM) are installed in strategic areas in and around the city.

Many studies have sought to understand household recycling behaviour, drawing on models from social psychology and exploring attitudes and situational variables as key predictors of recycling behaviour (Islam, 2021; Liu *et al.*, 2021; Ma *et al.*, 2021). These studies use the Theory of Planned Behaviour (TPB), which argues that an individual's behaviour is based on that individual's readiness to perform that behaviour (i.e., intention), which in turn is based on three factors: (1) attitude (the individual's positive or negative perception of performing a behaviour); (2) subjective norm (an individual's perception of social pressure to engage or not in a behaviour); and (3) perceived behavioural control (an individual's perception of his or her ability to perform a given behaviour) (Ma *et al.*, 2021:1). This study also seeks to determine the influence that other key stakeholders (government, and private recycling companies) have on impacting recycling behaviours. Understanding these combined factors that influence recycling behaviour can lead to more effective municipal community recycling programmes, in conjunction with reducing the waste pressure on landfills and preventing environmental degradation.

The rest of this chapter details the rationale for the study. The study's aim and objectives are then presented, followed by a synopsis of the study methodology, and the chapter conclusion.

1.2 Rationale for the study

In the face of increasing urbanization and the concomitant rise in consumption, waste management has become one of the principal challenges to governments across the globe. Currently, waste produced in the world's cities is projected to reach "2.2 billion tonnes per annum in 2025" (Lee *et al.*, 2016 cited in Marange, 2020:1). These challenges have prompted an increased attention in exploring integrated waste management systems", including recycling waste.

The waste management hierarchy (WMH) (Figure 1.1) indicates that the most environmentally friendly management choices include prevention (waste avoidance and reduction), reusing, recycling, and recovery

(Nyika *et al.*, 2020), with landfilling (a widely used method of waste disposal), near the bottom of the management hierarchy. Landfilling is a method of waste disposal that merely stores waste on the earth's surface. They are designed to contain the various materials stored in it. However, landfills have exceeded their capacity in many areas (Stubbs, 2020) and are now associated with dangerous and toxic substances that leach into the groundwater and soil over time, including greenhouse gases released from rotting food waste that contributes to global warming (Flanagan and Priyadarshini, 2021). Landfills are also part of the 'new urban commons' in many parts of the third world, where intensive salvaging takes place, posing human health concerns (Department of Environment, Forestry and Fisheries and Department of Science and Innovation (DEFF and DST), 2020). Yet, landfilling is the most employed option for managing waste in most developing countries, and South Africa is no exception (Schoeman and Schmidt, 2016). Nonetheless, the two types of waste management considered as unacceptable and not environmentally friendly is dumping and open burning (Figure 1.1).

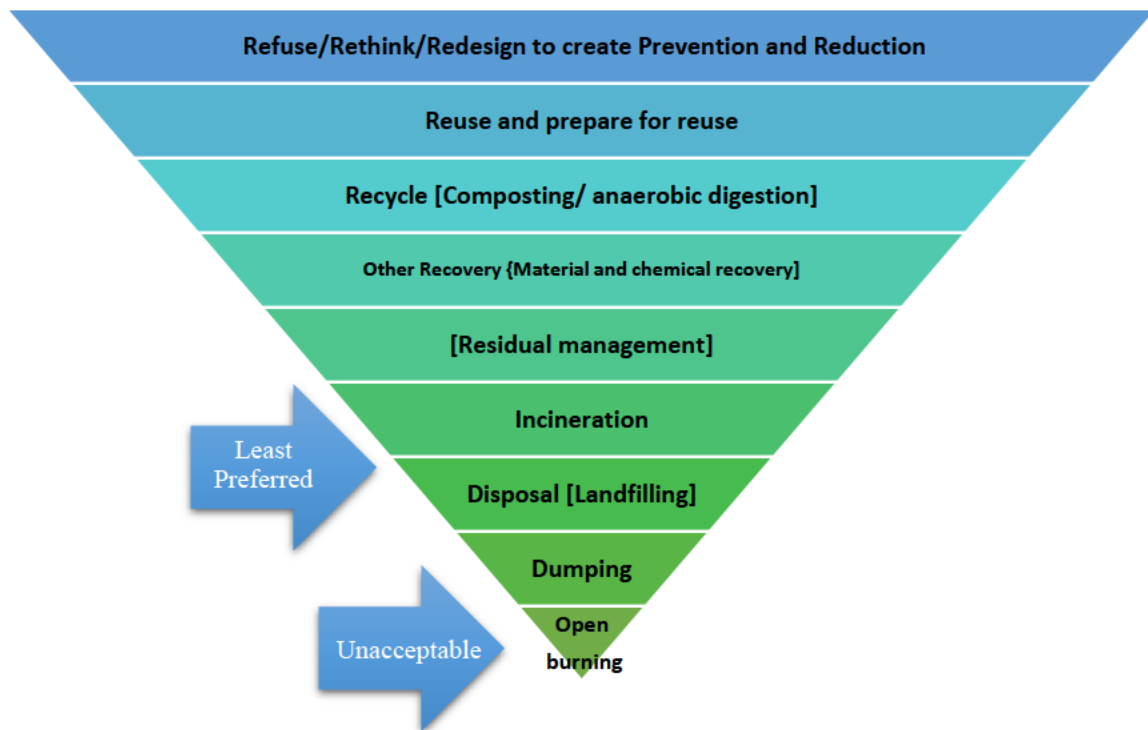


Figure 1.1: Waste Management Hierarchy (adapted from Nyika *et al.*, 2020:334 and Simon, 2019)

According to the 2018 State of Waste Report for South Africa, “55 million tonnes of waste” (Department of Environmental Affairs (DEA), 2019:11) reaches the country's landfills annually. Furthermore, over 50% of the general waste currently being disposed of in South Africa has the potential to be recovered for recycling or re-use; specifically, paper, glass, beverage cans and metal, which could reduce pressure on landfills (Schoeman and Schmidt, 2016:4). However, Strydom's (2018b:3) study indicates a mere 3.3% of South Africa's population commits to recycling their waste.

While the general population shows little commitment to recycling their wastes, a key feature of the National Waste Management Strategy (NWMS), which is a legislative requirement of the National Environmental Management: Waste Act (Act No. 59 of 2008), (DEA, 2019) are as follows:

Goal 1:

1. Within 5 years, 50% of wastes should be diverted from landfills (short term) (DEA, 2019:33).
2. Within 10 years, 60% of wastes should be diverted from landfills (medium term) (DEA, 2019:33).
3. Within 15 years, 80% materials that were previously landfilled should be reused, recycled, recovered, and alternatively treated (long term) (DEA, 2019:33).

Goal 2:

All persons living within South Africa should live in clean areas that have efficient, effective, and financially sustainable waste management (DEA, 2019:63).

Goal 3:

A recycling culture should be inculcated within the country of South Africa, with norms and standards aligning to a zero acceptance of open dumping, environmental pollution, and littering (DEA, 2019:64).

From these goals it can be seen that the adoption of recycling programmes, at the household level, and across municipalities in South Africa is a longstanding goal (Schoeman and Schmidt, 2016). The findings of the 2019 Revised and Updated National Waste Management Strategy (DEA, 2019), show a large gap between where South Africa would like to be, that is, 50% of wastes diverted from landfills within 5 years from 2017 (DEA, 2019:33), compared to where it currently stands, where only 11% of wastes are being diverted from landfills (DEA, 2019:11). To gain further insight into this gap, the Westcliff District within KwaZulu-Natal was chosen to do an in-depth analysis of communities' receptiveness to recycling initiatives. KwaZulu-Natal's population ranks second in the country of South Africa (STATSSA, 2017), and eThekweni (Durban) is the largest city (Cowling, 2023). Thus, the significant impact of such a study is expected to be prominent here.

Moreover, a middle-income, urban community was chosen because waste management services that are inefficient due to being logistically complex (i.e., low-income urban areas) would be biased when collecting data and are considered an external factor to the residents of the area and will impact how they will behave towards recycling (Dlamini *et al.*, 2017). Additionally, recycling was chosen for its applicability to South Africa, and comprehensiveness in dealing with household wastes (Kristiansen, 2016). Furthermore, there is a dearth of knowledge on the recycling behaviour in urban KwaZulu-Natal (Dlamini *et al.*, 2017). For example, a survey on South African household recycling behaviours from 2010 to 2015 showed minimal change in the recycling rates (Godfrey and Strydom, 2016). However, this survey was wide in scale and uncomprehensive. Similar findings were seen in Naicker's (2018) research in eThekweni which also found that the lack of recycling was due to the lack of provision, and accessibility of services to interested residents by recycling waste

management services. Likewise, a strong link between the geographic area and income class was seen, where higher income groups are more likely to engage in recycling behaviour compared to their poorer counterparts due to the service provision of recycling WMS (which was present in higher income areas but not present in lower income areas) (Naicker, 2018). However, these are dated studies and waste management is highly dynamic and constantly changing (Strydom, 2018b).

In addition, other factors affecting recycling practices include the inadequate provision of collection bins, inefficient collection of waste, and a deficiency in the employment of waste laws by the municipality as well as the position of households, socio-economic class, remoteness to these services, and a lack of recycling knowledge (Dlamini *et al.*, 2017; Gumbi, 2015). These key behavioural influences are the reasons for defining the parameters of this dissertation within the Theory of Planned Behaviour (TPB) context and were the main components to understanding what determines residents' recycling behaviour. These sentiments were echoed by Zhang *et al.* (2015), whose study used TPB and found that residents' beliefs, largely influenced how people recycle and that these beliefs were dependent on external factors such as understanding recycling and ease of access to infrastructure. Zhang *et al.* (2015) further indicated that if residents felt morally obligated to recycle (protect the environment) their recycling habits may improve. Furthermore, the TPB is a predominant method of studying residents' behaviours and perceptions of recycling (Reid *et al.*, 2018).

Consequently, this study builds upon existing research thus gaining a deeper and more recent understanding of residents' receptiveness to recycling services. It also uncovers the issues with the current waste management services, while focusing on the factors that influence the community's receptiveness towards recycling. However, to do this, one needs to fully understand what affects the residents both from being offered the service, and their understanding of the service. Therefore, the community and its service providers were investigated.

1.3 Aim of this research

This research aims to analyse the Westcliff, Chatsworth community's receptiveness to current recycling initiatives in the area.

1.4 Objectives

The objectives of the study are:

To understand the views and opinions of Westcliff community members on current recycling initiatives.

To examine the current recycling behaviours prevalent in the Westcliff community.

To analyse the roles external key stakeholders (private recycling companies) play in influencing and supporting these recycling views and behaviours.

1.5 Methodology Summary

The Westcliff district in Chatsworth was the chosen sample area, where 84 participants were conveniently sampled. The research followed a mixed methodology and used a case study and descriptive research design. Three different quantitative and qualitative tools were used to collect the data namely, surveys, focus group discussions (FGD), key informant interviews (KII) and site visits. The data was analysed using a mix of quantitative and qualitative analysis approaches. These results were complemented with secondary data through desktop research to provide a deep, meaningful, and scientific discussion.

1.6 Chapter Sequence

Chapter one (the current chapter) provides the setting for the entire dissertation and includes the motivation for the study. The chapter also details the aim and objectives. A methodology summary for the study is also found in this chapter. The second chapter discusses waste management globally and in South Africa. Gaps within the research are also assessed. Chapter three focuses on the study area and examines the methodology utilized to reach the study objectives. Chapter four focuses on the results and details the discussion. Chapter five summarizes the main findings as they relate to the study objectives, presents the conclusion, and provides recommendations for future research on household recycling behaviour and perceptions.

1.7 Conclusion

The projected global increase in waste volumes, coupled with the environmental limits of landfilling, has made integrated waste management systems (IWMS) and recycling, imperative. Indications are that over half of the waste ending up in landfills can be recycled. However, most studies indicate only a small percentage of the population engaged in recycling behaviour, despite the municipal roll-out of recycling initiatives. This chapter highlighted the need to understand and investigate community receptiveness to current recycling initiatives. Furthermore, this chapter presented the research motivation, aim and objectives. A summary of the methodology used was included.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

This chapter discusses the concept of waste, particularly waste generated at the household level. It then distinguishes where domestic recycling lies within the vast expanse of waste management classifications. The chapter then goes on to identify the general impact of Waste Management Systems (WMS) on the environment before discussing Integrated Waste Management Systems (IWMS). Additionally, the chapter explores recycling, where the sections explain each facet of this type of waste management, namely: goals for recycling, trends, stakeholder influence (government and business) and waste legislation. The review then analyses the current types of recyclables and recycling practices and initiatives. Factors affecting household recycling behaviour are reviewed in detail with a final assessment of the failures and opportunities present in South Africa. The chapter concludes with a discussion of the conceptual framework using the theory of planned behaviour and reveals its relevance to this study. Finally, the chapter highlights how this study aims to add to the knowledge base of recycling.

2.2 Waste and its place in society

Waste is generated as the consequence of human activity that does not utilise a resource completely or renders a resource obsolete (Nathanson, 2023). Waste can also be defined as any substance that is no longer required by the owner (Adeleke *et al.*, 2021). It can further be defined as any material that can be reduced, reused, recycled, or recovered, in which case, it can no longer be considered waste (Nathanson, 2023), and is then fed back into the economy as raw material (DEFF and DST, 2020). Furthermore, there are various sources of waste, such as industrial, agricultural, domestic, and so forth (Figure 2.1). This study refers only to domestic solid waste.

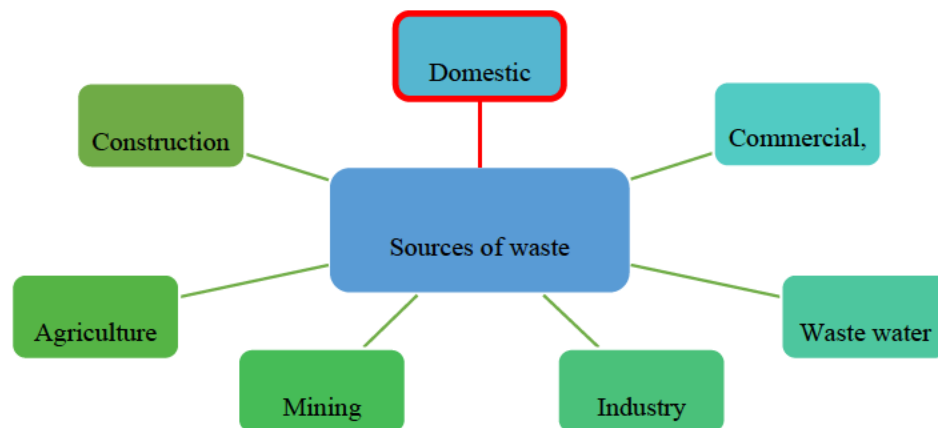


Figure 2.1: Sources of waste (Rajangu *et al.*, 2022:1)

Domestic waste is further differentiated based on what it is composed of. Where waste being produced in the garden is garden refuse and food products, paper, glass, plastics, metals, electronics, and cardboard will each be categorised into its own separate divisions (Dehghani *et al.*, 2021 and Marange, 2020). These materials can be further classified as solid wastes which can be classified even more as dry and wet wastes (Dehghani *et al.*, 2021). According to Dehghani's *et al.* (2021) definition, wet waste is all biodegradable material found in a household that requires disposal, such as food scraps, garden scraps and sanitary waste. They also describe dry waste as non-biodegradable and consisting of all glass, metals, paper, cardboard, produce packaging, clothing, and household dirt like dust (Dehghani *et al.*, 2021). Moreover, domestic waste can be identified as either hazardous or non-hazardous, where hazardous waste comprises of waste such as oils and paint, and non-hazardous waste such as glass, metals, paper, and packaging. Therefore, the term waste can be seen as a generalised term for an otherwise very diverse classification of materials no longer required by the user even if it can be recycled. This study focuses on solid non-hazardous wastes, which have the potential to be recycled.

From this definition and delineation, a further breakdown of solid waste management (SWM) was noted by Adeleke *et al.* (2021), where integrated solid waste was further divided into its governance component and activity component. Within the governance component, laws, regulations, interested parties and monetary resources are seen as important factors affecting SWM (Adeleke *et al.*, 2021). The activity component is broken up into five parts, namely, waste production, collection, disposal, treatment, and material recovery (Adeleke *et al.*, 2021). It is noted that these two components are not exclusive of each other. For example, laws defined in the governance component may be applicable to only specific parts of the activity component, making waste management a highly complex activity.

Another paradigm of waste's place in society is the concept of a circular economy (Figure 2.2). A circular economy (CE) grounds itself in the premise that all waste materials that can be re-introduced into the economy should continue the perpetual cycle, thus improving the economy instead of being an expense (Paes *et al.*, 2021). As an example, landfills generally are an expense as they have been associated with pollution. Figure 2.2 indicates that the CE has five pillars on which it is built: design of products, creation of goods, usage of goods, waste management and sustainable development (Adeleke *et al.*, 2021). Moreover, a study by Grafström and Aasma (2021), also indicates that raw materials are fed into the CE at the design and production stage and that this can be replaced by recycled materials that are obtained from previously used products rather than mined from the earth. In this evolved cycle, only residual wastes that cannot be recycled or reused are disposed of (Grafström and Aasma, 2021). This further indicates that waste is not only an output in society and the economy but is also a valuable input.

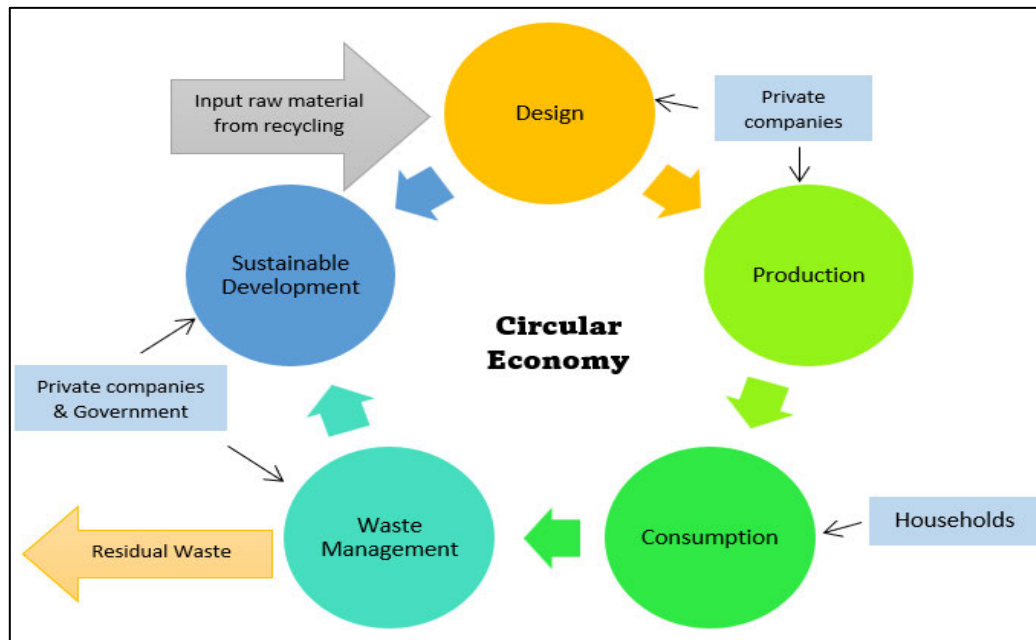


Figure 2.2: Waste in the Circular Economy (adapted from Adeleke *et al.*, 2021; Grafström and Aasma, 2021)

2.3 Integrated Waste Management Systems

The concept of integrated waste management systems (IWMS) not only gives context to waste in society and the circular economy but also forms a foundation for other concepts explored in Figures 1.1, 2.2 and 2.3. This is due to integrated waste management systems incorporating every element within the natural and anthropogenic environment to aid in removing waste from society in a meaningful manner (Koop, 2021). Bukari *et al.* (2017), describe IWMS as including natural elements such as solids, water, atmosphere, and energy with anthropogenic elements such as legislation, resources, and the stakeholders (government, private companies, and households). Another study adds to this definition by stating that the intertwining of these elements can lead to the mitigation, recovery, and recycling of wastes in an organised manner where the integrity of both human and environmental health is preserved (Adeleke *et al.*, 2021). Munsamy (2022), further emphasizes this by arguing that cities need to utilise IWMS in their structures to ensure the continued perpetuation of the economy, society, and the environment.

Moreover, Figure 2.3 depicts that the key role players as households, government, and private companies. Households produce a large amount of waste at-source that requires cleaning, separation, recycling and/or disposal. When these practices are done correctly, sustainability and conservation of resources can be achieved. However, if mismanaged, diseases and environmental contamination can occur. Alternatively, if a delicate balance between sustainability and economic feasibility is maintained, then controlled pollution and conservation of resources can be achieved, although it is not the ideal solution. For example, Ma's (2023) research demonstrates that recycling aids in resource conservation and the principles of a CE which leads to

sustainability. However, this is not always attainable due to financial and infrastructure limitations, and in these instances, landfilling is needed to ensure the confinement of dangerous/disease-causing wastes, i.e.: controlled pollution must be deployed (Figure 2.3). While the responsibility lies on households to recycle (behaviour in accordance with the structure of waste management provided to them), it is the government and/or private company's task to provide the infrastructure for the households to do so.

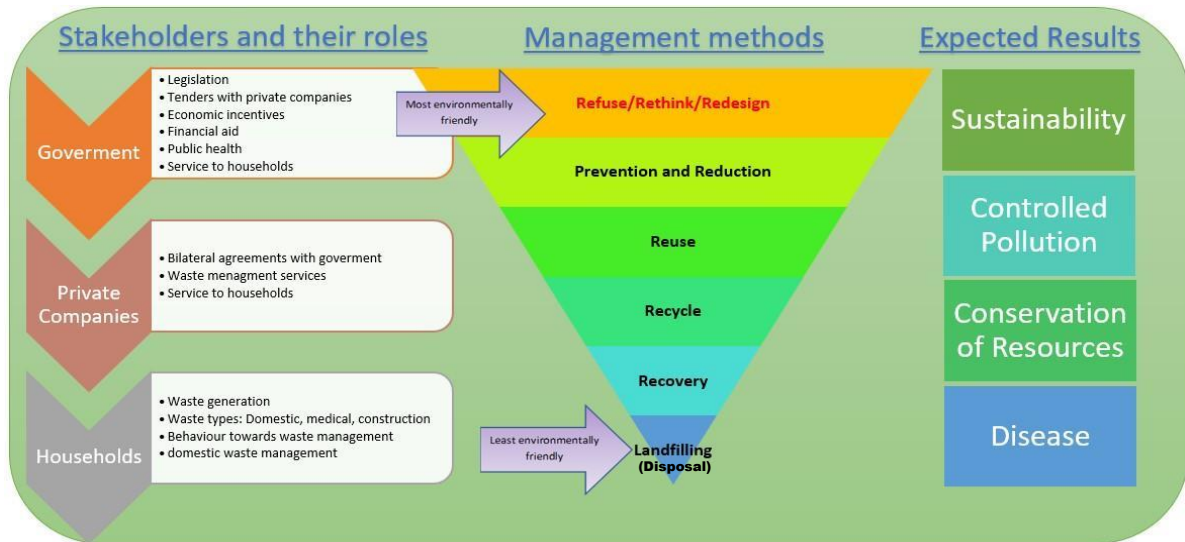


Figure 2.3: Waste Management Hierarchy as part of an IMS (adapted from Nyika *et al.*, 2020:334; Simon, 2019 and Bukari *et al.*, 2017:188).

Therefore, the government and private companies are also significant role players as they have the decision-making authority to create structures that support household recycling (Bukari *et al.*, 2017). Support can include service provision, education, and physical structures (Dlamini *et al.*, 2017). However, this has a delicate balance with finances and resources where each level of the Waste Management Hierarchy (WMH) must be carefully evaluated in line with the stakeholders and expected results, indicating why IWMS are so important.

Additionally, the IWMS uses the WMH (Figure 2.3) to delineate various management methods (Nyika *et al.*, 2020). According to the WMH, level one is the landfilling level, followed by the second level, which is the recovery level where materials are recovered by the higher levels, but is out of the scope of this research as only at-source recycling is focused on in this research. The next level is recycling at level three, and reuse at level four. Level five deals with the educational aspect of the WMH, which is prevention and reduction. While education is an important aspect of WM, it needs to be inculcated at an earlier stage, where it can limit adverse environmental impacts. The apex level (refuse, rethink, and redesign) is included to encourage society to rethink its consumption of products in terms of limiting overconsumption of natural resources. Landfilling is the final and least favourable management practice while recycling is one of the more favourable management

choices (Nyika *et al.*, 2020). However, any WMH system that is used must be maintained by the stakeholders to achieve or prevent different expected results (outcomes) showing the interconnectedness of the entire system.

Finally, the literature indicates that any deprivation in any part of the IMWS can lead to its undoing and that information and maintenance are key to its successful use (Adeleke *et al.*, 2021). Information in this instance includes the needs and wants of the stakeholders in the IWMS (Omotayo *et al.*, 2020). Therefore, each stakeholder's perspective has been discussed in this literature review.

2.4 The significance of waste management in the global context

The waste management hierarchy indicated landfilling as the least environmentally friendly waste management practice (Figure 2.3). However, it is one of the main waste management services utilized globally especially when other options are not possible due to the perceived ease of application and relative cheapness (Ferdous *et al.*, 2021). Maalouf and Agamuthu (2023), further highlight that many developing countries focus on waste removal through landfilling, as landfilling is seen as being better than waste being left in the streets where it can cause pollution and disease.

Internationally the landfilling rates for glass and plastics are “79% and 80.5%” respectively, (Ferdous *et al.*, 2021:1). However, these rates also include items that are not yet recyclable. For example, while 79% of mixed glass may be landfilled, this is made up of both recyclable glass such as all beverage glasses (cooldrink and beer bottles etc.) and windscreen glasses (which are not yet globally recycled) (Chenery and Feller, 2021). Moreover, globally, just over one-third of waste is landfilled (The World Bank (TWB), 2018). Of this, almost one-fourth is disposed through using landfills designed to contain the main pollutants and are self-contained to a reasonable extent (TWB, 2018b). Further trends highlighted by TWB (2018), indicates that least developed countries illegally dump or use uncontrolled dumpsites to a greater proportion than more developed countries and that the Middle East, Africa, and South Asia heavily rely on landfills as compared to other countries. Furthermore, greenhouse gas emissions and ocean pollution are some of the biggest concerns prompting sustainable waste management (Chertow, 2022).

Vaverková (2019) observes that while landfilling rates are still very high across the world, general waste management is greatly lacking in many low- and middle-income countries, which do not receive basic sanitation services such as landfilling. Furthermore, it was noted that wealthy countries look at a cradle-to-grave waste management system, where redesign and refusing are located at the top of the pyramid, while poorer countries do not (Simon, 2019). This trend follows the type of resources and technology accessible to different countries, where poorer countries can only afford basic waste management such as landfilling (TWB, 2018).

Additionally, the impacts of landfilling on the environment are of high concern. Therefore, the importance of understanding how people perceive recycling to encourage them to recycle is apparent. However, South Africa

is still performing better than other developing countries, in that most of the country receives some type of landfilling WMS (Schoeman and Rampedi, 2021) but this should ideally be recycling not landfilling.

2.4.1 The impacts of waste management on the environment

Research shows that South Africa predominantly either recycles or landfills its waste (DEA, 2019). In terms of recycling, the positive impacts include the conservation of virgin produce, prevention of littering and pollution, preservation of landfill space, improvement of job creation rates, reduction of poverty, addition to community comradeship, and inspiration to entrepreneurship (Sappi Global, 2022). Although most recycling involves water to rinse, transport, and reprocess materials, it is still seen to be less resource consumptive than landfilling (Sappi Global, 2022).

Topology is of major concern regarding landfill selection (Vaverková, 2019). Landfills that are positioned near rivers, usually have leachate that seeps into the environment (Vaverková, 2019). Furthermore, heavy winds also contribute to pollution of the environment, and gases transported with the wind cause odour pollution in nearby areas (Vaverková, 2019). The decay of waste products at landfills releases gases such as methane and nitrogen into the air but also contributes to the spread of disease, creating an unhealthy environment surrounding the landfill (Vaverková, 2019). A critical remark is that although gas emissions are seen to be a large issue with landfills, the government and even recycling companies do not collect and recycle food waste (DEA, 2019)

Landfills give rise to pollution such as noise, air quality, odour, dust, and traffic pollution (Vaverková, 2019). The effects of these can be seen in a well-known case study in the eThekweni Municipality, namely, the Bisasar Road landfill, the Municipality's largest landfill (Ahrens and Halbmayer, 2023). A 2016 study indicated that the landfill receives 3500 to 5000 tons of municipal solid waste daily (Sewcharan *et al.*, 2016). Studies conducted on this landfill found unacceptably high levels of methane gas emissions, which were greater than the acceptable amount by human health regulations (Sharife and Bond, 2012). While this particular landfill was chosen as a clean development mechanism initiative to convert methane gas into electricity, Sharife and Bond (2012), argue that this mitigation attempt cannot be deemed a suitable reason to continue landfilling. Sharife and Bond (2012) and Sewcharan *et al.* (2016) studies indicate significant human health impacts such as respiratory problems and cancer amongst communities residing in close proximity to the Bisasar Road landfill (Sewcharan *et al.*, 2016).

Furthermore, while landfills are designed with leachate-capturing systems when stormwater flooding occurs, heavy rainfall may be the cause of leachate contaminating groundwater as well as pollution of stormwater by accidental discharge from effluent catchment systems (Parvin and Tareq, 2021). The effects of odour, air, and water pollution are also major concerns of landfill sites (Dehghani *et al.*, 2021). These systems must be tended to and maintained which becomes a cost to the municipality. Furthermore, due to the mixing of heavily degraded material, material recovery from the landfill itself becomes costly as well.

Another issue with landfills involves their siting, which, internationally (and South Africa is no exception) are often fraught with concerns over environmental racism as they are in close proximity to low-income areas and particularly communities of colour (Yang, 2021). This has given rise to many cases of environmental injustice (Yang, 2021), such as the Bisasar Road Landfill case discussed above. Erickson's (2016) report on a community in Ann Arbor, in the United States also shows that from 1966 to 1995, numerous hazardous waste management and treatment centres were chosen to be sited in areas predominantly inhabited by minority and low-income communities. These residents suffered ill-health, which was attributed to these waste treatment centres (Erickson, 2016).

Therefore, it can be seen that landfills are a controversial debate as the social, and economic effects are numerous. They also have interconnected effects on the ambient environment in that they are aesthetically unattractive in neighbourhoods where they occur. The negative health and environmental impacts of landfills, and the societal reactions to it, have prompted government to look to alternatives to waste management that are environmentally friendly and economically sustainable, such as recycling as seen in the 2019 Revised and Updated National Waste Management Strategy (DEA, 2019).

2.4.2 Recycling and sustainability

One way to analyse how recycling is an important fulcrum to sustainable development is by assessing its applicability to WMS and the circular economy. Figure 2.2 shows the physical elements that make up an IWMS and CE while Table 2.1 relates these concepts specifically to the sustainable development goals, that is, the goals that have been developed to help world leaders prioritize activities that will save the earth's resources for the continued existence of society (Morais *et al.*, 2022).

Parallel to this is how people view and perceive recycling which will also be impacted by how they view a circular economy and sustainable development goals. For example, in Naicker's (2018) study, participants were questioned on whether they would recycle their waste to help give employment to others, which is an element in sustainability, recycling, and the CE. Therefore, with careful consideration of these elements and systems, the interconnectedness of recycling, sustainability, and a circular economy is apparent, so much so, that one improvement in part of the system would inevitably impact the other parts in the system.

For a greater understanding of the CE, sustainability, and recycling, a closer look of the linear economy warrants discussion. According to Neves and Marques (2022), the linear economy is an extract, create, utilize and dispose of system with no feedback elements incorporated into the model, such as recycling or sustainability, as no elements are salvaged and returned into the system. This implies that shareholders in the system lack the infrastructure and knowledge to incorporate recycling into the economy unless money is invested into it at the outset (Grafström and Aasma, 2021). This in turn makes recycled raw material a more expensive commodity than its virgin counterpart (Grafström and Aasma, 2021). It is for this reason that large enterprises in many

countries prefer the original process strategy of the linear economy which seemingly allows for quicker and easier profits (Grafström and Aasma, 2021).

However, this linear economy is no longer an option for society as it is heavily resource dependant and resource-depleting and cannot continue being fed from virgin sources indefinitely (Neves and Marques, 2022). This is why research and interest have been centred on CE sustainability and recycling in recent years. Research by the CSIR (2021), argues that South Africa is still very reliant on the linear economy model with large amounts of virgin material being extracted and sold internationally.

Table 2.1: Sustainable Development Goals (SDGs) and their applicability to recycling WMS.

Goal in SDG	Application to Recycling WMS and Circular Economy
1: No Poverty	Recycling creates a closed loop where any materials that are no longer needed are put back into the economy thus creating a circular economy and new products (Neves and Marques, 2022). This creates an entirely new industry, and work, where people need to interact with recyclable materials instead of it being left in a landfill. Neves and Marques (2022) state that recycling provides more labour and labour that is higher-level thinking, thus making it a wider platform to incorporate all types of employees, such as more females.
2: Zero Hunger	
8: Decent Work & Economic Growth	
9: Industry, Innovation & Infrastructure	
10: Reduced Inequality	
11: Sustainable Cities & Communities	Innovation is required to handle non-recyclable goods or to create more effective ways to recycle (Soonier, 2023). Innovation can be in the form of redesigning products/ processes or the design of new technology to handle these issues (Soonier, 2023). Furthermore, Figure 2.3 depicts how wide scale cooperation is needed to create a successful recycling system. Soonier (2023) also states the explicit need for these partnerships to achieve successful recycling, and emphasises the need for government, in the form of policy (law) development to execute it.
17: Partnerships to achieve the Goal	
3: Good Health & Well-being	Recycling would ensure that waste materials like plastics do not go into the environment where they cannot be broken down, and while it can break down into microplastics this is still extremely
6: Clean Water, and Sanitation	
14: Life Below Water	

15: Life on Land	harmful and becomes pollution to all living creatures (National Oceanic, and Atmospheric Administration (NOAA) (2022).
4: Quality Education	Oluwadipe <i>et al.</i> (2021) states that education in society is needed for people to understand the need to recycle.
12: Responsible Consumption & Production	A cradle-to-grave approach is encouraged, where producers are encouraged to design goods that are environmentally efficient and effective, and where products are designed with their disposal stage considered at design stage to ensure the loop is closed and the goods can be recycled (Hagelüken and Goldmann, 2022).
7: Affordable and Clean Energy	Since recycling brings back used materials into the production line, much natural virgin resources are saved from being extracted from the earth (Neves and Marques, 2022). For example, the use of secondary raw materials to create new goods, and the use of waste-to-energy technology to create energy (Campitelli et al., 2022).
13: Climate Action	

This reliance on a linear economy model further indicates the need for stakeholder engagement from the government, private companies, and households (CSIR, 2021). However, this can be changed through engagement, which can include the introduction of constructive discussions on how to move the country from a linear economy to a circular one through policy creation and widescale marketing on the importance of a circular economy.

Recycling has the potential to turn waste into opportunities that would save energy, and landfill space, alleviate the excavation of virgin materials, and in the process create jobs, and sustain livelihoods (Strydom, 2018a), therefore being a solution to the linear economy drawbacks. Recycling and sustainability are linked, and when implemented correctly, can have significant positive effects on society. These positive effects are presented in Table 2.1 which draws on CE, recycling, and SDG's elements.

Moreover, according to Parveen *et al.* (2020), while the rethink and redesign level of the WMH are critical to a circular economy, when it comes to the production line, innovation in recycling processing techniques also add greater value to the production chain, making it easier to recycle all the materials used. Their research highlights other innovations that could increase the number of goods recycled. Innovations mentioned include underground collection services, geographic information system administration of collection services, improved collection trucks, and automated sorting (Parveen *et al.*, 2020). Furthermore, one study suggested that as modern technology improves, society tends to accept and incorporate CE and sustainable principles in their lives (Grafström and Aasma, 2021). Figure 2.4 illustrates how sorting and collection are centrally important to

waste management and how, by integrating proper sustainable waste management practices (WMP), these resources can be put back into the economy.

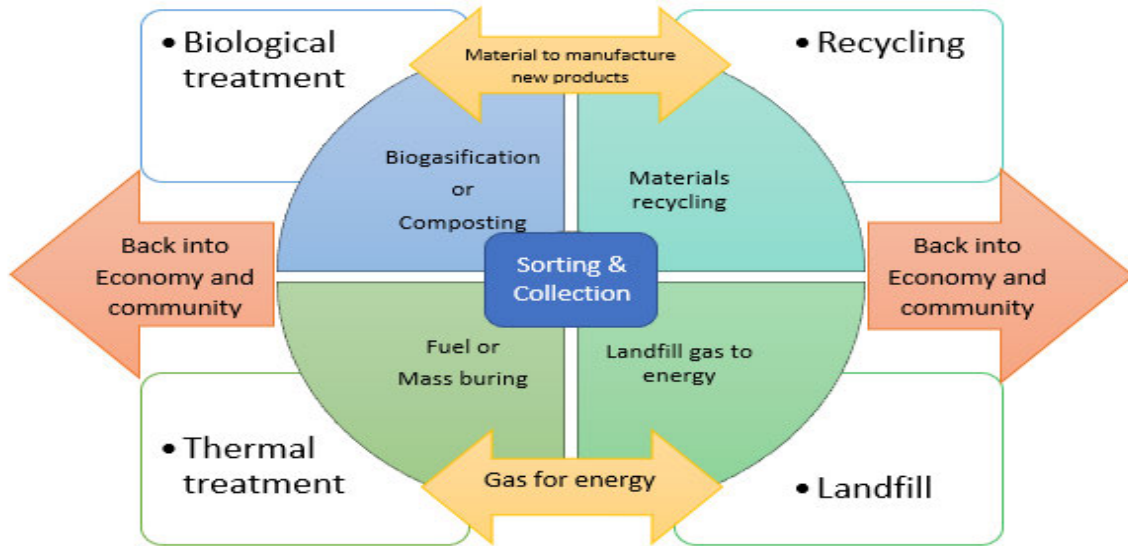


Figure 2.4: Recycling's place in an Integrated Waste Management system with Circular Economy principles, (adapted from Mercuri *et al.*, 2014)

The recurring themes in each section of Table 2.1 are that, firstly, recycling is a natural solution to removing wastes from the environment, and secondly, education of stakeholders and innovation in the recycling industry are required to move from a linear economy to a CE and sustainable society. In this regard, there are many studies being done on new technology and methods to make recycling a much easier process. Garcia and Robertson (2017), state that new techniques may include the chemical breakdown of plastics as well as the ability to melt and process different plastics into one. This is done to reduce the need for pre-sorting plastics and improve the profitability of the materials (Garcia and Robertson, 2017). Additionally, researchers are also on a search for new ways to recycle materials that are not currently recyclable such as windscreen glass and bed mattresses (Chenery and Feller, 2021).

Therefore, not only is there a future for recycling, but society is actively trying to find new and improved ways to recycle. If this comes to fruition then recycling may become easier, thus more people may willingly want to recycle which will have a domino effect on recycling rates, sustainability, and a higher reliance on secondary materials instead of virgin materials. With these innovations, developing a sustainable and circular economy may be more achievable.

2.5 Recycling trends across the world and in South Africa

Studies show that while there has been an increase in the uptake of recycling at source, many countries still fall short of their recycling targets. The studies of Chen *et al.* (2018); Meng *et al.* (2018) in China, for example, show an improvement in participation in recycling from eight cities in 2000 to 26 cities in 2015. However, the research also indicates that 60 million tons of valuable materials found in residential waste fell within the recyclables category, suggesting that only 25% of these wastes being recycled, which shows a great loss of secondary resources (Meng *et al.* 2018). This loss of secondary material has bred a new layer to recycling and society where the low growth of at-source separation has given rise to waste pickers in many countries, as with South Africa. This means that the waste pickers informally pick up recyclables from household curbsides, and then sell these goods to formal recycling companies such as Mpact (DEFF and DST, 2020).

From a European perspective, the lowest recycling rates are in Malta at 11% (Statista, 2022). Furthermore, the two highest recycling rates were Germany (67%) and Slovenia at 59.3%, respectively (Statista, 2022). Additionally, Poland and Latvia have moderate recycling rates of 38.7% and 39.9% correspondingly (Statista, 2022). In terms of other well-developed countries, North America has reported having a 32% recycling rate as of 2019 (US EPA, 2021). This is a large contrast to South American countries such as Latin America and the Caribbean which have very low recycling rates of 1% to 20%. These numbers are low but vague. However, about 145 000 tons of waste is landfilled daily in both Latin America and the Caribbean (Savino, 2019).

Another familiarity that can be found between South American countries and South Africa is the large number of uncontrolled dumpsites that are plaguing the country (Savino, 2019). Conversely, European countries (developed countries) have much higher recycling rates than South Africa and countries in South America (considered to be developing nations). However, it would be inaccurate to compare developing and developed countries to each other as it has been noted by numerous authors that developed countries have more access to infrastructure and education which are essential to WMS being implemented and run successfully (Parveen *et al.*, 2020). Therefore, this could be the reason that developed countries have higher recycling values than developing countries (Parveen *et al.*, 2020). While more research is needed to discuss in detail the various links between developing and developed countries and socio-economic factors such as educational awareness and desire to participate in recycling, this study is constrained to understanding a developing country like South Africa, and the socioeconomic factors that affect recycling behaviour.

Additionally, in a study based on household participation in recycling in African-based countries, the following results were found: 16% show at-source separation practices and the rest do not show any type of at-source separation practices (Roos *et al.*, 2021:1). These recycling rates are comparable to other research done in Africa on separation at source; 10% of respondents recycle in an Ethiopian study, 18% of respondents recycle in a Nigerian study, 32% of respondents recycle in a Tanzanian study, and 7.2% of respondents recycle in a South

African study of whom 2.6% are rural dwellers (Roos *et al.*, 2021:8). These figures further substantiate that developing countries, suffer from a lack of resources to implement WMS infrastructure and awareness.

According to the United Nations Environment Programme (UNEP, 2018), published data on Africa indicates that 125 million tons of domestic waste was produced in 2012, with a projected rise to 250 million tons by 2025. Furthermore, the data indicates government collection service of domestic waste at 55%, whereas 90% of waste is thrown in uncontrolled dumping grounds (UNEP, 2018). A mere 4% of waste is recycled on the continent (UNEP, 2018).

The literature reviewed suggests that globally, society is still far from being completely sustainable (ability for earth to sustain human activity) (Wilmoth, Menozzi *et al.*, 2023). However, recycling is seen to be the main form of waste management in developed countries as compared to developing countries, thus showing the need for improvement in recycling WMS in South Africa and other developing countries.

The South African NWMS currently includes the goals set by Agenda 2063; calling for half of the waste produced to be diverted from landfills by 2023 (Strydom, 2018a). This means that separation by residents at the household level is an important facet of waste management (Strydom, 2018a). Furthermore, this separation means that the quality of the recyclables (e.g.: wastepaper) will be higher, and the conditions that the waste pickers are exposed to will also improve (Strydom, 2018a). Separation at the source is a key pivot to the country developing a waste hierarchy and achieving zero-waste-to-landfill and sea (Roos *et al.*, 2021). Therefore, in terms of the literature presented thus far, South Africa's goals are on par with that of the world, but the achievability of these goals is contested.

2.6 The stakeholders: Government and private recycling companies

As demonstrated in Figure 2.3, the three main stakeholders involved in domestic recycling are the residents (discussed later), the government and private recycling companies (Ferrara and Missios, 2012). The literature review dissects these relationships a little further.

2.6.1 Government's role in recycling

The context of recycling in its various levels has been established through the WMH and its international placing. Therefore, South Africa will now be discussed, starting with the government, which is the primary decision maker of all functioning of the country, including recycling (le Grange, 2022). It has been shown that waste management, especially recycling, is the responsibility of the local government (le Grange, 2022; Haywood *et al.*, 2021). This was best demonstrated in 1989 when the Environmental Conservation Act was revised to include the planning of waste management at landfill sites (Godfrey and Oelofse, 2017), as a local government responsibility (le Grange, 2022).

The main aim of the 1989 Act was to mitigate the environmental effects of poor waste management planning at both controlled, and uncontrolled landfill sites (Godfrey and Oelofse, 2017), as illegal dumping poses significant environmental risks (Haywood *et al.*, 2021). The National Environmental Management: Waste Management Act (Act 59 of 2008), and its 2014 amendment, currently includes waste management practices like recycling in national and local government decision-making strategies (Godfrey and Oelofse, 2017).

Ernstson *et al.* (2021), argue that the South African Government has had to deal with waste management agendas, concurrent with social-economic development agendas, while balancing these needs with the financial burdens that come with creating new sustainable structures. Domestic recycling programmes has had the potential to bridge these different agendas. To this end, municipalities like eThekweni for example developed and launched a country-wide recycling programme with The Mondi Recycling Group (now Mpact), in preparation for the country hosting the 2010 FIFA World Cup which in turn promised much economic relief (Mander *et al.*, 2009). However, since then the programme has significantly decreased in scope over time (Naicker, 2018).

2.6.2 Impact of legislation on recycling participation in South Africa

The foundation for all environmental legislation is the South African Constitution (Act 108 of 1996) – Section 24 (Bosch, 2016), which states that all citizens of the country have a right to an environment which is not harmful to their health or well-being. Moreover, the government attempted to further the agenda of creating such an environment by drawing up the national norms, standards and legislation that called for landfills to have lower gate fees for the disposal of waste to landfill, which was intended to reduce the amount of illegal dumping (Godfrey and Oelofse, 2017). Furthermore, illegal dumps were and are unmonitored, which causes a lot of environmental concerns (Godfrey and Oelofse, 2017). Besides that, the government developed various fiscal policies, and instruments to enable changes, such as the low gate fees to utilize landfills (Nahman, 2021). These changes were used to inspire people to utilize the facilities rather than dump their waste (Kubanza and Simatele, 2019). Furthermore, the government aimed to license all landfill sites, which costs millions of rands, to ensure proper care was taken of the landfill (Nahman, 2021).

The National Environmental Management Act - NEMA, 1998 (Act No. 107 of 1998) states that not only do people have a right to an environment which is not harmful to their health or well-being but that this right must be enforced while the protection of the environment and conservation of natural resources is upheld (Envass.co.za, 2021). The NEMA introduced the waste management hierarchy in South Africa with a view to reduce waste being disposed of at landfill including recycling. This is where meaningful recycling began, with the adoption of the White Paper on Integrated Pollution and Waste Management in the early 2000s, which focused on the prevention of pollution and reducing the amount of waste produced (Makgae, 2011). Consequently, this has driven the corporate, and informal sectors to have a greater impact on shaping the recycling landscape of South Africa (Godfrey and Oelofse, 2017). Further, international instruments such as

the Polluter Pays Principle (PPP) has been enshrined in legislation and compels polluters to pay for the mitigation, monitoring, and remediation of the pollution they create (Nahman, 2021).

Parallel to this, the National Waste Management summit and the Polokwane Declaration committed to gearing South Africa toward a zero-waste-to-landfill society through recycling by 2020 (Godfrey and Oelofse, 2017). One of the key outcomes was a new focus on household waste generation, and the possibilities of recycling at the household level as opposed to just waste disposal at landfills. Although, well-intended, these aims were never reached, and are divisive topics in the waste management society (Stubbs, 2021).

Once this stage was set, the prohibition of single-use plastic and its plastic bags counterpart began (Bezerra, Walker *et al.*, 2021). It is also noted, that even in 2003, taxes on plastic bags were introduced to mitigate littering of the environment (Bezerra *et al.*, 2021). In response to the changing legislation, the local recycling market increased with companies such as PET (Polyethylene Terephthalate) Recycling Company, The Glass Recycling Company (TGRC) (Godfrey and Oelofse, 2017).

A final note on the NEMA Waste Act of 2008 is that it is a controlled framework that includes both waste that is not recyclable such as hazardous substances, and the recycling of reusable resources (Godfrey and Oelofse, 2017). It is aimed at mitigating the negative health, and environmental effects of improper waste disposal (Makgae, 2011). Moreover, the inundation of legislation has been hard to instil and has even become encumbrances to the progression of recycling in the country (Godfrey and Oelofse, 2017). Lastly, while South Africa has good laws in place, corruption, and lack of public support in national structures may be a reason recycling rates are low in the country where only 11% of wastes are being diverted from landfills (DEA, 2019:11), as compared to the projected goal of 50% of wastes being diverted from landfills by 2022 (DEA, 2019:33).

2.6.3 The roles of private companies in recycling

The changing legislation enabled the local recycling market to flourish even more, such as companies like PET Recycling Company & The Glass Recycling Company (TGRC) (to name a few) increasing their collection and presence within the South African market (Godfrey and Oelofse, 2017). For example, PETCO (Polyethylene Terephthalate Company) has become a steward of PET recycling and targets post-consumer PET plastics (PETCO, 2022). However, this company does not directly liaise with households, but rather through small businesses and local municipalities (PETCO, 2022).

Moreover, other companies such as collect-a-can deal with end-use aluminium and work with conglomerates such as Nampak and Mittal to recycle beverage cans. Furthermore, other metals such as scrap metals are recycled by companies such as Fine Metals, The Reclamation Group, to name a few (Metal Recycling Association of SA, 2023). Additionally, TGRC also does not deal with households directly, but rather helps small businesses set up glass banks which are drop-off sites for people to put glass in it (Marange, 2020).

The recycling of end-use paper and packaging occurs widely through the Mondi Recycling Group which in June 2011 demerged into both Mondi and Mpact (and are now used interchangeably in literature (Mondi Group, 2011). According to the Department of Environmental Affairs (2018), Durban's local government implemented a recycling programme called the Orange Bag Recycling project, which collects recyclables such as plastic, glass, paper and cans (DEA, 2018). Furthermore, the project provides around "345 000" of households with at-source recycling (DEA, 2018:44). However, according to the Mpact 2015 Sustainability Report, "350 000 households" are serviced as part of the Orange Bage Project and only paper-based recyclables are collected and delivered to Mpact (Mpact, 2015). Nevertheless, Naicker's (2018) study indicates that only the middle to upper income households received this service while lower income households did not, or if they did receive it, they do so sporadically. This means that only select wastes and select suburbs are serviced by the recycling WMS, which could be the reason for the low recycling rate in Durban.

In the gap of these low rates, an informal sector has arisen, which is known as waste pickers, who have now formed a meaningful and integral part of the recycling system (DEFF and DST, 2020). These interested and dynamic stakeholders consist of a large and engaging waste picking sector of South Africa's informal recycling market (DEFF and DST, 2020). They consist of nearly 90 000 informal one-person recyclers, or even as much as 215 000 waste pickers (Godfrey and Oelofse, 2017:6). The waste pickers provide the sorting and collection logistical structure the recycling businesses require to access the household market without instituting wide-scale and expensive collection and sorting infrastructure (DEFF and DST, 2020; Parveen *et al.*, 2020).

Approximately, 80% to 90% of the paper, and packaging weight can be attributed to this waste picker sector (Godfrey and Oelofse, 2017). This saves local governments millions in landfilling management, and other waste management needs, which arise from government service provision and further improves the social-economic level of the areas they work in (DEFF and DST, 2020). Due to the informal sector, the void between domestic recycling has somewhat been filled. However, this is not holistic as recycling rates are still low (Godfrey and Oelofse, 2017). A noticeable flaw to this sector is that although the government has tried to institutionalize the sector with more formal structures this has been ineffectual with no infrastructure, no transport, tools, or place for the sector to utilize and grow (Godfrey and Oelofse, 2017).

As suggested by the literature, while many of the large recycling companies in South Africa do recycle domestic waste, most of them rely on the government or waste pickers to deliver it to them. Alternatively, households are expected to bring their goods to local drop-off sites to recycle should they wish to (Lombard and Lombard, 2010).

2.6.4 The need for Extended Producer Responsibility (EPR) scheme

Recycling is not the apex waste management technique; minimization is further up (Figure 1.1). As such, although this study is centred around recycling the Extended Producer Responsibility (EPR) must be mentioned

for a holistic approach because the EPR centres around the manufacturers of the products and in essence require them to take back their used products for environmentally friendly disposal such as recycling (Nyakudya *et al.*, 2022).

Furthermore, the EPR directly links the concept of recycling to production, consumption, and household use (Parajuly *et al.*, 2020). The EPR has enabled greater publicity for recycling by conglomerates which in turn may allow more people to know about recycling in general, therefore creating a social norm (Parajuly *et al.*, 2020). An example of this can be seen in Makro's e-waste collection drive, on the 14 October 2023, members of the public could bring their e-waste to participating Makro's and could receive various vouchers for their e-waste, due to the sheer popularity the supposedly 2- weekend drive, become only one week (Labuschagne, 2023). However, companies such as Desco, have still availed themselves to receiving these items, without compensation to the owner (Labuschagne, 2023).

Additionally, as stated by Godfrey and Oelofse, (2017) private recycling companies started incorporating a cradle-to-grave strategy taking on the EPR scheme. Moreover, originally, EPR schemes were elective for companies to have. However, the NEM: WA (Act 56 of 2008) implored that EPR programmes should become mandatory. This new era of EPR was best illustrated by the Waste Tyre Plan of 2012 (Godfrey and Oelofse, 2017). However, this type of programme like others has had numerous encumberments to it such as the government implementing EPR taxes (that is, EPR fees are now charged as taxes) (Godfre and Oelofse, 2017). That is, waste producers and branding institutes must pay a fee for every tonne of product that is made. However, the exact values are situation-specific (OECD-Organisation for Economic Co-operation and Development, 2021). This was further proven in a study by Sebola *et al.* (2018), who stated that only 20% of tires were recycled in South Africa.

The show of strength of taxation has now been looked upon as money-making and unnecessary exploitation rather than a funding avenue for sustainable waste management. Sustainable waste management would create livelihoods for the unemployed and new ventures for businesses, which could develop from resource reclamation (Novotny, 2021; Godfrey and Oelofse, 2017).

Over and above this, in 2014, the government looked to create EPR programmes for paper, and packaging as well as e-waste (Novotny, 2021). This has come to fruition in 2020 through the NEM: WA (Act 59 of 2008) in the Extended Producer Responsibility Scheme for Paper, Packaging and Some Single Use Products - Department of Forestry, Fisheries and the Environment (2020). This has in turn led to private recycling companies not knowing where they stand in terms of future growth and funding in the recycling sector (Novotny, 2021; Godfrey and Oelofse, 2017). Even more surprising, the Government has stated that EPRs are aimed at increasing the funding budgets to promote various waste management strategies (Godfrey and Oelofse, 2017). Nevertheless, the EPR is seen to be South Africa's next phase, where the circular economy and reclaimed material are put back into the supply-demand chain (Godfrey and Oelofse, 2017).

2.7. Material classification of recyclables and recycling practices at the household level

Understanding recycling is a complex undertaking. It further has many different stakeholders such as the household residents and recycling companies. In terms of households, the United Nations Environmental Protection (UNEP) Agency has hailed Woolworths Recycling Labels as the one to soon become the norm in South Africa, this has further been recognised by other large organisations in the country (UNEP, 2020). The label has been assessed by the agency as being specific, detailed, and transparent of what the product is made of (UNEP, 2020). Furthermore, recycling categories that are not mentioned in the recycling number system include food organics, e-waste, and bricks (ISM Waste & Recycling, 2022).

Moreover, another less official but widely used nomenclature consist of six main categories and 57 subcategories (Recycling.com, 2022). These include plastics, paper, metals, organic material, glass, and composites (Recycling.com, 2022). The subcategories are denoted by the recycle triangle (mobus) symbol with a number at the centre that represents its name and the abbreviation below (Wilson-Harris, 2022). Additionally, the American Society for Testing and Materials created the International Resin Identification Code which codes plastics from 1 to 7 and stand for:

- 1 PET (Polyethylene Terephthalate)
- 2 HDPE (High-Density Polyethylene)
- 3 PVC (Polyvinyl Chloride)
- 4 LDPE (Low-Density Polyethylene)
- 5 PP (Polypropylene)
- 6 PS (Polystyrene)
- 7 All kinds of other plastics (ABS (Acrylonitrile Butadiene Styrene) and PA (Polyamide/ Nylon) to name a few.

However, a pertinent fact is that plastics numbered seven are not yet recyclable and usually contain harmful xenoestrogen which is an endocrine disruptor (Wilson-Harris, 2022). Therefore, while it may have a recycling symbol it is not readily accepted by recyclers as it is a category used for plastics without well-known recycling codes, which could be misleading to many people (Wilson-Harris, 2022). Moreover, composite materials have been hard to recycle, and only recently has any real innovation occurred. However, these have not yet become easily accessible and therefore most composite materials remain largely non-recycled, although it has a classification code (Krauklis *et al.*, 2021).

Over and above this complex nomenclature, there are also three well-established ways of recycling waste based on what each waste product/ recyclable is made of (Bluevision, 2022). Mechanical recycling relies on the physical breakdown of the recyclables. Furthermore, chemical recycling converts the atomic structure of the materials into another source of fuel or raw material (Smith, 2020b). However, this research focuses on

mechanical recycling. Energy recycling (recovery) is the process whereby wastes are converted into a type of energy such as fuel.

Recycling in this manner relies on categorising recyclable materials correctly (Parveen, *et al.*, 2020). These unofficial seven main categories and 57 subcategories have an even finer category of colour (Recycling.com, 2022). The first main category is plastics (discussed above). These are various type of plastics are found as drinking bottles, flowerpots, chips packets, phones, etc. (Energy Efficiency & Renewable Energy (EERE), 2021). The second category is batteries and are listed as numbers 8 to 14. They are characterised by all types of batteries (Recycling.com, 2022). The third category are paper based material from numbers 20 to 22. These are all paper, cardboards, and newspaper products (EERE, 2021). The fourth category are all types of metals and are labelled under numbers 40 and 41 (Recycling.com, 2022). The fifth category incorporates all organic material such as wood, cork, cotton, jute, and other textiles but not household kitchen wastes (Recycling.com, 2022). This category is labelled 50 to 69 and also includes clothing (Recycling.com, 2022). The sixth division is glass numbered 70 through to 79 and is associated with all types of glass materials (EERE, 2021). The final category is called composites. They contain all materials with a mixed composition and ranges from numbers 80 to 98. These include TetraPack, toothpaste bottles etc., (Recycling.com, 2022). The preceding classification was found through a desktop study of company data. However, Mohamad, Sattar and William (2007:459) and Chemeurope.com (2023) highlight the use of the International Universal Recycling Codes. This classification has 6 main categories in this classification, namely plastics, batteries, paper, metals, organic material and glass Chemeurope.com (2023). These 6 categories are further broken down into 42 subcategories Chemeurope.com (2023).

An important concept is that while the recycling triangle and number can be found on a material it does not mean it can be recycled, but it is rather there to help classify what the material is to the waste management companies, the production companies and other stakeholders.

2.7.1 Current recycling initiatives

As discussed in the Mpact 2015 Sustainability Report, “350 000 households” are serviced as part of the Orange Bag Project and only paper-based recyclables are collected and delivered to Mpact (Mpact, 2015:15). This service was intended to collect cardboard, paper and plastics that would immediately be recycled on a weekly basis (Marange, 2020). However, this has not come to fruition in any permanent and wide-scale manner (Naicker, 2018). Naicker’s (2018) research also attested to the fact that only high to medium income areas received the orange bags and that the medium income area received irregular collection of the bags. Additionally, recycling waste management companies include public-private partnerships with various companies, such as Collect-A-Can (cans), Mpact (paper and plastics) (Mpact, 2015) and The Glass Recycling Company (glass) (Marange, 2020). Yet, none of these companies deal with households directly (Lombard and Lombard, 2010). Many of these companies also create public collection sites (initiatives) such as glass and

paper recycling domes (Sustainable Seas Trust (SST), 2022). Residents are expected to search for these drop-off sites and deposit their recycling on a voluntary and free of charge basis (Lombard and Lombard, 2010).

Figure 2.5 depicts the locations of recycling sites that can be seen on an interactive map available at: <https://sst.org.za/maps/recycling-and-waste-locations> (Treevolution, 2022:33). An analysis of this map reveals that the only recycling initiatives that occur in the Durban region are glass and paper drop-off points indicated by the yellow, grey, and blue squares (SST, 2022). Moreover, there are a few reverse venders, recyclers, and municipal recycling drop-off zones in the area (SST, 2022). The recyclers are concentrated in industrial areas while the drop-off sites are all along the city including residential areas. It is apparent that metal, plastic, and e-waste drop-off zones are lacking. However, the RVM are machines that accept glass, plastics (1,2 and 5), TetraPak and beverage cans (SST, 2022). Additionally, the RVM are a new type of technology which allows individuals to take their selected recyclables to the machine to be recycled and then be compensated through reward vouchers (Alberts, 2022). A critical note is that while these initiatives are good strides for recycling, this analysis is based on a single source and each area has not been visited to assess the tangible impacts of these initiatives.

Furthermore, in 2009 the City of Johannesburg embarked on a separation at source programme with Pikitup (a city specific initiative) (Kadyamadare and Samson, 2023). In this programme, suburbs of the Waterval area were delineated and serviced at the household level, where their dry recyclables were collected from their curbs (Kadyamadare and Samson, 2023). Unfortunately, Pikitup had not achieved their targets of 30 000 tonnes (Kadyamadare and Samson, 2023:8) and only 20.808 tonnes (Kadyamadare and Samson, 2023:8) of dry recyclables from the whole city of Johannesburg was collected. It was found that while the initial desire was there, to recycle by the residents, the follow through action was not (Kadyamadare and Samson, 2023). Additionally, Pikitup do not deal with e-waste, organic material, or other more specialised material such as biohazardous waste (sanitation wear).

It is evident that while there are many recycling initiatives in place (as seen in Figure 2.5) all around the eThekweni Municipality that have created positive forward motion on recycling, albeit fairly recent, the statistics of landfilling in the country and province of KwaZulu-Natal are still overwhelmingly high. As already mentioned, the Bisasar Road landfill, which found in KwaZulu-Natal is infamously known as the country's largest landfill. Therefore, for a greater understanding of this disjuncture, an analysis of how people perceive these recycling initiatives was investigated in this study.

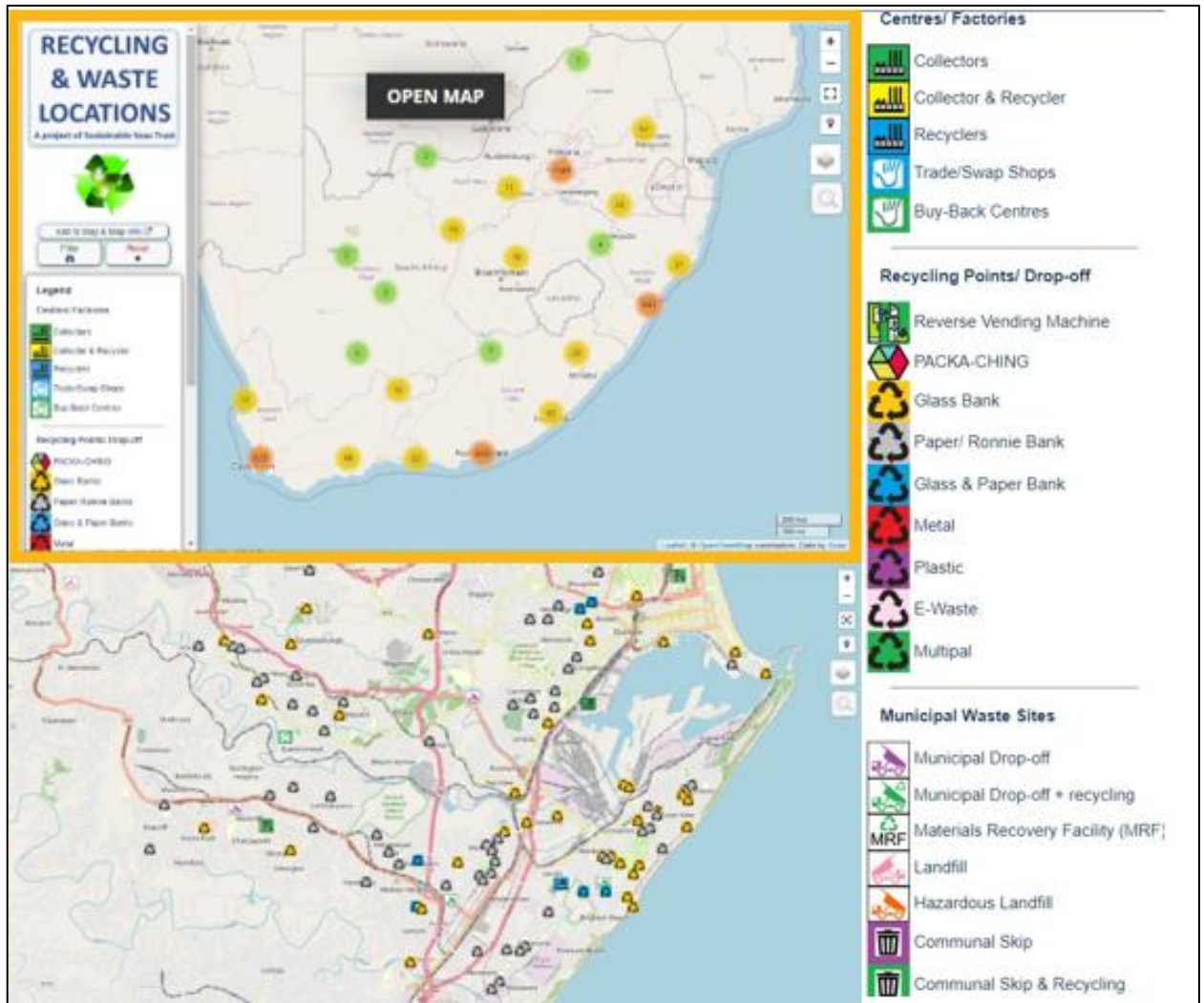


Figure 2.5: Interactive recycling map (SST, 2022: <https://sst.org.za/maps/recycling-and-waste-locations>)

2.8 Socio-demographic factors that affect household recycling behaviour

Recent research on recycling rates amongst middle-to-high income households in South Africa, indicates that smaller families (two to three members) partake to a greater extent in at-source separation than larger families, however, this study was done in a small rural community of Kwa-Zulu Natal (Roos *et al.*, 2021). A suggested reason for this could be a lack of the participants being able to encourage recycling among other members of their household (Roos *et al.*, 2021). Moreover, some households may lack communication among their members, indicating that each resident in the house should be treated as an individual rather than a collective (Roos *et al.*, 2021).

High-income households showed the highest proportion of recycling at source, followed by medium, and then low-income households (Roos *et al.*, 2021). Dlamini *et al.* (2017) attributes this to poor service delivery in

poorer communities. Additionally, low-income households frequently cannot afford to pay for waste management services (Schoeman and Rampedi, 2021). Consequently, recycling services are seldom provided to them (Schoeman and Rampedi, 2021). This could be an attributing factor for the low recycling rates in South Africa.

Further evidence of the influence of socio-economic status and service delivery can be seen in Naicker's (2018) research, which showed that high to medium income households received recycling services and were termed as easy to access. It was also found that the provision of the service also encouraged recycling as a norm within the community. Additionally, the study also found that a higher educated population (up to tertiary level), more economically active, and senior members of society, tend to partake in recycling more.

Conversely, studies also indicate a high level of recycling in the informal sector (Muringa, 2021; DEFF and DST, 2020), typically characterized by low-income populations, particularly in developing countries. Here recycling rates are attributed to providing livelihood and survival strategies for poor households. As this chapter has found, there are many factors that influence whether people partake in recycling, together with reasons for that particular choice. It further indicates how multiple sectors of society plays different roles in the recycling cycle, and how resources can move from the bins of high-income households to the daily living of the low-income households.

2.8.1 Perceptions of South African residents on recycling behaviour

Research shows that in 2019 only about 10% of South Africans were dedicated domestic recyclers (Kubanza and Simatele, 2019). This falls in line with the country's published statistics which state that while most municipalities started some type of recycling, many lack the resources to keep it functional (Statssa.gov.za, 2018). Strydom (2018a:1) and Pewa (2019), attribute the poor recycling rates to the lack of storage space and time. Pewa (2019) adds that a lack of waste management services from the government is a further barrier. These findings can be further dissected by the CSIR's (Council for Scientific and Industrial Research) countrywide study, which was analysed by Strydom (2018b) as follows: in 2015, 66.6% (Strydom, 2018b:2) of South Africans did not recycle which was an improvement from the 2010 study, where 74% of the population did not recycle (Strydom, 2018b:2). Therefore, as suggested in the papers, South Africans do not currently recycle to a large degree and feel a sense of discomfort in interacting with recycling due to the repeated lack of service delivery by the government.

2.8.2 The awareness, and knowledge of residents on recycling

The current paradigms are that with knowledge, people would recycle at-source and that both knowledge and action are mutually intertwined (Schoeman and Rampedi, 2021). However, recycling at-source depends on residents' decisions to do so and is much more layered than this simple paradigm as stated in the TPB (Strydom,

2018a). In terms of how many South Africans know about recycling waste management, and current at-source separation initiatives, a few case studies around South Africa can be highlighted. For example, 57% lacked knowledge on recycling (case study in Vryheid) (Roos *et al.*, 2021). Naicker (2018) (eThekweni), Dlamini *et al.* (2017) (Kwa-Zulu Natal), and Godfrey and Strydom (2016) (South Africa) have also stated that lack of knowledge was a key barrier to communities recycling.

Yet, research has shown that there was a weak correlation between knowledge and action as shown through Cramer's V- Value (Roos *et al.*, 2021). In this study, of the 43% of residents who were aware of at-source separation and recycling initiatives, 84% did not participate in recycling and 19% of those residents did participate in recycling (Roos *et al.*, 2021).

Additionally, Strydom (2018a) and Naicker (2018) found that the lack of understanding about recycling, and the inconvenience of the placement of recycling centres were further reasons for a lack of recycling. Strydom (2018) attributes these as the main reasons for the lack of household recycling. Parallel to this, bureaucracy has made it difficult for stakeholders outside of government to tackle the issues of recycling (Godfrey and Oelofse, 2017).

The link that is missing is whether these residents experienced external factors that discouraged them from recycling at curbside, even though they had the knowledge to do so. Furthermore, the type of changes to these external factors can help encourage others to recycle. The underlying question that arises is, why do residents not recycle, and what is being done to remediate these issues?

Dlamini *et al.*'s (2017), study on residents living in a township in eThekweni, found that the location of homes, socio-economic level, distance to recycling centres, and lack of recycling bins were major reasons that the residents of that area did not recycle. They further go on to state that these areas are logistically complex for service providers to access (Dlamini *et al.*, 2017). The study indicates that the lack of services is a huge constraint to recycling.

Besides the above, other research shows that urban eThekweni areas should be benefiting from the curbside collection of recyclables from 2010 to meet the country's goal of zero waste to landfill (as seen in the National Environmental Management: Waste Act (Act No. 59 of 2008) - Goal 3 (DEA, 2019:64). To achieve this the Mpact Recycling company was contracted by the municipality owned Durban Solid Waste Management (DSW) to create the orange bag curbside collection project which was to collect various cardboard, paper, and plastics weekly (Marange, 2020; Mpact, 2015:15). However, only the high and middle-income areas received this service, which resulted in a 1.5% of residents in those areas recycling (Naicker, 2018). This indicated that the selective provision of services may be the main reason recycling rates are still extremely low (Naicker, 2018). The literature also led to the same barriers as the others mentioned which are logistics, finances, education, attitudes, and service provision (Gokal, 2023; Morais *et al.*, 2022; Nahman, 2021).

Therefore, there is a unanimous understanding that even when people had knowledge of recycling, the municipality did not support them. Furthermore, this could have led to why many residents may not have known about the recycling initiatives. As a result, in one way or another, both knowledge and experience shape household residents' views on recycling.

2.8.3 Households' willingness and unwillingness to participate in recycling practices

When considering the future willingness of households to recycle, one would need to consider both the current choices participants have as well as perfect hypothetical scenarios where all the various stakeholders work synergistically. Roos *et al.* (2018) study shows that only 28% of the participants in the research showed an inclination to recycle their waste. This was seen to be lower for the researchers who compared their findings with similar studies of that time (Roos *et al.*, 2021). In Naicker's (2018) research, the communities showed a willingness to recycle due to their environmental conscience to protect the environment. They further stated that they would recycle plastic, paper, cardboard, batteries, light bulbs, and cans (Naicker, 2018).

However, in Meng *et al.* (2018: 539) research (based in a national study in China), the largest influence on why people were not willing to recycle was as follows: 56%-time cost, 45% perceived cost. While factors for why residents would recycle included: 35% perceived profit, 29% neighbour's influence, and the least was 8% environmental awareness, etc., (Meng *et al.*, 2018:539). Considering the above information, only a proportion of the participants were willing to recycle and would do it due to their environmental conscience.

Conversely, the unwillingness to recycle was mostly due to the perceived time and financial cost. Data from several studies (discussed below) have identified comparable results for why people do not recycle. Some of these reasons include inconvenience and a lack of knowledge. For example, Roos *et al.*'s (2021) study indicates that 75% of participants found recycling inconvenient while 15% attributed low recycling levels to a lack of knowledge on how to recycle (Roos *et al.*, 2021).

Furthermore, the limited provision of bins by municipal waste management services also restricted the degree of separation at-source, that residents could do (Gumbi, 2015). Moreover, the failure of the municipality to regularly collect waste, and the inaccessibility of recycling infrastructure helped in the creation of illegal dumpsites and a lack of implementation of current waste laws by the municipality (Gumbi, 2015). This indicates that although recycling WMS was being implemented, many residents could not utilize it, (Gumbi, 2015). Additionally, Naicker's (2018) findings came to similar conclusions that the sampled communities did not recycle due to a lack of knowledge on how, and where to recycle. The findings also indicated a lack of awareness of various recycling initiatives and buy-back centres. However, some knowledge was known about the various drop-off centres.

The following literature indicates that the main reasons for not recycling are that it is time and labour consumptive. A lack of education on how to recycle is a secondary factor (Roos *et al.*, 2021; Schoeman and

Rampedi, 2021; Strydom, 2018b). However, there are also many seemingly smaller reasons for whether households do or do not participate in recycling. For instance, it was found that when a community receives positive feedback that their recycling behaviour is improving or of their community recycling statistics are improving, it creates a positive feeling towards recycling which aid in individuals wanting to continue and improve their recycling rates (Knickmeyer, 2019). This view is supported by Roos *et al.* (2021) and Schoeman and Schmidt (2016) whose research found that of all the participants sampled, those that stated that they were currently recycling had also shown a great interest in joining future at-source recycling programmes. A proportion of participants (about 38%) showed disinterest in participating in recycling practices (Roos *et al.*, 2021:12). A further 22% stated that they would move from non-recycling practices to recycling their waste, due to the suitability and convenience that the municipal recycling programmes afforded them (Roos *et al.*, 2021:12).

Furthermore, several studies indicate that incentives (Kotze, 2020) such as discounts on amenities and lifestyle choices, and community financial rewards (Naicker, 2018), enhance and encourage recycling behaviour. Additionally, the participants agreed that they would be willing to recycle if recycling receptacles were located near their homes, and if rinsing and separating recyclables were not a prerequisite (Naicker, 2018).

2.9 Constraints and opportunities in current recycling strategies in South Africa

Barriers (such as limited-service provision of curbside recycling or sharing knowledge of why residents should recycle) have become failures, due to the lack of these barriers being mitigated. It is due to this lack of mitigation that South Africa has seen little effective progress over the years, regardless of the initiatives and knowledge available. One of the key constraints to recycling behaviour in South Africa, is that recycling is not mandatory (Daniel, 2020). Together with this, recycling services are not equally disseminated across South Africa, which is synonymous with the findings in other countries across the world regardless of economic strength (Strydom, 2018a). Some of the key reasons for non-participation in domestic recycling include the lack of storage area, lack of time, non-aesthetic appeal, and unhygienic conditions associated with recycling (Strydom, 2018a; Naicker, 2018). These reasons fall within the ambit of both individualistic and environmental constraints.

Even with poor service delivery, South Africa has remained in line with global recycling trends due to many waste pickers (DEFF and DST, 2020). This could mean that while South Africa can be seen as in line with global recycling trends, the global trend in itself is low, for example North America has a recycling rate of 32% in 2019 (US EPA, 2021), while South Africa's recycling rate is 34.5% in 2017 (DEA, 2018: iv) and Germany is at 67% ((Statista, 2022). This means that South Africa could have a greater impact on recycling if adequate service delivery were given.

Moreover, South Africa's legislative recognition for recycling, and its decade-long programmes, in some areas, have been proven to be a powerful lens which many countries and researchers utilize in understanding how

recycling can work within the country, at least on paper (Roos *et al.*, 2021). However, this statement is a contradiction to reality because although the recycling programme is in place in some areas, and is running, and the legislation supports it, the actual provision of these services to residents is sparse (Strydom, 2018a).

Over, and above the barriers posed directly to the households of South Africa, further barriers come from the relationship between WMS and the government. According to Naicker (2018), the residents were only able to recycle specific goods which meant that many materials that can be recycled such as glass were not recycled, which further adds to the number of materials that goes to landfills. The finding was further substantiated by Godfrey and Strydom (2016) who states that in 2015, the most recycled wastes were paper, and plastic once curbside recycling of these wastes became institutionalized. Furthermore, Gumbi *et al.*, (2015) found that the lack of proper implementation of recycling services influenced the recycling rates of the residents.

In Naicker's research, the sample communities were not aware of recycling drop-off points, buy-back centres etc., and were not extremely interested in receiving this information. However, a great deal of the residents did recycle their batteries and light bulbs by using the drop-off centres. This was a completely different issue than the issues highlighted by Gumbi (2015), and Dlamini (2017) who stated that although residents did know about drop-off centres these facilities were unkempt and inaccessible. This lack of provision of recycling services in the form of comprehensive curbside collection of all wastes, and the selectiveness of recycling WMS could be the reason for low rates of recycling in urban eThekweni areas.

In summary, it was found that the main opportunity in South Africa's recycling sphere is that it has a very well-crafted legislation that encourages positive environmental behaviour in theory. It further identified that while the country's recycling rates are low it is on par with the trends of the world. Secondly, the review of literature has pointed to many barriers including unequal service provision of recycling WMS, a lack of knowledge and a lack of funding from the government to name a few. Thus, the recycling waste management system has failed in as much as these barriers have kept recycling rates low in the country.

2.10 Conceptual Framework

This study uses the theory of planned behaviour to analyse pro-environmental behaviour. This theory is seen to be the most pertinent type of theoretical approach for understanding people's behaviours and perceptions (Schoeman and Rampedi, 2021). This approach is known as the Ajzen theory of planned behaviour (TPB) (Figure 2.6) (Ma *et al.*, 2021). For example, one such finding was that personal beliefs played a significant role in individuals' recycling at source and that community encouragement played a significant role in why people recycled (Meng *et al.*, 2018). It analyses how individuals' actions and daily activities are impacted by their attitudes, subjective norms, and perceived behavioural controls (Reid *et al.*, 2018).

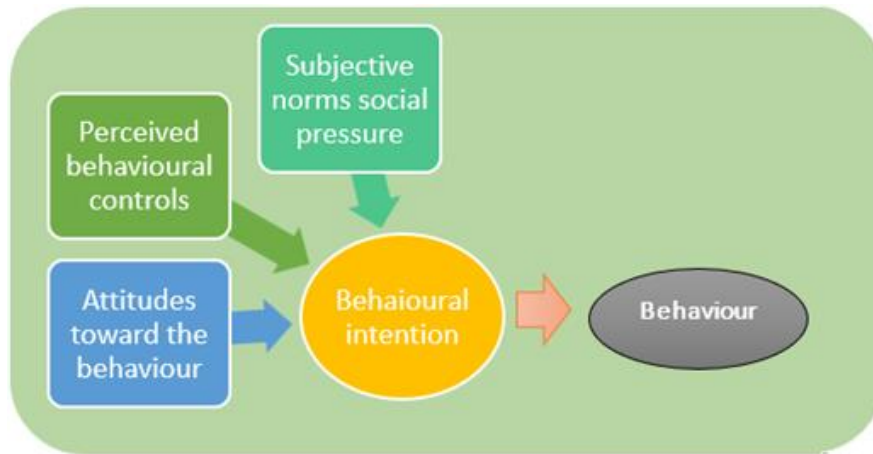


Figure 2.6: The Theory of planned behaviour (Schoeman and Rampedi, 2021)

A more detailed understanding shows that TPB has six categories, namely: attitudes, behavioural intention, subjective norms, social norms, perceived power and perceived behaviour control (LaMorte, 2019), as illustrated in Table 2.2. The TPB also focuses on the mental processes and individual behaviour that people exhibit toward environmental practices. This applies to the individual's emotional motivations towards environmental issues (Kotze, 2020). Furthermore, the Stern and Oskamp approach to analysing intricate environmental sociology states that both internal and external issues work synergistically to create the behaviour that the community exhibit (Meng *et al.*, 2018).

Additionally, the ABC (Attitude, Behaviour, Condition) theory by Guagnano assesses three main components namely, attitude, behaviour and condition (Ma *et al.*, 2023). Here, people's internal attitudes, and external conditions result in a behavioural pattern (Ma *et al.*, 2023) towards recycling. For example, people perceive that by recycling their waste they have a positive impact on the environment (Parajuly *et al.*, 2020). The person decides to recycle and receives constant support through curbside pickup. Thereafter, they tell their neighbours who applaud this behaviour and start the cycle again as they decide to recycle as well (Czajkowski *et al.*, 2015). This then leads to community recycling, and the landfill in turn receives less waste while the recycling companies receive more produce which feeds the economy.

Furthermore, Thakur and Onwubu (2023), add that factors that feed into attitudes, perceived behavioural control and subjective norms (Figure 2.6), are the independent factors of awareness and knowledge. Their research further describes, how knowledge on how, where, what, why and when to recycle can directly impact how the community feels about recycling (subjective and social norms), their perceived power and behavioural control, and their attitudes towards intending to recycle and then actually performing the behaviour (Thakur and Onwubu, 2023). Moreover, they also state that awareness can directly impact subjective and social norms which in turn affects their intentions to recycle (Thakur and Onwubu, 2023). It was found in their study that knowledge

and awareness directly impact the entire TPB construct. These links and examples were further elaborated on in Table 2.2 below.

Table 2.2: Theory of Planned Behaviour and its application to domestic recycling waste management (adapted from LaMorte, 2019 and Strydom, 2018a).

TPB Construct	Explanation	Example
Attitudes	How one feels about the behaviour which includes weighing these feelings against the expected outcome.	I think it is useful or not useful for me to recycle.
Behavioural intention	What motivates one to do the behaviour, where motivation and likelihood to perform the action are directly proportional?	I will be willing to recycle if curbside recycling was available to me.
Subjective norms	How one perceives and judges the social acceptance of the behaviour.	It is easy/ difficult for me to recycle.
Social norms	The actual social acceptability of the behaviour.	My community thinks it's important for us to recycle.
Perceived power	How much control one has over factors influencing the behaviour.	I am provided with what I need to recycle.
Perceived behavioural control	How one thinks they can control the behaviour, but this can be very dynamic and situational. This construct is usually responsible for why people have varied behaviours.	I know how to recycle and where to recycle.

Tucker (1998 cited in Meng, 2018) has taken the separate approaches and has tried to integrate each of the factors into one holistic approach. These are: the behaviour of reducing wastes, separation of recyclables, and the influence of recycling services. It was noted that it was possible to analyse each of these factors but that could be very comprehensive and would extend the scope of the study (Meng *et al.*, 2018). This could be why there is a dearth of information on these factors in any single study (Meng *et al.*, 2018).

2.10.1 Criticisms of TPB

There are still some drawbacks to the TPB approach. For example, only issues associated directly with recycling behaviour can be assessed, such as separation at source by residents and collection from curbside by recycling

companies, although, other aspects, such as government provision of efficient service, do exist as well (Meng *et al.*, 2018). As was seen throughout this chapter, people's behaviours are shaped by the society they live in. As an example, a lack of service delivery has led to despondency to recycling at source. Moreover, LaMorte (2019) had also echoed these sentiments by stating that historic events can influence how people may react to future events of a similar nature. They also stated that the TPB does not take financial and environmental influence into account. Moreover, it does not consider time, whereby the intention to perform the task may not occur concurrently with the actual task being done (LaMorte, 2019).

Furthermore, a person may decide upon a certain planned behaviour, that is, a certain course of action, but environmental conditions out of their control may prevent this thought from becoming action (Strydom, 2018a). For example, many residents may want to 'curbside' recycle, but the government may not be supporting this through relevant infrastructure (Strydom, 2018a). With this said, the theory of planned behaviour tells us that for a person to perform an action, they need to first think of it, and then decide to do it (Strydom, 2018a). Moreover, it is assumed that a positive attitude towards recycling will also carry the intention to recycle (Strydom, 2018a). Or it could be that due to social norms, they say that they have the intention to recycle (Strydom, 2018a), but may not necessarily want to do it or be able to do it. Consequently, it can be a perceived behaviour that the participants would want to recycle (Strydom, 2018a), when this may not be the physical action carried out. However, the final assessment of the data does show that an intention to recycle has a direct positive effect on both recycling behaviour, and the action of doing recycling (Strydom, 2018a).

2.10.2 Significance in this study

While the TPB is a concrete method of analysing how people would react in a situation, it can have a limiting factor in some applications. For example, questionnaires are used to assess how people feel and act regarding their waste management activities, and since the questionnaire is voluntary, people who are slightly more inclined towards practicing recycling would be more likely to answer the questionnaire. Given that convenience sampling methods were used, this limiting factor proved significant. Additionally, people who do not recycle due to personal factors, may have not responded to the questionnaire. For example, if residents feel apathetic towards the infrastructure (the recycling process is perceived as a failure by them), they may not see a point to answering a survey on recycling, which in itself, is useful information to have.

Furthermore, noting that people who did not answer the questionnaire as not being keen to recycle would be an unsubstantiated assumption. Therefore, the TPB has been used as a paradigm to inform the study that people's behaviour is largely depicted by what they think about a situation. However, it must be contextualised through external influences. That is, by analysing how the residents in Westcliff feel about recycling, one can gauge their receptiveness towards using current recycling initiatives and further brings meaning to their usage of WMS.

For example, in the case of Naicker's study (2018) participants in one location used traditional WMS as nothing else was available to them, and they had a negative view of recycling due to the unavailability of curbside recycling services. Additionally, the TPB has been used to structure and categorise the study's questionnaire development. To bring further understanding to the possible subjectivity that the TPB may bring, a second and more focused layer to the TPB, that is, pro environmental behaviour (PEB), was analysed.

Pro environmental behaviour is a phrase coined for all actions that humans take towards improving the environment or reducing their impact to the environment (Balundè *et al.*, 2019). This includes but is not limited to the use of public transport like trains, buying at local grocers as well as personal awareness of PEB such as what daily anthropogenic actions negatively impact the environment (Sottile *et al.*, 2020).

Moreover, attitudes are seen as dynamic and easily susceptible to change. While beliefs and identities are seen to be more entrenched with people's motivations and personalities, their beliefs and identities are still subject to change over time (Liu *et al.*, 2021). However, the change in beliefs and identities are more gradual, and is often a better indicator of how people behave (Gatersleben *et al.*, 2012).

Furthermore, from a PEB perspective, recycling is seen as being the correct way to dispose of wastes (Chierrito-Arruda *et al.*, 2018). The research of Chierrito-Arruda *et al.* (2018) also stated that understanding PEB in the context of the TPB will lead to better policy development and better participation in recycling initiatives, because examining these paradigms will help towards developing people's environmental beliefs, education and understanding (Chierrito-Arruda *et al.*, 2018). Research has further depicted that by propagating that PEB is the morally correct behaviour to do, such as recycling of electronic waste, people will in fact participate in this behaviour (Parajuly *et al.*, 2020). However, this lies in delicate balance with other factors such as ease of access to recycling infrastructure, which may outweigh the feelings of pride associated with caring for the environment as being the motivation to recycle (Parajuly *et al.*, 2020; Meng *et al.*, 2018). This was further substantiated by the previous section on current attitudes towards recycling, where many studies showed that while they would recycle due to it being a PEB, other factors like service delivery made this a good notion rather than an actionable belief.

Therefore, from this brief outlook on PEB, it can be seen that the TPB is key to understanding how and why people behave the way they do towards certain activities, while the PEB provides a focused lens on understanding the results of the TPB from a perspective that recycling is an activity that people should participate in, due to its perceived benefits to the environment. This further helped analyse the support or lack of support towards participating in research on PEB activities such as recycling.

2.11 Conclusion

Based on the evidence presented above, it is seen that barriers to improving the recycling culture of the residents include distrust in the service provision structure from a government perspective, a lack of knowledge and experience and a disjunction between service provision in different areas. It was also found that more people were willing to recycle than were not and that any unwillingness to recycle was due to the expected time and financial cost they would incur. In closing, it was found that while reasons to recycle may differ among communities, the reasons for not recycling were unanimous and the perceptions and behaviours of the household residents are linked to the waste management service rendered.

CHAPTER THREE: STUDY AREA AND RESEARCH METHODOLOGY

3.1 Introduction

This chapter provides a socio-economic contextualisation of Chatsworth as a township, followed by a further contextualisation of Westcliff, as a suburb (colloquially known as Unit 3). The history of Chatsworth has a significant influence on the theory of planned behaviour, and positive environmental behaviour, which is elaborated in the following chapters. This chapter explains the methodology used in the study, as well as provides a rationale for the research questions. The dissertation uses a mixed-method approach, utilizing household questionnaires (Appendix 1), KII interviews (Appendix 2) and a FGD (Appendix 3) to investigate how participants feel about recycling initiatives. Lastly, this chapter highlights the sampling method used, and the processes for data capturing. It further describes how the data was examined as well as the limitations posed by the methodology used.

3.2.1 Overview of Study Area

Westcliff is a suburb in Chatsworth that is located in the eThekweni Municipality which forms part of KwaZulu-Natal province (Figure 3.1). Westcliff was chosen because it contains some of the landmark areas of the township such as the Chatsworth Youth Centre, Harikrishna Centre and Chatsworth Mall, making it easy to access participants, while still being designated as a township. Furthermore, due to the researchers access to the community liaison and familiarity to the area, Westcliff was chosen.

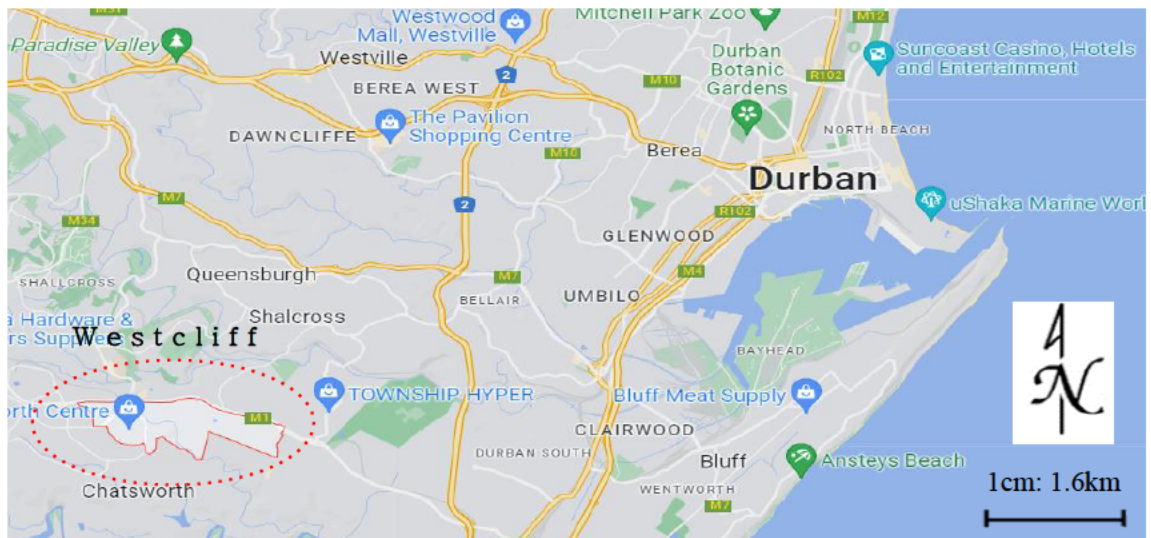


Figure 3.1: KwaZulu-Natal, delineating Westcliff (Unit 3), Chatsworth, South Africa (Google Maps, 2022; Dawnarain, 2004:96-98)



Figure 3.2: Westcliff (Unit 3), Chatsworth, KwaZulu Natal, South Africa (adapted from Google Maps, 2022; Dawnarain, 2004:98).

Figure 3.2 was created not only to define the parameters of the study (which were considered as Westcliff households). It also shows all the businesses, schools and other public areas found within the community. This map proved a valuable asset in the Results section as it helped to order and gather all the different collected data into one easy view which helped understand the impact of location of various WM initiatives. Furthermore, each layer of the socio-economic and environmental characteristics was used to structure all research instruments and helped contextualised the data.

3.2.2 Socio-economic characteristics

According to Sewpaul and Pillay (2011), the Group Areas Act of 1951, designated Chatsworth as the only place where Indians were allowed to live. When this occurred, many of the so-called middle-to-lower income class Indians migrated into Chatsworth (Desai and Vahed, 2012). Most of the original houses in Chatsworth are of low standard, characterized as semi-detached with two different families living in each unit (Desai and Vahed, 2012). They are double-story and have about two or three bedrooms and one bathroom upstairs, followed by a lounge, dining room, kitchen, and water closet downstairs (Desai and Vahed, 2012). The original houses were small by design (Desai and Vahed, 2012). This is important as recycling has been known to be space consumptive (Dlamini *et al.*, 2017). Moreover, families are sometimes forced to live in close proximity to each other. Lower income families still have this original housing structure, while those with higher incomes have extended their houses physically. Big families are the norm due to the lack of job opportunities, therefore members of the extended families cannot live on their own (Desai and Vahed, 2012). Understanding the participants living conditions helped to understand the reasons for/ or not to recycle.

Unit 3 of the 11 units that exist in Chatsworth is also known as Westcliff. It constitutes 11% of the total population of Chatsworth with 16793 residents (Frith, 2011). Moreover, 62.1% are middle-income, earning between R 9 600.00 to R 53 000.00, 14% have no income, and 13% are affluent earning above R 614 001.00 (Statssa.gov.za, 2011). There is no data for the income group earning between R53 000.00 and R614 001.00 (Statssa.gov.za, 2011).

3.2.3 Environmental conditions

Environmental conditions, while not central to waste management (recycling), are important (Dlamini *et al.*, 2017). Firstly, recycling left in the open are subjected to weathering which will deteriorate the structure of the recyclables (Demlie, 2017). Furthermore, waste management services are usually unavailable during bad weather until conditions are clear or moderate (Dlamini *et al.*, 2017).

The province is classified as having a subtropical and temperate climate (Britannica, 2020). The temperature is directly proportional to altitude, where higher elevations are cooler on average (EDTEA, 2017). For KwaZulu-Natal, the warm moist air of the Indian Ocean brings in a warm wind, and rains are during the summer months which fall between October and April (Jury, 2022). The environmental conditions of Westcliff help understand possible issues surrounding the reliability of WMS that service the communities of eThekweni.

3.2.4 Waste Management Strategies

In theory, the eThekweni Municipality provides communities with recycling bags (orange and clear) for collecting glass, paper, cardboard, plastic, and cans (Lombard and Lombard, 2010). Additionally, according to Marange (2020), residents of eThekweni are given orange, clear, blue and black bags. These bags are collected

by the Durban Solid Waste municipal service, which also works with smaller community-based recycling companies to sort and recycle the various types of recyclables (Bosch, 2016). Thereafter, the black bin bags are sent to the landfill and the blue bags are sent to the garden refuse landfill (Bosch, 2016). However, these recycling initiatives have proven to only be institutionalised in certain areas (Naicker, 2018). Furthermore, while Durban's Bisasar Road Landfill (which has been closed since 2016) holds records for being South Africa's largest landfill, and while it does do some waste-to-gas generation, it does not negate the negative impacts of landfilling on the environment nor lessen the burden of the amount of waste that is produced by the residents (Sewcharan *et al.*, 2016). This information on the running and closing of the Bisasar Road Landfill helped develop an understanding of the role of recycling companies (KII in this research) as an important stakeholder and the impact they have on WMS. It can be seen from the literature that recycling companies and the local municipality who control landfilling, hold an important part in WMS of the eThekweni area.

Chatsworth's waste transfer station, according to the eThekweni Municipality's Integrated Waste Management Plan of 2021, is located in the residential area of Westcliff (Bosch, 2016). A transfer station (on Sagittarius Road) is used to temporarily hold the waste before it can go to the final landfill site (Mariannhill Landfill) (Adeleke, 2021). The transfer station handles furniture, and garden waste. Additionally, the site is 1,500 m² and had 11 waste-skips in total (Bosch, 2016). The recycling activities include the collection of used oil and private collection programmes that include plastics, cans, glass, and tires (Bosch, 2016). It was noted by Bosch (2016) that the ablution facilities require maintenance, that the sewer line had a leak and that there was some litter found around the facility (Bosch, 2016).

From the above, two highlights should be noted: 1. There is no mention of a comprehensive recycling system, as paper and cardboard are not listed as being collected, which is a major category for recycling. 2. While the site is for waste removal, it is unkept, there is a guard stationed at the site full-time (Bosch, 2016), indicating the responsibility taken by the municipality with regards to WMS. According to STATSSA (2011:1), Chatsworth has a "94.9%" rating for the reliability of refuse removal. However, this does not specify landfilling, recycling, or both.

3.2.5 Infrastructure, and service levels

Chatsworth is set away from the city centre of Durban (Desai and Vahed, 2012). It is spread out on either part of the Higginson Highway (Figure 3.2 the orange line), which is a main arterial route into the city's economic hub (Allopi, 2003). Within Chatsworth, there are many libraries, schools, cemeteries, parks, entertainment spaces, shops, eateries, and a large mall (Desai and Vahed, 2012). These amenities can be found in every unit of Chatsworth (Desai and Vahed, 2012). The nearest university institution is the University of KwaZulu-Natal. However, other smaller tertiary institutions have been developed since then (Desai and Vahed, 2012). About 82% of Chatsworth is connected to the municipal sewerage line, 79% receive running water, and 91% have electricity for household use (STATSSA, 2011).

3.3 Research paradigm

Academic research has a well-defined structure, where a researcher must have a methodical, traceable approach to defining a problem and then understanding that problem (Mzimela, 2017). It is for this reason, that as a researcher, the work presented must encompass a well-defined methodology. A research paradigm dissects the thinking behind the research into its origination, scope, validity, and methodology (Proofed, 2022).

The research topic is defined as follows: “An investigation of community receptiveness to current recycling initiatives: The case of the Westcliff (Chatsworth) District in the eThekweni Municipality” which was further elaborated on, in terms of analysing Westcliff’s residential community’s receptiveness to current recycling initiatives in the area through examining the views, opinions, and behaviours of Westcliff community members on current recycling initiatives. The study also enables an analysis on the role other key stakeholders (government, and private recycling companies) have in influencing and supporting these views, and behaviours.

The context behind the research question is that recycling initiatives are services created for people to use; hence their user-friendly nature will completely determine if that service is of any benefit to the community. The converse to this statement is that, if it is found not to be of benefit, this translates into environmental deterioration, or landfilling, as people are not receptive to recycling. Therefore, only finding out if the community is receptive to recycling is not enough, as they do not live in silos, thus their thoughts and behaviours are influenced by the outside world.

It is for this reason that the conceptual framework, the Theory of Planned Behaviour, is useful as it states that under a certain set of events, people will hold views on performing a task (in this case recycling), and these views, based on external factors may create a positive or negative action being done. These factors are created through the infrastructure and service provision of the area, where their beliefs may be pro-environmental and if it is, could result in them performing the task. However, the recycling companies, wholesale, retailers, government, and waste pickers do have direct responsibility in shaping these beliefs and behaviour. Therefore, the research has a 3-prong approach to accurately address each of these factors. This is in relation to understanding the community’s receptiveness to recycling by way of the research methodology that will investigate each of these factors and was elaborated on further below.

Consequently, this research follows a pragmatic paradigm as the status quo of recycling is dynamic and forever evolving with technology, understanding, and the development of infrastructure (Hagelüken and Goldmann, 202). This means the research has a mix of positivism (what the relationships between the factors are) and constructivism (why multiple factors are occurring) (Feilzer, 2009). Therefore, due to the above-defined parameters, a mixed-method approach is used, that is, quantitative research methods for the positivism paradigm and qualitative research approach for the constructivism paradigm.

3.4 Research Approach

The process of research methodology is a process of data gathering, guided by the study aim, objectives and literature review (University of South California, 2023). The methodology further includes discussing the type of methodology used and the reasons for its use and what research approach was followed (University of South California, 2023). This study adopted a case study approach, utilizing a mixed methods approach (Table 3.1) viz., a case study and a descriptive study which used Questionnaires (Appendix 1), a FGD (Appendix 2), Participant Rural Appraisal (PRA) (Appendix 2) and KII interviews (Appendix 3).

3.4.1 Mixed methodology

Mixed-method research utilizes both quantitative and qualitative data (Taherdoost, 2022). This provided the researcher the ability to do a complex analysis (Table 3.1) of the data received as opposed to using only numerical or descriptive data (Taherdoost, 2022). This further enabled the research to provide meaningful information that defines the community and quantifies its behaviours. Moreover, descriptive research by nature finds the occurrence of a specific issue and helps identify avenues to address these problems (CCEERC, 2021). Furthermore, a case study integrates multi-sourced, written data (Schoeman and Rampedi, 2021) that is in-depth and are thus location/ issue specific (Taherdoost, 2022).

Table 3.1: Framework used to structure data collection for each research question

Research Questions	1. To examine the views, opinions, and behaviours of Westcliff community members on current recycling initiatives. 2. To analyse the roles other key stakeholders (government, and private recycling companies) play in influencing and supporting these views, and behaviours. 3. To understand the factors affecting the community's recycling behaviour.	
Conceptual Framework	Theory of planned behaviour	
Research Paradigm	Pragmatic approach	
Research Methodology	Mixed methods	
Research Design	Case study	Descriptive

Tools for data collection	KII (2)	Survey (84)
	FGD (10)	
	Survey – open-ended (84)	
Type of data	Qualitative	Quantitative
Key aspects answered through each design method	Views, opinions	Behaviours
	Factors affecting the community's recycling behaviour	Roles of other key stakeholders

The approach utilized to extract the data from the participants was a survey study (Table 3.1), where samples of the community were studied as an indication of the typical behaviour of each community member. However, due to the immense size of Chatsworth, the local district named Westcliff was selected where a sample was utilised from this population. For the qualitative portion of the research, a FGD comprising of 10 randomly selected participants and two KII were used. This mixed methodology allowed for triangulation of the data and findings, offsetting the weakness and strengths of any single research method could offer.

3.4.2 Participants: Residents and Key Informants

The inclusion criteria of participants were that they were residents of Westcliff and over the age of 18 years. Household heads or representatives were targeted. It is assumed that in these cases, the representative could provide comprehensive information on the entire household's WM behaviour.

For the household interviews design, the consensus amongst waste management research, is that a confidence level of 95% is used (Roos *et al.*, 2021). Also, as specified by Roos *et al.* (2021), the margin of error used should be 5% to ensure accuracy. Furthermore, according to SurveyMonkey Inc (2021); QualtricsXM (2020), the standard deviation used should be 5 which is 0.5 in the equation. Lastly, a formula was designed that used the pre-set confidence level of 95% and standard deviation of 0.5 to determine random sampling. The sample size was calculated through using $n = N \div [1 + N(e)^2]$ (Singh and Masuku, 2014).

Sample Size Equation

Therefore, the sample size can be calculated as follows:

$$n = N \div [1 + N (e)^2], \text{ where } [N = 16\,793 \text{ and } e = 5\% = 0.05]$$

$$n = 16\,793 \div [1 + 16\,793 \times (0.05)^2]$$

$$n = 390 \text{ (ideal sample population).}$$

While n = 290 in ideal testing conditions, the actual sample collected was n = 84 participants.

Where the confidence interval = 85% - 5% = 80% (lower limit) and 85% + 5% = 90% (higher limit).

The study also comprised of a FGD, which was done with 10 randomly selected respondents from the group above, to gain a deeper insight on their behaviours and opinions. These participants were chosen by means of the demographic information collected from the survey questionnaires using two key criteria questions 1: those who answered yes to being a part of a focused group, 2: based on location, that is, individuals from different streets were preferred to give diverse responses since recycling waste management services are largely impacted by location (Thomas, 2018; Dlamini *et al.*, 2017). Where multiple participants indicate willingness to join the focused group, a random number generator was used to choose participants within each stratum.

Furthermore, KII interviews were conducted with two recycling companies viz., WastePlan and Mpact (Naicker, 2018). This was done to gain a further in-depth understanding of the recycling behaviours of the Chatsworth community.

3.4.3 Development of research instruments and questionnaire

The research instruments chosen were survey questionnaires (Appendix 1) and a FGD schedule (Appendix 2) aimed at the residents as well as key informant interviews (KII) (Appendix 3) aimed at recycling companies.

A questionnaire was designed with three sections that were focused on investigating each of the established factors that influence recycling such as demographic data, economic data, education, views, opinions, and waste management in the area. It was used to evaluate the behaviour of the sample groups (Godfrey and Strydom, 2016) i.e., a list of questions that have numerical answers (quantitative) and questions with non-numeric descriptive answers (qualitative) (Taherdoost, 2022). These questionnaires consisted of binary questions with answers yes and no and Likert Scale (scaled) questions which produced quantitative data, as well as open-ended questions which produced qualitative data (Dlamini *et al.*, 2017).

Section A: Demographic data such as household size, gender, and age.

Section B: Part 1: Waste management and practices. Linkert scale questions and binary questions were used.

Section B: Part 2: Scenario-based questions. This would provide information on the recycling behaviour of the community and their recycling support structures.

Validity check-point questions were also used. Two questions were placed in two different places in the questionnaire and were in deliberate contradiction to the preceding section of questions. From this, an inter-rater reliability agreement (IRRA) approach was used to determine which responses may have been done without comprehension of what was being asked or which were inconsistent responses (Dudovskiy, 2018). For example: Why do you recycle: “I want to save landfill airspace” (with binary answers), “To encourage my family” etc. with the final statement of: “I do not recycle my waste”. Two participants were taken out due to a contravention in the IRRA (resulting in a sample of n=84).

Furthermore, the questionnaires were developed to collect data on the recycling behaviour of the community within the context of the TPB and PEB through a self-evaluation by each participant. It also endeavoured to use this analysis to find avenues of improvement in recycling at the household level and in doing so, reduce the amount of waste that goes to landfills, thus improving recycling rates.

Furthermore, the FGD Schedule was created using the Survey Questionnaire, however, a Participatory Rural Appraisal (PRA) section was added. PRA is the term used to describe the collective methods used to engage rural communities to enable them to impart their perceptions of their living conditions and experiences with a researcher (Damale *et al.*, 2022). It further enables the researcher to pose objective-specific questions to the chosen group in order to get valuable information on the topic at hand (Sikwebu *et al.*, 2021). Furthermore, the PRA can contain a variety of activities such as ranking exercises, social landscape/ participatory mapping, time series change analysis to name a few (Damale *et al.*, 2022). Lastly, Chandra (2010:7) expressed PRA's as allowing the participants to feel empowered, candid in expression of thoughts, interactive, hands-on, rapport-building, and exciting. Therefore, since Chatsworth is considered a township setting, it was found that a PRA would be beneficial to the study objectives, in terms of creating depth, understanding and to encapsulate a tactile experience of recyclables. It was for this reason that three PRA exercises were developed (Appendix 2).

The exercises were as follows:

1. Ranking Exercise (participants rank their familiarity with the categories, likelihood to recycle that category and understanding on what each recycling category was).
2. A participatory mapping exercise of various recycling initiatives in Westcliff or other relevant WM information.
3. Timeline exercise on participants understanding of the evolution of WM in the Westcliff area.

Lastly, the KII was developed from the Survey Questionnaire, however, from a servicing of the household perspective (Appendix 3). Two KII were conducted, one with Mpact and another with WastePlan, both who are large scale recycling companies operating within the borders of South Africa. The researcher had conducted these interviews separately and one-on-one, to allow for open and confidential discussion. Both companies operate recycling yards and own numerous recycling trucks and are considered large companies with thousands of employees and have international reach.

3.5 Data collection and analysis

The data collected through sampling were cross-referenced with any secondary data that was available online or in print. This secondary data is information that is not directly collected but can be easily gathered from available sources such as newspapers and government press articles (Smith, 2020a).

3.5.1 Administering the questionnaires

Convenience sampling, a form of non-probability sampling, was used to select respondents for the household survey. Convenience sampling is an appropriate way to gather data for research dealing with attitudes, behaviour, and practices (initiatives) as evidenced by Smith's (2020a) research, who did research on recycling behaviours of domestic households. The researcher actively sought willing participants, until the sample size was reached (Nikolopoulou, 2022).

Lastly while 390 participants were an ideal number for the sampling (according to the sample size equation), only 84 participants were willing to partake in the survey. However, due to many streets being visited in Westcliff, there was a richness in data in terms of different locations in the Westcliff area being represented. All participants were kept anonymous to help encourage engagement with the questionnaire and FGD. The survey questionnaires were completed from November 2022 to March 2023.

3.5.2 Data analysis

The primary data collected from the surveys was captured and analysed using the Microsoft Excel computer programme. Descriptive statistics were utilised to analyse the data collected by the quantitative study. These statistics includes measures of central tendency (mean) and dispersion (standard deviation) as well as frequency distributions (Smith, 2020a). The data were displayed on graphs.

The qualitative data was assessed using content analysis and interpretative phenomenological analysis (IPA), the IPA intrinsically assesses households' personal and lived experiences (Warren *et al.*, 2022). The FGD and open-ended survey utilised content analysis approach while the KII were evaluated through the IPA analysis. Thereafter, secondary data was reviewed and assessed through the narrative qualitative method (Warren *et al.*, 2022).

3.5.3 Data validity

Validity means that the data should be representative of the population (Patino and Ferreira, 2018), be accurate and reliable; and replicable (Middleton, 2022). Smith (2020a) warns, that due to recycling behaviour and services being so site-specific, these validity issues must be assessed with the care of the situation for the specific area being dealt with. This study's analysis utilized both quantitative and qualitative data from multiple sources, thereby ensuring any bias was cross-referenced throughout to ensure the integrity of the results.

3.6 Conclusion

The area of Westcliff was utilised as the case study, with 84 participants for the household survey. Additionally, a FGD comprising of 10 participants, and 2 KII were undertaken. A mixed methodology was used comprising of both qualitative and quantitative data. Lastly, the quantitative data was analysed through graphs and tables, while the qualitative data was analysed through the IPA and content analysis methods.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents an analysis and discussion of the research findings, adopting the TPB lens (conceptual framework). The chapter is categorised into three main themes of: recycling culture, recycling views on recycling initiatives and recycling behaviours by the participants. Key elements to the discussion included knowledge and reliability. The data was expressed in graphs, tables, figures, and direct quotes from respondents. Some questions were not compulsory, hence the n-vale of lower than 84 which was the total sample size (indicated by n-vales on graphs).

4.2 Analysis of demographic profile of participants and their recycling culture

Figure 4.1 represents the age of the participants. As this question was not compulsory, it yielded a response from only 78 participants. The majority of the participants are aged between 41-60 years old (39%), followed closely by the 20-40 age group (37%). Approximately 76% of the sample (ages 20-60) is adult and considered in the economically active age group. The remaining 24%, fall into the ages of between 61-80, or older adults, who are generally retired people. According to the Cornell Law School (2020), the age of 18 years is the age when a person can be responsible for their behaviours. Furthermore, Neves and Marques (2022) state that recycling trends tend to also correlate with age group demographics.

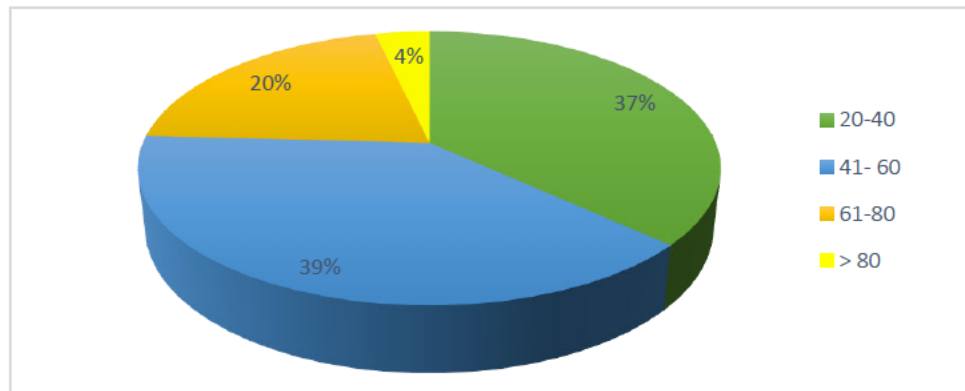


Figure 4.1: Age of interviewee (n=78)

Studies report that age is strongly correlated to pro environmental behaviours, where the youth have more interest in environmental protection than older adults (de Kock, 2020). It was further seen that while the elderly may have more time to recycle, the knowledge and ability to recycle may be lacking (Gokal, 2023; de Kock, 2020). Another study qualifies this finding by stating that the youth and middle-aged adults were more inclined to exhibit pro environmental behaviour than older adults (Gokal, 2023). A study by Viljoen *et al.* (2021), further shows that a willingness to recycle does correlate with age, however, Gokal's (2023) research indicates that age

in connection with other factors such as social media usage must be analyzed to determine the full nature of these interactions.

4.3 Timeline of WM strategies in Chatsworth

During the FGD, the participants were asked to collectively partake in the creation of a timeline of WM strategies in Chatsworth. They were asked to mention all information they could personally recall on anything to do with or that they thought would be relevant to the WM discussion. According to the respondents, the suburb of Chatsworth was formed in 1964, and the timeline of WMS in Chatsworth (Figure 4.2) covered the period 1950s to present day (2023). From Figure 4.2, the following was found: in the 1960s to 1980s the reuse of recyclables was popular. In the 1970s glass bottle recycling became popular. In 1994 the country became a democracy and marked the start of Durban Solid Waste Management (DSW). From the 1990s to the 2000s there was a noted influx of packaging materials and in 2010 South Africa transitioned towards a zero waste to landfill strategy. In 2010 South Africa hosted the FIFA World Cup (Fédération Internationale De Football Association), this brought an influx of money and tourism into the country and was seen as the reason as to why the country institutionalized many curbside recycling systems (Figure 4.13). From 2011 to 2021, the participants experienced poor service delivery in WM. Lastly, from 2021 to 2023, there is minimal recycling and the use of orange, clear and black bin bags for curbside collection.

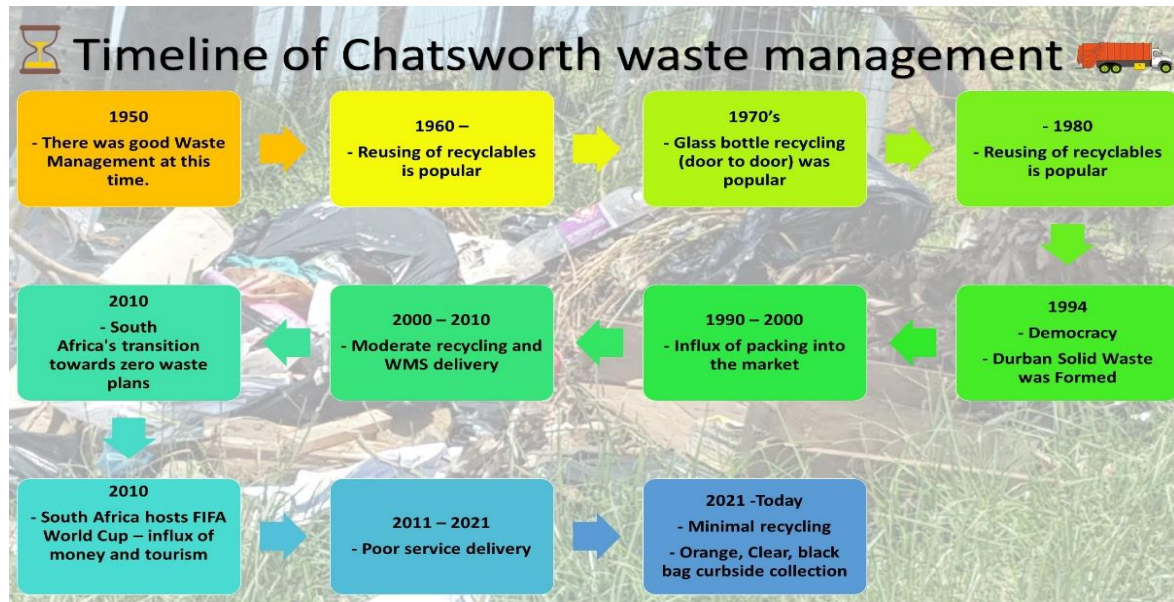


Figure 4.2: Timeline of Chatsworth WMS (Sourced from FGD n =10)

From Figure 4.1, the predominate age group was born between 1960's and 1980's (aged 41 to 60), which, when overlapped with Figure 4.2, indicates the reuse of recyclables and curbside glass recycling as the norm of the

period. This information helps to understand the behavioural, social and knowledge background of the participants. It was an oversight by the researcher that no question was asked on how many years the residents were staying in the study area. However, only residents currently predominantly staying in Westcliff were allowed to answer the survey.

A majority of participants in the FGD (Appendix 2) further stated that they enjoyed this period as children (of getting financially rewarded for collecting and depositing glass for recycling). They further lamented that during this period poor male children would go to each house collecting glass to sell, a trend still seen today. The second most predominant age group were born between the 1980's and 2000's, from Figure 2.4, the reuse of recyclables was still active, DSW was formed and an influx of packaging in the market occurred. The influx of packaging was further discussed in the FGD (Appendix 2) where a minority of participants stated that: "Everything is prepacked now, there is the introduction of plastic bags into the system and hygiene is better".

From the views discussed in Figure 4.2 and the FGD (Appendix 2), the recycling culture of the community is evident. It shows how much of an impact the various WMS has made, such as the collection and reuse of milk bottles that occurred nearly 50 years ago, which is still fondly remembered, and missed. This notion is further substantiated by the open-ended survey responses (Table 4.1). It was noted that most (45%) of the respondents used recyclable containers for general household storage (foods, drinks) while the rest specified other storage uses from there recyclables such as general household storage (28%), and storage of tools (6%). The miscellaneous uses (21%) included watering container for plants, writing on both sides of paper, distribution of food in plastic recyclables and reuse of glass jars.

Table 4.1: How participants reuse their recyclables (n=30)

Summary: Store food and drink items	45%
To store stuff in the freezer	3%
Food is stored in the container	3%
Spices	3%
Cool drink bottle – water in fridge	6%
Store food	30%
Summary: General household storage	28%
To store small items	6%

Containers are used as storage containers	6%
Boxes to store goods	3%
Store items (unspecified recyclables)	13%
Summary: Miscellaneous uses	21%
Used as a watering container for plants	3%
Reuse some containers	3%
Write on both sides of the paper	3%
Reuse plastic bags	6%
Give out food	3%
Reuse/give glass jars, bottles, plastic containers	3%
Summary: Storage of tools	6%
Storage of screws, pins etc.	3%
Store tools	3%

The recycling culture theme aids to assess and outline the Social Norms of the sample area (Table 2.2 of the TPB Construct). Social norms as discussed in Table 2.2, relates to what actions are acceptable by the society the participants are a part of, and are important as discussed by Strydom (2018a), in attributing a person having a positive attitude towards recycling and thus having an intention to recycle which may result in the behaviour of recycling their wastes indeed occurring. Therefore, from the data, it can be found that the social norm in the area (at least within the sample) is to reuse and recycle their wastes.

4.4 Education levels

In Figure 4.3, only n=77 answered the education question. Nevertheless, from Figure 4.3, it is ascertained that 52% of participants have a secondary level of education, 42% have a tertiary level, 4% have primary education and 2% have no formal education. The data shows that the majority of the participants (98%) had some type of basic education. This indicates that they should be able to understand why and how they should recycle (attitudes and behavioural intention from Table 2.2), once taught. Omotayo *et al.* (2020), states that education

has a direct relationship with environmental consciousness, and found that with education, participants had a greater concern for environmental protection.

Thus, education has an impact on attitude and behaviour. Moreover, Kamara (2006) found that with knowledge on the environmental impacts, participants are motivated to get the skills and to commit to behaviours to reduce their environmental impact (perceived power). Additionally, education on recycling is seen as a unanimous requirement to improve recycling rates in the community (Roos *et al.*, 2021).

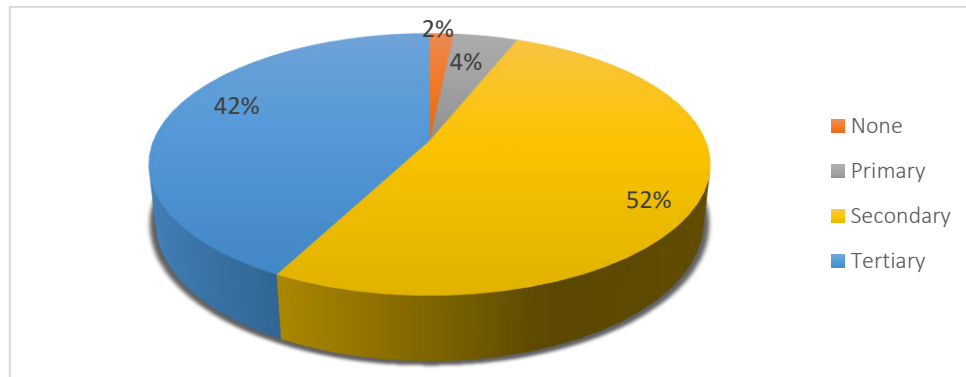


Figure 4.3: Education level of participants (n=77)

4.5 Employment

Figure 4.4 indicates that more than half of the participants (55%) are employed (38% formally employed and 17% self-employed). Furthermore, 24% of the participants are retired, 15% unemployed and 6% were students. These figures are comparative to the statistics in Section 3.2.2, where 14% of the Westcliff population have no income. A study by Gokal (2023), stated that retired people have been found to have more time to recycle. Furthermore, Pewa (2019), suggests that due to the lack of formalization in the recycling industry, many people have found meaningful employment in recycling. Additionally, Smith (2020a) describes that pro-environment behaviours were encouraged in certain workspaces where recycling was promoted. These findings blend itself to the Key Informant (KII) interview where the Mpact Key Informant stated that based on their personal observations on the socio-economic conditions of Chatsworth, the community of Chatsworth would be dedicated recyclers if they were given the opportunity to do so, and that recycling requires dedication. This opinion can be seen in Figure 4.4 and 4.5, as most of the participants had at some point of time worked (retired), do work (employed) or will work (students). Here the idea of Westcliff having a recycling culture is further entrenched.

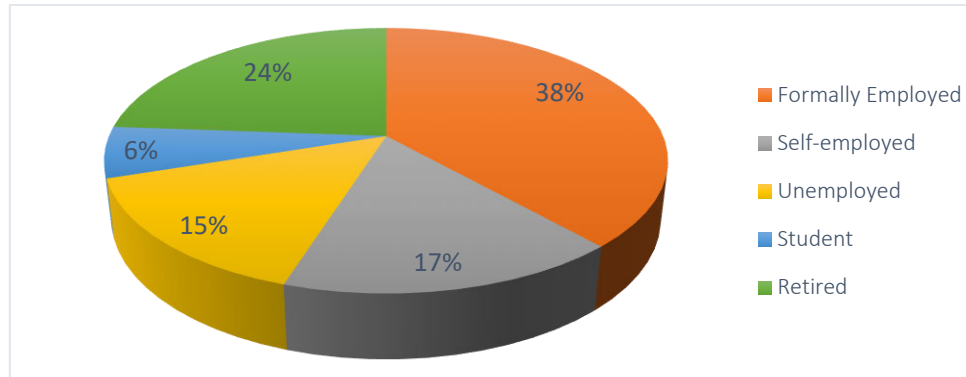


Figure 4.4: Occupation (n=81)

These notions were supported by a WastePlan KII, who had given an example on how they believe this recycling culture could be developed into tangible action of recycling all domestic wastes, the example was: “at most 90% of people would recycle, and at least 45% of that 90% would be fully committed. Most people will first need to take baby steps”. The subjective norm (Table 2.2) of the KII was that while the recycling culture is there to cultivate, it is not the current social norm to actually recycle, and that for this to happen the participants would need to become more engaged in recycling behaviours, other than reusing and recycling a few things such as glass.

These sentiments fit into the WMH (Figure 2.3), where reuse is seen as being better than recycling, but since not all goods can be reused, recycling was a better option than landfilling. Furthermore, the fact that participants had noticed an influx in packaging shows their astuteness to the two highest levels of the WMH of rethink, prevent and reduce waste. However, while the culture of reusing recyclables was seen in the data, it was also noted that the circular economy (Figure 2.2) requires more than just reuse, as wastes must be recycled to be put back into the production chain. Additionally, while the social and subjective norms do point to a recycling culture of the Westcliff area, the behaviours of actually recycling ones’ waste will also be affected by the individuals’ attitudes towards the behaviours and the perceived behaviours control. As stated in Meng *et al.* (2018) research, all constructs of the TPB must work synergistically, for a community to perform the act of recycling. Therefore, the above data was used to give context to the results found below.

4.6 Community views on recycling initiatives

From the TPB (Table 2.2) the attitudes of the participants were established through understanding their views and opinions. The data was collected using a survey questionnaire (Appendix 1), which is depicted and discussed below.

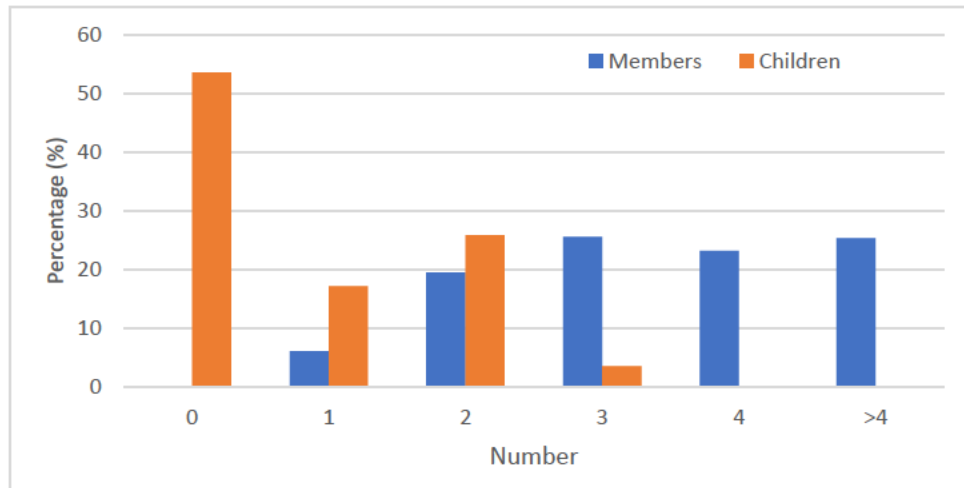


Figure 4.5: Distribution of household members (n=84)

Figure 4.5 highlights the distribution of the household members and the number of children per household. From the data, 54% had no children, 26% have 2 children, 17% have 1 child and 4% have 3 children. Therefore, from the sample, almost half of the participants have no children living in their household, while a quarter have 2 children in their household. In terms of general household size, 26% participants have 3-member household, 25% have more-than-4-members per household, 23% have 4-members in a household, 19% have 2-members in each household and 6% is a 1-member household. It is evident that around a quarter of the sample either have 3,4 or more than four members per household, with the least participants having just 1 member in the household. Thus, the distribution of children throughout the sample has implications on the respondents.

Fornwagner and Hauser's (2022) study found that parents were more prone to exhibit pro environmental behaviours when they were watched (held accountable) by their children. Another study found strong correlation between children sharing their environmental education and PEB attitudes with their parents thus influencing them to have PEB and learn about caring for the environment (Damerell *et al.*, 2013). This was further elaborated on by a comment in the FGD (Appendix 2), where a participant stated that symbols and pictures could help her young child to learn to recycle. Therefore, it is suggested that not only can children influence parents to recycle but that the converse can be true as well. Consequently, educating children may indeed be very effective in introducing recycling into the household.

This effectiveness was utilised by Mpact, as according to the KII at Mpact "We have a post-consumer programme that is well-done and in-depth. Once we get 500 kg per month for 4 months, the school gets a paper bank, however, this mostly deals with paper & cardboard due to sorting logistics. These banks use a truck and crane system which then uses the weighbridge where the school gets money back". This means that the system in place relies on the school's social structure to reach households of Chatsworth. Furthermore, it relies on children as proponents of encouragement to their households. However, from Figure 4.5, this data would not

be relevant for 54% of the participants sampled who did not have children in their households. But as mentioned by Damerell *et al.* (2013), adults are also strongly influenced by children who are not necessarily their own, thus furthering the notion that children are strong proponents to encourage adults in the community to recycle. However, currently, 88% of respondents in Figure 4.6, stated that they would or do recycle as a motivation for environmental protection, thus showing avenues for improvement through the system, as explained by Mpact.

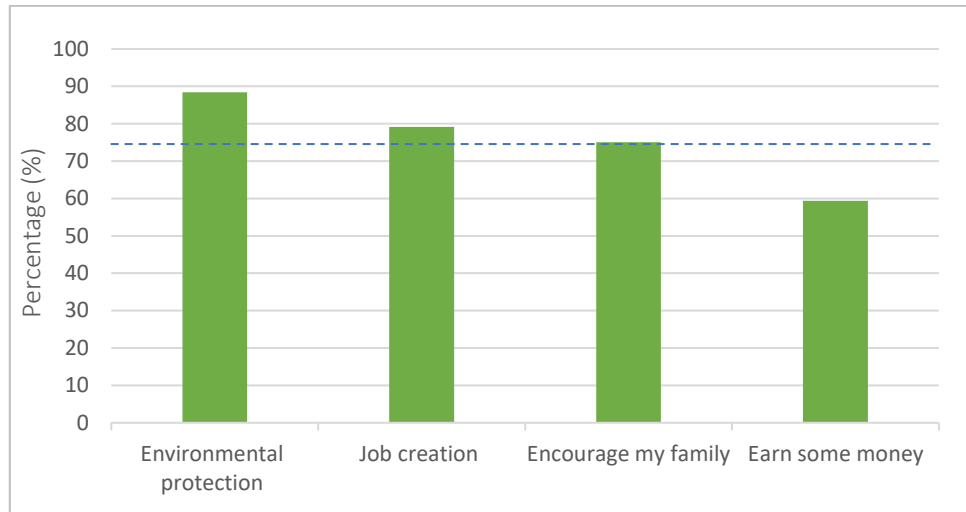


Figure 4.6: Reasons why participants would/do recycle (n=84)

Figure 4.5 indicates that most participants have three or more members in their household (74%). This value also closely corresponds with Figure 4.6, which indicates that many participants would encourage their family to recycle (75%). This could mean that due to having large families living with each other, the desire to encourage others to recycle is great. In addition, the literature suggests that large families, and communities living in close proximity, such as in the study area, tend to exhibit greater recycling behaviour (Desai and Vahed, 2012).

The reasons why participants would recycle, ranked in descending order, are environmental protection (88%), job creation (creating jobs for others) (79%), to encourage their family (75%), and to earn money (within the household) (59%). These trends match Naicker's (2018) research based in South Africa where environmental protection was also a predominate reason for why participants would recycle. This could possibly be due to a few reasons. Firstly, in Table 4.2, participants gave their opinions to an open-ended "express your views" question on the survey questionnaire, 85% of n=14, expressed how important they felt recycling is to improve their external living conditions that are "clean and beautiful", which showed a pride in living in an area that recycles, which is usually associated with more developed countries. They also showed a knowledge that recycling has many environmental benefits (Table 4.2). Moreover, a majority of the residents are working, indicating that they have income streams which could be why earning money from recycling was lower.

Additionally, the majority of the residents have a formal education, which further indicates that their understanding on the impacts of recycling on “saving the environment” is highly probable. Lastly, in Table 4.2, only 2% where n=14, stated that they recycle for monetary gain. Which further support the ideas presented on why the environmental protection value was so high as compared to the other reasons on why residents recycle.

Table 4.2: Open-Ended Responses of Residents views on recycling (n=14)

We all need to do our part to recycle and keep the community clean, for now and generations to come.	Tally	Recycle for money.	Tally
We need to save our dumping sites.	1	I recycle for money	1
Keep our country clean.	1	I recycle scrap metal parts	1
Let's leave a better world for the next generation.	1		
This world must change before we destroy it.	1		
We must keep Chatsworth clean and beautiful.	1		
We all need to pitch-in to save the world.	1		
Recycle or bin it.	1		
Pick-up for hygiene and neatness x 3	3		
Recycling is necessary	1		
We should all strive to do it	1		
Total: 12 (85%)		Total: 2 (14%)	

Additionally, analogous findings were seen in Kotze (2020) and Naicker (2018), who state that the possibility of incentives would help encourage participants to recycle. These incentives may have been particularly useful to the unemployed. Kotze (2020) states that those who are starting out or who do not have employment such as the youth are keen to gain financial reward for recycling. Based on Figure 4.4, this can account for 45% of the population sampled who do not have formal employment. Moreover, the financial statistics of the Westcliff area in general indicates that 13% of individuals appear affluent (Statssa.gov.za, 2011), meaning that 87% of

the community are not wealthy, therefore, financial reward can be an important tool to encourage recycling. These views were also supported by the FGD where one resident stated that they enjoyed the olden days when they would receive money for glass, as a way to earn money as children. This was also concurred by the KII with Wasteplan who reported that “Revenue rewards would help, for example, in Europe, you get coupons for recycling”. This further concurs that incentivising recycling could garner more support from participants.

4.7 Reasons why participants would/do not recycle

Figure 4.7 shows the reasons why participants do not or would not recycle. These include being unaware of where to recycle (43%), being unaware of how to recycle (36%) followed by recycling being labor intensive (34%), recycling being time intensive (30%), and the lowest factor was not seeing a reason to recycle (18%). Key findings from literature suggests that knowledge of where and how to recycle are the highest limiting factors to recycling (Roos *et al.*, 2021; Naicker, 2018). Additionally, these results are further supported by the questionnaire survey where one participant stated that the elderly, in particular lacked knowledge on how to recycle, however, other studies have disproved this notion by stating that the older generation have been seen to be more environmentally conscious (Gokal, 2023). Additionally, only 20% of the participants in this study were 60-80 years old with greater than 80 years old being 4%, therefore, more age specific research would need to be done to establish the opinion of this participant. Additionally, according to the participants, there was a lack of knowledge of what types of goods can be recycled, such as polystyrene, this was further seen in Figure 4.8. Furthermore, Chenery and Feller (2021) also discussed how there was a lack of knowledge on the diversity of recycling materials that exist.

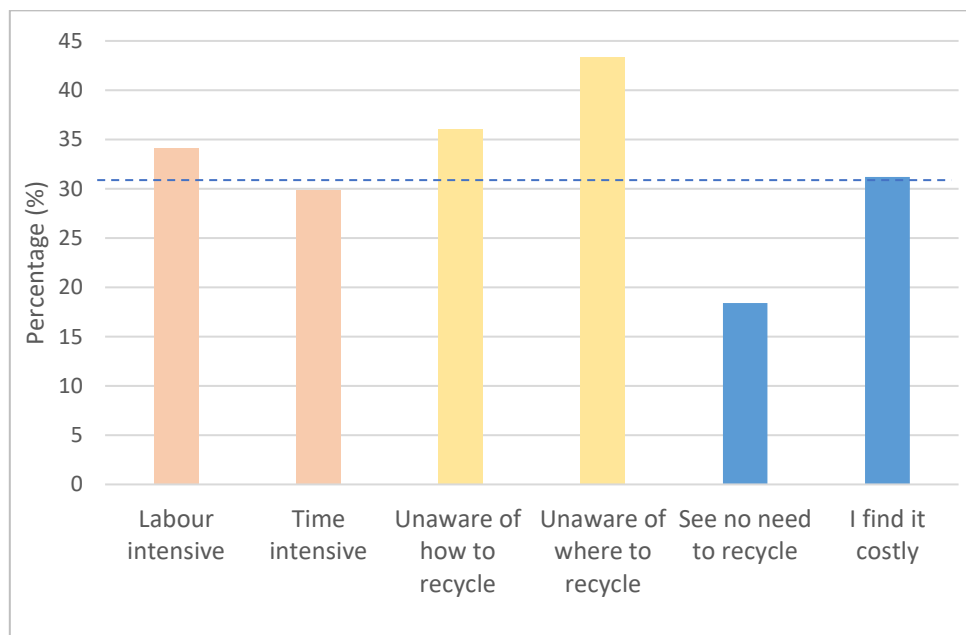


Figure 4.7: Reasons why participants would/do not recycle (n=84)

Another noticeable trend in Figure 4.7 is the depicted values for time intensity, which were the third and fourth highest reasons for why participants did not recycle. Several studies highlight the time factor as an impediment to recycling (Roos, 2021; Smith, 2020a; Meng *et al.*, 2018; Naicker, 2018; Strydom, 2018a).

Figures 4.6 and Figure 4.7, both describe the positive and negative elements of why participants would or would not recycle. Participants had to either respond yes or no to each given element. The graphs reflect a greater “Yes” response. From Figure 4.6, there was an average of 75% of responses to why participants would recycle while in Figure 4.7, a mere 32% average of respondents to why participants would not recycle. Therefore, it can be seen that in this study, that the reason to do recycling outweighs the reasons against recycling.

These trends support the initial finding that Westcliff has a positive recycling culture. It can further be seen that the participants themselves have a PEB perspective on recycling as seen in the research of Chierrito-Arruda *et al.* (2018), who state that recycling is a morally correct behaviour, and proves that the participants sampled do hold these beliefs. However, as previously mentioned, the attitude of believing one should recycle lies in balance with other external behaviour which may or may not encourage the action of recycling to occur (Saphores *et al.*, 2012). Therefore, before a final conclusion can be made on whether the sampled participants do have a positive recycling culture, their actual behaviour must be considered.

4.8 Understanding waste

Based on the ranking exercise in the FGD (Figure 4.8), it was established that only polystyrene and light bulbs were completely unfamiliar to participants while e-waste, batteries and organic material were of medium familiarity to participants. Glass, plastics, paper, cardboard, metal cans and scrap metals had a high familiarity with participants. However, many of these categories were only familiar to the participants at a surface level, where they knew what it was, but did not know the different types of recycling categories. Familiarity referred to whether a participant could associate a certain object as recyclable or not, while understanding referred to how well the participants know how to classify recyclables into its different categories.

In the “Understanding Category” there was mostly a low level of understanding for recycling categories that had many subdivisions within it, such as glass, plastics, cans, batteries, and light bulbs. This can be attributed to a lack of awareness as some materials cannot be recycled while some need more advanced recycling facilities. For example, windscreens, while are made from glass are not yet globally recyclable (Chenery and Feller, 2021) or PET trays which require special equipment to recycle which are not currently used in South Africa (PETCO, 2021).

Recyclable Items	Familiarity of categories	Likelihood of recycling categories	Understanding of this recycling category (as a group)
Glass 	High - 10	High = 10 Would recycle all categories if we were able to separate, through knowing how to and being provided with bins/bag and collection service	Low
Plastics 	High – 10		We know what plastic is but not the different types are.
Food waste / Organics 	Medium – 4		High
Paper and Cardboards 	High – 10		We know what paper is but not the different types are.
Metal Cans (food and drink tins). 	High – 10		We know what metals are but not the different types.
Polystyrene 	Low - 2		High
Scrap Metals 	High – 10		High
Batteries 	Medium – 5		Low
Light bulbs 	Low - 1		Low
e-waste 	Medium – 4		Medium
e.g.: Very familiar = high (6 to 10 are familiar), Medium = (4 to 5 are familiar) and Low (1 to 3 are familiar)			

Figure 4.8: Ranking Exercise – Understanding Waste WMS (Sourced from FGD n=10)

Moreover, the majority of participants of the FGD unanimously stated that they would separate the recyclables if they were provided with bins and bags. Thus, showing their receptiveness to using recycling initiatives. Additionally, the data shows that participants are willing to recycle and would do it to a certain extent based on the space and infrastructure available to them. A final note was that the researcher had to explain what each subcategory was before Figure 4.8 could be filled out, but once the knowledge was given, participants openly accepted it and showed interest in recycling, which gave a lens into the possible type of responses that could be expected should this type of information be shared.

4.9 Recycling information

Figure 4.9 illustrates that most participants preferred receiving recycling information through social media (73%). According to Budree and Fietkiewicz (2019), the high usage and convenience of social media makes it a powerful tool for sharing information between South African campaigns. Furthermore, the 73% value closely aligns to Figure 4.1 where 76% of participants are 20 to 60 years of age, the age groups that prefer using social media (Budree and Fietkiewicz, 2019). Moreover, similar findings stated that the youth and middle-aged participants (Gokal, 2023), found out information on recycling through social media, thus further illustrating its prevalence. However, some participants also showed interest in receiving recycling information through television (32%) and newspapers (33%). Radios (19%) and Magazine (16%) had the least amount of popularity.

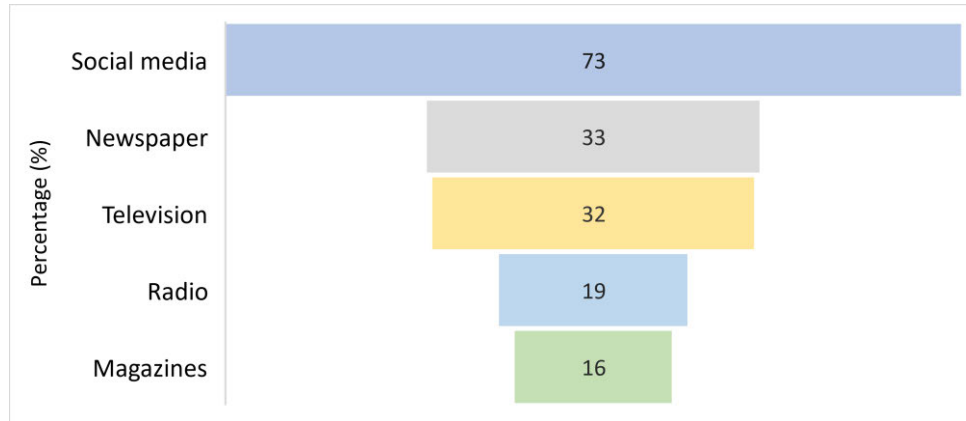


Figure 4.9: Preferred methods of receiving recycling information (n=84)

The trend on the prevalence of social media as a proponent to encourage household recycling was further substantiated in the FGD (Appendix 2), where one participant stated that there was no media coverage or media campaigns that advertised any recycling initiatives in the area of Westcliff.

Moreover, the KII from WastePlan stated that they also depend on the smaller recycling companies and newspapers to disseminate recycling information to participants. However, this too has proven to be ineffective as only 33% of the participants sampled would like to receive recycling information through the newspaper while 73% of participants would like to receive this information through social media. Additionally, it was noted that none of the participants in this sample mentioned any form of social media presence of recycling (e.g., WhatsApp Chat Groups), which was further supported in the FGD where only one participant mentioned seeing a newspaper advert at some distant time. Therefore, it can be theorised that for more participants to have access to the information and for recycling companies to have more penetration into the community, if not all methods of communication are used then social media should be a key focus.

4.10 Awareness of recycling initiatives

The concept of a lack of knowledge and a lack of impactful advertising on how, where, and why to recycle was further substantiated by Figure 4.10. It was found that recycling containers were the most known recycling initiatives, at a mere 42%, recycling buy back centers at 40%, while government recycling initiatives were even less at 27%. These figures indicate that there was not a high level of knowledge of the existence of these initiatives. These trends were further refined through qualitative data (FGD and survey) for a deeper understanding.

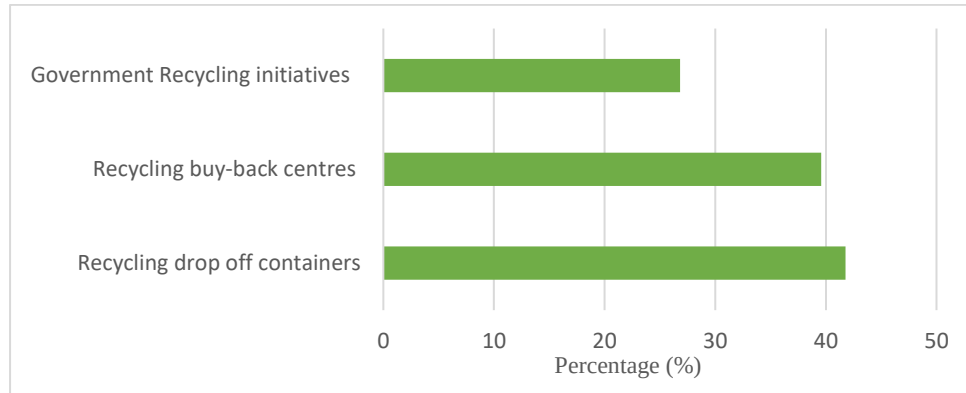


Figure 4.10: Awareness of recycling initiatives (n=84)

During the FGD a minority of the respondents expressed that they did become aware of curbside recycling due to provision of bin bags or seeing the recycling trucks on the main roads. However, they further expressed that this gave them little understanding of how, where, and why to recycle. Additionally, a majority of the FGD recommended that more awareness would increase recycling rates.

Lastly, Figure 4.10 indicates that participants are unaware of WMS and drop-off sites, or of local schools that act as collection sites. These views conflict with Mpac's KII opinion, who felt that these sites have a lot of traction within the community. The Mpac KII further stated that they believed that due to the sites having their branding, it would act as an advertisement for the recycling of household wastes and would suffice to notify the public on their existence. However, as already evaluated, participants were mostly unaware of this, thus showing site advertisement to be an inappropriate method for wide scale dissemination of recycling information. Therefore, a key finding in the data is that there is a disjunction in the recycler's method of communication to the public.

To further encapsulate how much or how little understanding the participants of the FGD had on WM in their area, a PRA mapping exercise: Waste and Sampling Map of Westcliff was done. Participants were asked to highlight various elements of WM on the map (Figure 4.11.1). During this exercise various recycling initiatives were discussed by individual participants. Firstly, a participant stated that they noticed a scrap yard and recycling company (cardboard, plastic, glass) (blue stars North of the Map) in Unit 10 while a second participant named a national retail outlet - Woolworths who collects customers light bulbs (blue star in Chatsworth Mall).

Moreover, many roads in Westcliff were sampled due to the ease of access to the households (Figure 4.11.1: pink and purple lines). This falls in line with the Mpac KII who stated that there were no logistical issues in Chatsworth. Additionally, Westcliff is found along a main highway in Chatsworth (Northern most road) thus further showing the ease of access of the area. Other key aspects found on the map, was the interconnectedness of Westcliff to other Units, which was also mentioned in the FGD, i.e., five small recycling companies lie just

outside the boundary of Westcliff (blue stars). However, while participants were aware of these companies, they did not use them. This contradicts the idea shared by PETCO (Polyethylene Terephthalate Company) (2022), who stated that they do not liaise with households directly, but rather relied on small businesses and local municipalities to handle this correspondence. It is clear from the data presented in Figure 4.10 and Figure 4.11.1, that this is not enough, as the local WMS are ineffective and the private recycling companies are not utilised by the household participants.

These recycling initiatives, further adds to Figure 4.10, as it showed that some participants have some knowledge about these initiatives, while others do not. Therefore, it was concluded that the issue of education was a key barrier where a lack of knowledge on how and where to recycle impeded the participants ability to recycle, this is supported by the recyclers who also agree residents need to learn how and where to recycle their wastes to be able to encourage more residents to recycle. These sentiments were also seen in Naicker (2018); Strydom (2018b); Dlamini *et al.* (2017), where a lack of knowledge on recycling practices were a great barrier.

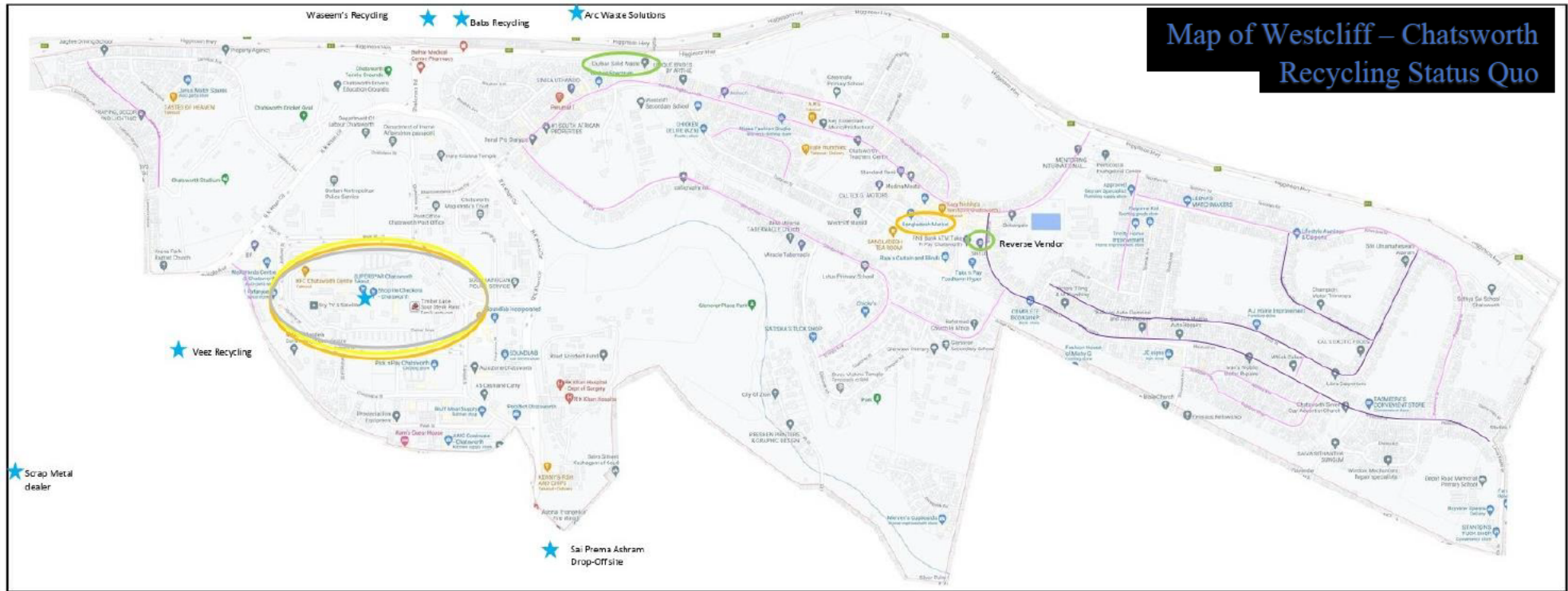


Figure 4.11.1: Focus Group Discussion Mapping Exercise

4.10.1 Awareness of recycling initiatives – The Reverse Vending Machine

A final recycling initiative already mentioned in the Literature Review was the RVM (Reverse Vending Machine) (Figure 4.11.2). During the FGD, a participant mentioned the RVM, and further explained that this is a machine that one can deposit their cans into and receive money on their Shell Garage Reward Card, the reward was approximately R1.50 per can at that time. This initiative was then added to the map (during the PRA mapping exercise) as a green circle near the Take and Pay on the North-East of the map.



Figure 4.11.2: Reverse Vending Machine at Shell Garage (Own Source – Date taken: 2023.05.23)

The literature of other studies points to a general trend of participants not being given the knowledge to empower them to recycle but Figure 2.7.2 indicates that the information is on websites if a resident had to look for it. Moreover, many of the recycling companies in the eThekweni area have also created public collection sites (initiatives) such as glass and paper recycling domes (SST, 2022). However, participants are expected to search for drop-off sites and deposit their recycling on a voluntary and free of charge basis (Lombard and Lombard, 2010).

Additionally, once the other participants of the FGD heard about the RVM they showed a keen willingness to utilise this avenue of recycling and the concept of being rewarded was further motivation. However, the Key Informants (Mpact and WastePlan) were unaware of this Shell Garage RVM initiative. But the WastePlan KII had mentioned that this type of recycling and rebate system could prove successful in garnering community support of recycling.

The RVM shows a clear example of how a lack of dissemination of information to participants about an initiative can be the reason why there is so little use of the initiatives. That is, once participants heard about this initiative; they were interested in using it. However, the WastePlan KII stated that getting long term commitment can be difficult, but the Mpact KII stated that participants do require the service. Therefore, these findings were further explored through the analysis of the participants actual recycling behaviour.

Further still, the RVM (Figure 4.11.2), only recycles a limited amount of goods, for example paper and cardboard are not taken, which means even if every resident used this method, many materials will still not be recycled. Figure 4.11.2 indicates that plastics (HDPE, PP and PET), metals (food and drink cans), TetraPak and glass can be recycled using this machine. This theme of only certain recyclables being collected was also prominent with the key informants and the municipal WMS. It was noted that neither the participants nor recyclers (Mpact and WastePlan) were aware of the RVM at the Shell Garage in Westcliff (Figure 4.11.1 and 4.11.2).

4.10.2. Analysis of awareness of recycling initiatives

The results indicate that participants perceived behavioural control (Table 2.2) is that they lack the knowledge due to not being provided with it. However, the knowledge is there to be gained if the time was taken to look for it. Time appears as a recurring theme (Figure 4.7), as to why participants would not recycle. The element of time can also be extended to time to get the information on how to recycle and to do the recycling (meaning that residents did not have the time to gather the information for themselves). This was further substantiated by the fact that when DSW had delivered the orange bags to the residents, which had information on it, residents read and followed it. Therefore, the time required to get this information if it were not provided to them, was inconvenient.

While the participants showed a lack of knowledge and a lack of time to get this knowledge, further links to external providers were drawn. The question of whose responsibility is it to ensure the residents have the knowledge could best be answered by referring to Figure 2.3 where it is clear that government and private recycling companies (stakeholders) have direct power to get the information to the residents, rather than expecting the residents to look for the knowledge themselves. This is further collaborated by Dlamini *et al.* (2017) who stated that the provision of education to residents is a service that should be given by the government and private companies. Le Grange (2022) and Godfrey *et al.* (2017) also share similar sentiments, that the legislation of the country makes WMS planning a responsibility of local government. As seen in the WMH (Figure 2.3) this planning must include engaging with both recycling companies and residents and must further include the dissemination of recycling knowledge. Furthermore, from a circular economy perspective, if either of these stakeholders wanted to continue or grow the production line and economy (as required by the SDG's: Table 2.1) then they should do what is required to get residents to recycle such as giving them meaningful education on a platform (social media) that is used by the residents because in this pursuit many SDG's such as healthy living, education, job creation etc., (described in Table 2.1) would be a natural output.

However, one problem with holding the stakeholders such as private recycling companies accountable in providing the service of education to the residents, is an issue raised by the Mpact KII, of the mills becoming full and then having to stop accepting certain produce until the load is alleviated. The Mpact KII stated: "The price of paper had dropped by nearly 50% due to mass amounts of surplus in the mills." This is linked to the supply and demand markets for paper. Which could be linked to the linear economy of the country. Thus, showing that a social change from a linear economy to a circular economy is needed. The responsibility would then also lie with the producers (EPR), as mentioned in the literature review, the producers of various products must be held accountable for how they make their goods (virgin material verses recycled material) and how they expect the goods they sell to be discarded once used (Parajuly *et al.*, 2020; Makgae, 2011). This discussion brings up multiple themes outside the scope of this study. Nevertheless, for the scope of this study it is noted that recycling companies have the influence to evoke recycling behaviour in the Westcliff area, at least from a knowledge perspective.

Consequently, these views and opinions do show a willingness of participants to partake in recycling, and a willingness to support this culture by the recyclers. These views and opinions were further analysed through investigating the recycling behaviours of the participants.

4.11.1 Effects of reliability on participants' attitudes and behaviour

Figure 4.12 indicates that a predominate number of participants stated that they feel their WMS were unreliable (60%) and would not pay for recycling WMS to be rendered (64%). Furthermore, 15% of the participants were unaware of how reliable the WMS are and only 25% of respondents found their WMS to be reliable. Converse to these findings is that in 2011, Statssa.gov.za found that Chatsworth waste removal was reliable 95% of the

time. However, it is unclear if this is for both none recycling and recycling waste removal. It can also be noted that 2011 is 12 years before this present study was undertaken, and the data provided by the government is dated and is taken from a government source.

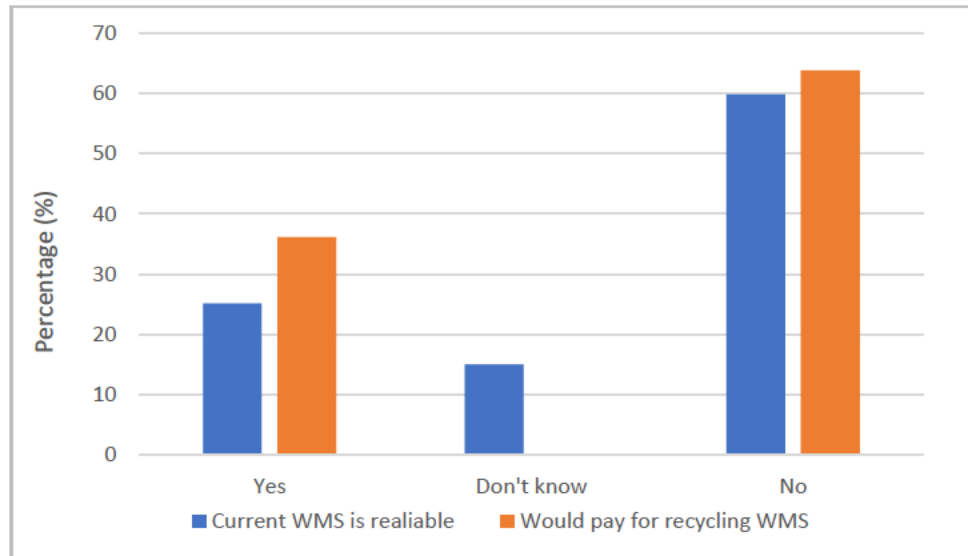


Figure 4.12: Residence experience of WMS (n=84)

The questionnaire results indicated that a minority of participants felt that Chatsworth was a marginalized community (historically, due to apartheid), and for this reason received unreliable WMS. Participants also indicated (Figure 4.11.1 – green circle) that the municipal landfill is located towards the centre of Westcliff, which can also indicate environmental racism issues as was discussed in the case of Bisasar Road Landfill. Participants also believe that not enough education is given on recycling and that even drop-off sites would help enable their personal recycling needs.

Furthermore, the participants in the FGD showed their displeasure of the unreliable nature of WMS, while a minority from the questionnaire survey, stated that this unreliable service created a despondence in their intention to recycle. According to the majority of the FGD participants, unreliable services created frustration, especially as participants pay refuse collection fees, and thus expect regular services (Figure 4.12). These views were supported by the Mpact KII, but the WastePlan KII added that if residents were consistent recyclers, the recycling companies could find avenues to help the residents recycle at curbside. Additionally, from this analysis of the views and opinions of the residents that did partake in the case study, the issue of the lack of sample participants, discussed in Chapter 3, may have been due to an apathy in recycling WMS due to the abovementioned issues.

Another element outlined by respondents in the questionnaire was a new theme of uncontrolled dumping, which can still be linked back to poor service delivery. Furthermore, a majority of the FGD participants shared insight

on the issue of uncontrolled dumping in the Chatsworth Centre Shopping Mall area (Figure 4.11.1 – grey circle). This created a negative impression of the current WMS, as participants believed that the municipality should keep the area clean. These findings are supported by the literature, where UNEP (2018) states that in Africa, due to a lack of WMS, uncontrolled dumping is rife. Furthermore, South Africa has made attempts to put the power into the residents' hands, by lowering landfill gate fees (Godfrey and Oelofse 2017). However, as seen by the data, this has not been effective. Furthermore, a FGD participant mentioned that they work for a local metal recycling company, and that they along with the local counsellor was attempting to resolve this issue of unreliability on a private company level. They further discussed how the company collects scrap metal from informal collectors, whom they pay.

Parallel to this, the literature found that well-run waste management service provision develops positive community morale to support a recycling programme. This view is echoed by the studies undertaken by Roos *et al.* (2021) and Schoeman and Schmidt. (2016) where participants who received recycling services were more willing to join future at-source recycling programmes. Therefore, the impact of an unreliable WMS is an important factor when analysing the effectiveness and influence of current WMS on future WMS.

4.11.2 Reliability of WMS

The issue of the reliability of current WMS point to the government as the primary stakeholder in the WMH (Figure 2.3) as it is the organisation that performs these services to the community. A looming scenario associated with the WMS is that the orange bag recycling project is not functioning to its full capacity, with the lack of reliability being a key barrier. The orange bag project has proven to be the most used system by participants and the initiative most preferred by participants. However, as expressed by the Mpact KII, the collapse of this service has created a vacuum in the take-up of recycling, because when it was running well residents were happy to support it, but when it stopped, residents were disheartened.

Furthermore, a minority in the FGD mentioned that there is a lack of funds to properly manage the WMS, which was an initiative that emanated during the 2010 FIFA world cup (Figure 4.13), when the country had an influx of both money and tourism. Figure 4.13 brings light to these discussions, where it shows that the country had been gearing up towards the FIFA World Cup, thus putting money into recycling curbside initiatives, adding to the national image and the promise of and influx of wealth and tourism into the country. The majority of participants in the FGD further concurred that WMS was better before 2010 than after 2010.



Figure 4.13: Extract from “eThekweni Sustainable Waste Management Guideline” (Mander *et al.*, 2009:4,12).

Moreover, when the FGD participants were asked if they pay collection fees, they unanimously stated that they do, and that this is why they fully expect reliable service, as they are paying for it. Furthermore, Table 4.3, was developed based on a question in the survey questionnaire (Appendix 1), here it also shows that a majority are aware that they do pay collection fees (66%) while only 44% are not aware of these fees.

Table 4.3: Respondents awareness of collection fees (n=84)

Do you pay for collection fees?	
Yes	66%
No	44%

Another avenue explored was what became of the funds collected by the municipality for WMS. To understand this a desktop search was done, this yielded a barrage of newspaper articles from across the country that highlighted alleged accounts of misappropriation of funds. For example, Makhanya (2023) expressed that the

eThekweni's DSW had expended R60 million in 2016 on recycling programmes, and that it has since disintegrated which has impeded its effectiveness. While Mngadi (2020), stated that eThekweni residents' views on the provision of refuse bags were marred by the sub-standard quality of refuse bags, making many residents reconsider the value of their collection fee payments to the municipality. Moreover, another article stated that DSW openly admitted that they did not have funds due to ballooning expenses of townships (like Chatsworth) WM (Mbanjwa, 2018). Furthermore, a third article expressed that the residents of Chatsworth had not received recycling bin bags for many months and that this made recycling extremely difficult (Magubane, 2021). These views further supported the theme of reliability as discussed.

Additionally, Godfrey and Strydom (2016) study on recycling in South African household sector, found that the issue of misappropriation of funds severely impacted the financial provisions required to support a well-run WMS. Dlamini *et al.* (2017) further reported that a lack in monetary support within eThekweni made it hard to service areas far from the city centre (such as Chatsworth).

Therefore, based on the above results, it was found that while the municipality had initially provided a well-run recycling WMS to the community this had not been done on a consistent and long-term basis. Some reasons were seen to be a lack of monetary provision and/or misappropriation of funds.

4.12.1 Analysis of recycling behaviour of participants

Heimlich and Ardoin (2008), states that a community's internal attitudes are affected by external conditions which result in a behaviour, in this case recycling. This section analyses the current recycling behaviours of the participants and how this interlinks with their attitudes and external conditions. The section will then dissect the ideal recycling initiatives, and how this may be supported by the external conditions (external stakeholders).

Figure 4.14 depicts that a majority of participants do receive coloured recycling bin bags (64%) while 31% receive only black bin bags. Furthermore, only 7% of participants sort their waste and take it to a drop-off site. Therefore, the coloured recycling bin bags are the predominate WMS method in the community. This is a departure from Strydom's (2018b:3) study which found that the general trend for South Africa is that "only 3.3% of participants are committed to recycling of their domestic waste". Figure 4.15 was used in conjunction with Figure 4.14 for a deeper understanding of the types of WMS received in the community and current methods of waste sorting.

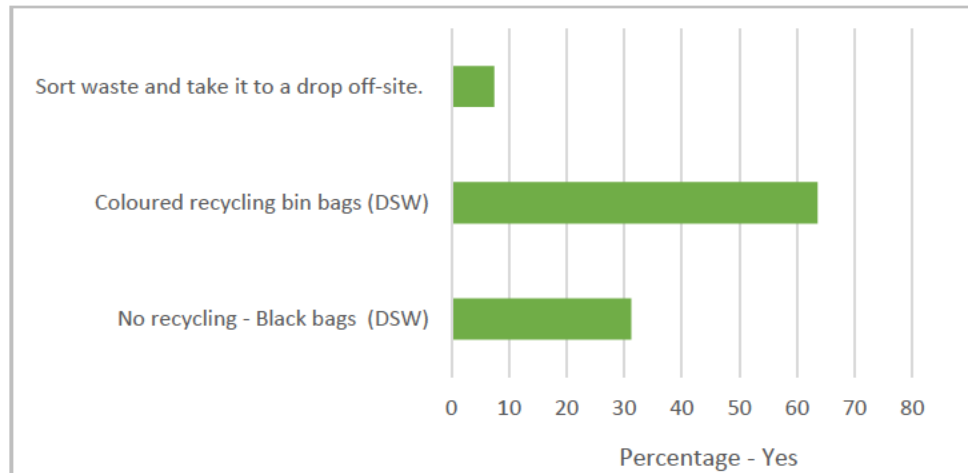


Figure 4.14: Types of current WMS received (n=84)

Figure 4.15 indicates that 47% of participants separate their wastes, 41% do not recycle, 11% rinse and separate their recyclables while only 1% rinse their recyclables. Therefore, the predominant type of waste sorting is to only separate their recyclables with not recycling at all as a close second (41%).

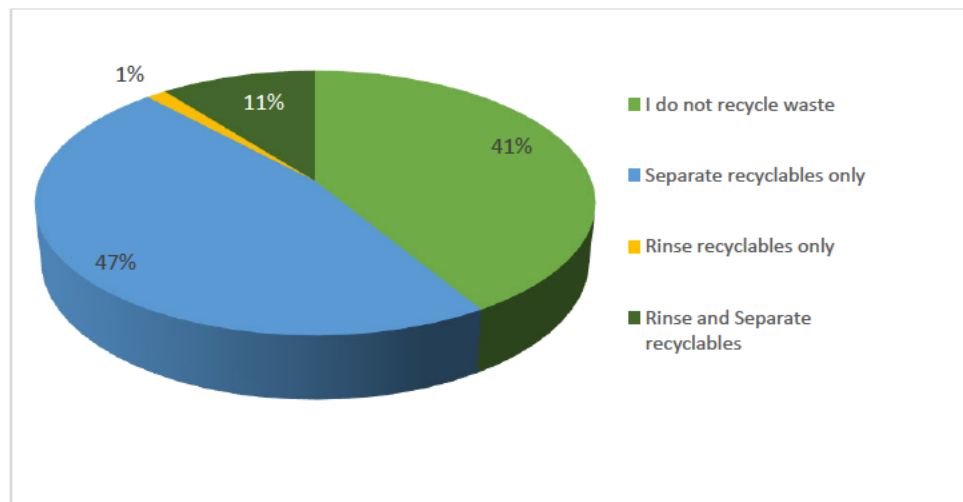


Figure 4.15: Participants current methods of sorting waste (n=84)

Similarly, Roos *et al.*'s. (2012) study indicates that 38% of participants were disinterested in recycling. However, the values differed in the other categories. For instance, Roos *et al.* (2012) found that only 19% of participants partook in recycling and 43% were aware of at-source separation, which is much lower than the 57% of participants who do either rinse, sort, or do both actions.

A note must be made that Figure 4.14 deals with what WMS is received (and may not constitute as these methods being actively used) while Figure 4.15 deals with which type of WMS behaviour is engaged in.

Therefore, to understand this finding, it must be seen in conjunction with the types of recyclables recycled and the types of wastes collected by WMS.

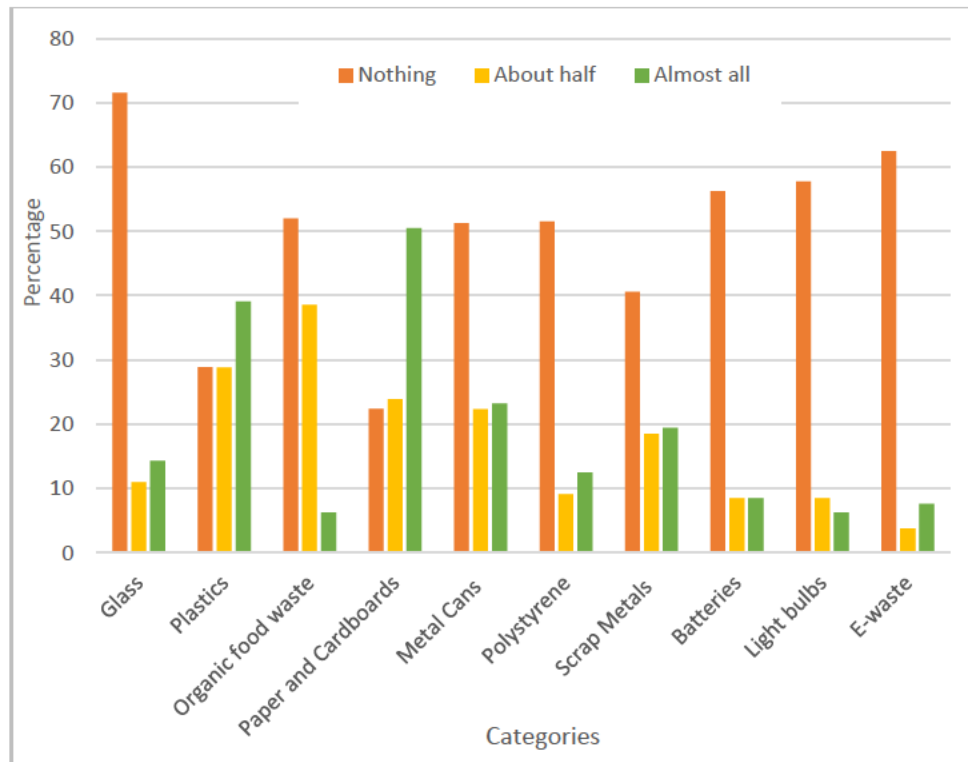


Figure 4.16: Types of waste-categories recycled by participants (total n=84 [with multiple responses allowed]).

In terms of the types of waste categories recycled (Figure 4.16), paper and cardboards were most recycled (51%), followed by plastic (39%). This corresponds to the orange bag recycling project initiative which collects only these goods. Metal cans (23%), scrap metals (19%) and glass (14%) were recycled, which is interesting because metals and cans are high valued items and can be completely recycled (Recycling.com, 2022). Another key point here was made by the Mpact KII who mentioned they have a great post-consumer paper recycling programme.



Figure 4.17: Pictures of Westcliff participants curbside on morning of pick-up day for municipal collection
(Own Source – Date taken: 2023.02.09).

Moreover, photographs taken (Figure 4.17) from the streets of Westcliff on the day of the DSW waste collection, proved insightful. Firstly, it was seen that the orange bags were used but were a minority to the black (none recycling) bin bags, which coincided with Figure 4.14, where most participants reported that they did recycle. It also coincided with Figure 4.16 where only certain categories were recycled.

The theme of responsibility is again revisited, by analysing both Figure 4.14 and 4.17 together. As was already discussed, WMS provision must be initiated and carried forth by the municipality and recycling companies, and then be sustained by the participants taking up the daily routine of recycling. Based on Figure 4.14, it can be extrapolated that if the participants were provided with the right recycling bin bags and tools, they would take on the task of recycling. This was further substantiated by the FGD where participants all jointly stated: “provision of bags would help” and “when we did get bags we read and saw what to do, as written on the bags” and by Figure 4.17 evidenced above.

Table 3.3.1 Waste Collection Approach per Waste Type Adopted by eThekweni Municipality

WASTE PRODUCED	WASTE STORAGE TYPE		WASTE COLLECTION PROCEDURE
DOMESTIC	Black bags –household refuse disposal		Kerb-side
	Orange Bags – paper, cardboard, tetra pack materials & plastic recycling		Kerb-side
	Clear Bags – glass and cans recycling		Kerb-side
	240 litre wheeled refuse containers – Hygienic storage and collection of domestic refuse in high density residential areas.		Kerb-side
GARDEN REFUSE	Blue bags –optional garden refuse disposal		Kerb-side

Figure 4.18: Extract from Bosch (2016)

These findings can be further supported by the research of Bosch (2016) which has been displayed in Figure 4.18. The bags provided to participants are only orange bags, which collects paper, plastic, cardboard and Tetrapak (Figure 18). However, the other recycling bin bags and categories such as glass and cans has been omitted (Figure 18). Therefore, it is clear to see, that participants recycling behaviour is synonymous with what they are provided with, and that they feel that they are recycling to their best of their ability, because this was easily available to them.

4.12.2 Ideal WMS preferred by Westcliff participants

In Figure 4.19, 81% of the participants selected that they would ideally like to have curbside recycling where they sort their waste, and have it collected as it was done previously (orange bag project). Ten percent stated that they would prefer general black bag DSW services and 9% stated that they would like to sort their goods and take it to recyclers themselves. This finding draws back to the discussion on reliability of the WMS. It was

further emphasised by the Mpact KII who reported that “when the orange bag project no longer adequately serviced the area, many participants were disheartened and sceptical about trying other systems”.

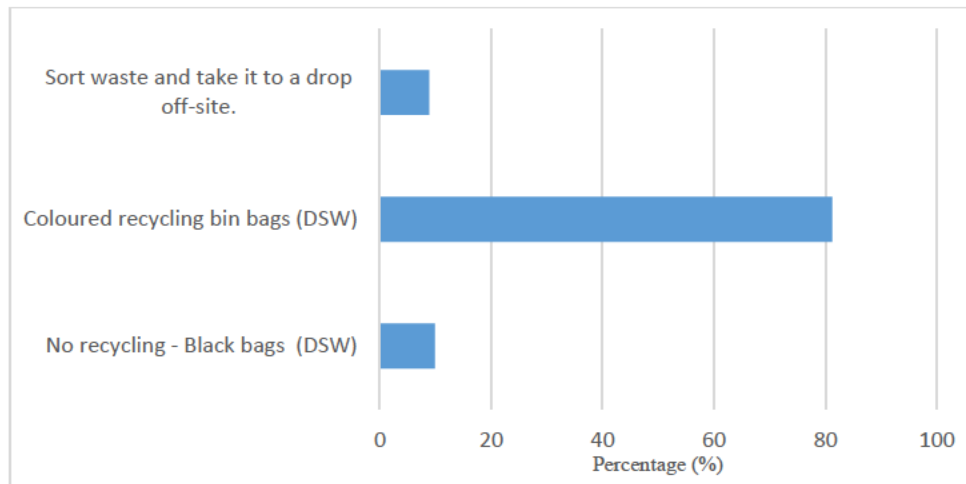


Figure 4.19: Ideal WMS preferred by participants (n=84).

The notion of residents feeling disheartened, however, can be restated based on Figure 4.20, where 100% of participants stated that they would use a curbside recycling service if it were created for them. So, while the respondents were disheartened by the current WMS service, it did not negate them being open to a well-run (specially created) WMS centred on recycling.

Furthermore, Figure 4.20, allowed for multiple responses and for this reason illustrates that of the 100% of participants who stated that they would ideally like curbside recycling, of these 100% of n=84, 35% stated that they would use this service if rinsing and separating were a pre-requisite, while 57% said they would use the service if rinsing and separation were not a pre-requisite. These findings were similar to the findings of Meng *et al.* (2018) who stated that 56% of participants found recycling time-intensive and with Roos *et al.* (2021) where 75% of participants found recycling inconvenient. Thus, bringing in the element of time, as shaping the attitudes to why participants would or would not recycle.

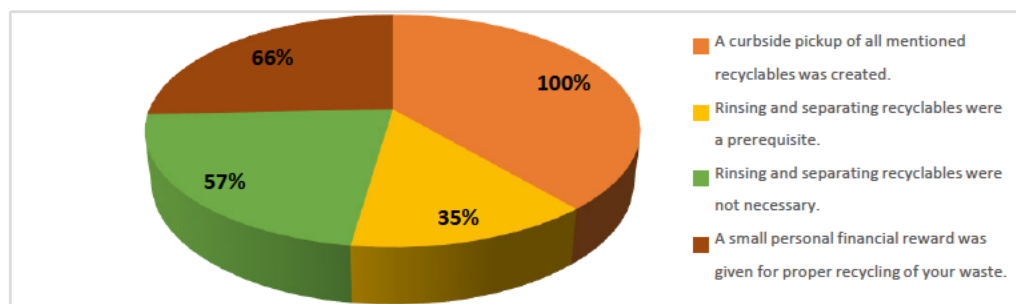


Figure 4.20: Ideal methods of recycling wastes (n=84 – multiple responses allowed)

Additionally, 66% stated that they would enjoy a small financial reward for recycling their goods correctly. This value correlates with the fact that other studies also found that incentives would be a motivating factor as discussed in Figure 4.6 (Kotze, 2020; Naicker, 2018).

Another facet touched on by a majority of the participants at the FGD were how they expressed excitement and enthusiasm for recycling initiatives in other areas of South Africa and the world. One participant stated that “I have 2 bins for recyclables and a bucket for compost, plus we make Eco-bricks (Figure 4.21), where you fill plastics into a bottle until its firm and then build non-load bearing structures with it”. A second participant added “when I lived in elite areas we separated recyclables into dedicated coloured bags, normal waste in black bags and rubbles refuge to be dropped off at dumps”. While a third resident expressed “overseas they have a very different and efficient recycling system” (Figure 4.22). As seen in Figure 4.22, the bins are organised in a vertical stack with four labelled compartments (Plastics, Organic’s, Paper and Glass).



Figure 4.21: Alternative WMS tools - Eco-Bricks and compost bin (Participant Sourced – Date: 2023.05.23).



Figure 4.22: Alternative WMS tools - Recycling set-up in Spain, Europe (Participant Sourced – Date: 2023.05.23).

The participants enthusiasm towards alternative recycling tools shows the willingness for participants to participate in well-run WMS. Which can be seen from the Mpact KII as well, who stated that there is a desire

for the communities of Durban to want to recycle, and by the WastePlan KII who stated that if residents were committed to recycling it could bring forward a well-run system in years to come, but that it will be a slow process of integration due to the nature of recycling behaviour of residents not always being consistent.

Based on the results presented, it can be established that participants do recycle with what WMS they are given, but find this service inconsistent, and that they would recycle all their goods if they were provided with reliable and comprehensive recycling tools such as bin bags, and curbside collection. The themes, of time, reliability and knowledge were also revisited.

4.13 Application of TPB Conceptual Framework to the findings of the study

The results from the data collection have been analysed and discussed in this chapter (Chapter 4). Based on this analysis and the conceptual framework laid out in Chapter 2 the following links and summary have been deduced in Table 4.4.

Table 4.4: The Theory of Planned Behaviour and its application to the dissertation results

TPB Construct	TPB informative question and Analysis of Results	Dissertation Results
Attitudes	How one feels about the behaviour which includes weighing these feelings against the expected outcome Effects of reliability on participants' attitudes and behaviour.	Residents find their current WMS inconsistent, and that they would recycle all their goods if they were provided with reliable and comprehensive recycling tools such as bin bags, and curbside collection. Residents do want to recycle for many reasons.
Behavioural intention	What motivates one to do the behaviour? Reasons why participants would/do not recycle. Ideal WMS preferred by Westcliff participants	Environmental Consciousness and Environmental Protection Job creation for others Residents would prefer to have coloured bags for curbside collection.
Subjective norms	How one perceives and judges the social acceptance of the behaviour. Views on recycling initiatives	Low income/ street people make an income from the wastes, residents do not mind leaving these materials aside for them to take, but currently find the waste pickers messy and unorganised.

		The KII was that while the recycling culture is there to cultivate, it is not the current social norm to actually recycle, and that for this to happen the participants would need to become more engaged in recycling behaviours, other than reusing and recycling a few things such as glass.
Social norms	The actual social acceptability of the behaviour. Recycling culture WM strategies in Chatsworth	Recycling norms inculcated into residents due to “milkman” or collecting glass for spending money as a child. All residents enjoy reusing various recyclables such as plastic containers in their homes for a variety of things. Majority residents want to recycle due to wanting to protect the environment.
Perceived power	How much control one has over factors influencing the behaviour. Understanding waste Awareness of recycling initiatives	Residents stated that they would separate the recyclables if they were provided with bins and bags.
Perceived behavioural control	How one thinks they can control the behaviour, but this can be very dynamic and situational. Reliability of WMS Recycling behaviour of participants	If the WMS were reliable and provided residents with information and bin bags, residents would recycle. They also stated that they lacked time to get the knowledge they required to take part in recycling.

As was seen in the study by Thakur and Onwubu (2023), every construct within the TPB impacts and affects the resident's intention to recycle and subsequent behaviour of recycling. Based on Table 4.4, it can be established that the social norms of the community are, that recycling is a required need to mitigate many environmental issues, as well as provides livelihoods for the poorer communities. These social norms are further solidified by the subjective norms of each participant who feel that if waste pickers were organised and tidy, they would be even more happy to support them, as well as by the KII stating that recycling as a practice must become a social norm rather than just a few ad hoc recycling behaviours and intention. The resident's perceived power is that they are simply not provided with the knowledge, awareness, and infrastructure to carry out any meaningful and committed recycling. Lastly, the community's perceived behavioural control is that if they were given these tools (knowledge, awareness, and infrastructure) they would in fact recycle. These results were also seen in the research of Zhang *et al.* (2015) who stated that residents' beliefs were dependant on external factors such as provision of recycling curb side collection. Moreover, the fact that the residents of Westcliff choose

environmental consciousness and environmental protection as reasons to recycle, further correlate with the findings of Zhang *et al.* (2015), who stated that this is a pro environmental behaviour that morally obligates a person to protect the environment, thus becoming a socially acceptable (and expectant) behaviour.

Additionally, Meng *et al.* (2019), research also attests to the notion that internal and external issues work synergistically to create the behaviour that the community will exhibit. Therefore, it can be deduced from Table 4.4, that the external issues such as the lack of provision of comprehensive and reliable curb side collection has been a barrier to the residents acting on their pro environmental behaviour of wanting to recycle to protect the environment. This stands to reason that if they were provided with such services, they would carry out the behaviour and even encourage others to do so as well. Converse to this, as noted by Saphores *et al.* (2012), access to recycling infrastructure can outweigh the sense of pride one has when exhibiting pro environmental behaviour. This was seen with the residents of Westcliff, who did not recycle any other material besides what the municipality collected, nor did they delve deeper into finding other avenues to recycle, due to time and knowledge constraints.

Based on an analysis of the TPB with the results of this dissertation, it was concluded that the connecting and most notable underlying issue is that there is a lack of awareness and a lack of knowledge given to the residents, which further was impacted but the constraint of time to get this information. Therefore, the deeper barrier found in the study was a lack of communication between private recycling companies and residents and a lack of service provision by the government that serves the area. It can be postulated that if any one of these issues were mitigated an increase in recycling in the area could occur.

4.14 Conclusion

The results from the data revealed many themes and findings. Firstly, resident participants of Westcliff have shown a natural recycling culture in their history and have shown an affinity towards past recycling initiatives that had since stopped. Secondly, their views were mostly unanimous, that they would recycle if they could but lacked easily accessible knowledge on how, where, and why to recycle. While it was acknowledged that the information is there for the participants to get if they desired, they simply have not done so, one finding showed that time could be a limiting factor for participants not being able to seek the information on their own. In the greater scheme of the WMH as a system, the onus would then lay on recycling companies and the municipality to disseminate this information, as this would profit them in the long term and achieve many SDG goals and WMH elements. It was found that the current methods for information dissemination was ineffective to how the participants would prefer to receive this information.

Therefore, this research suggests that if the information was given to them through social media, more participants would recycle. A key example used was the RVM at the Shell Garage, which participants did not know about. As well as the fact that the WastePlan recycling company were planning to put an advert in the newspaper to ask people to recycle, where only 33% of participants would have been privy to.

Furthermore, it was found that the lack of reliable curbside collection, and the lack of diversity of goods collected shaped how receptive the community was to recycle. That is, they were disinterested to support a service that was not reliable. This theme was further developed when the resident's recycling behaviour was evaluated. It was seen that many participants did recycle their goods when they were provided with bin bags to do so (orange bin bags). But did not recycle other goods that were not targeted by the WMS in their area (clear bin bags).

In terms of future recycling behaviour participants showed an 100% willingness to participate in a well-run curbside recycling WMS. This means that there is a high receptiveness towards future recycling initiatives but not as high of a receptiveness to current recycling initiatives due to the lack of reliability. Finally, the current recycling initiatives that are run by the local municipality have negatively shaped the views, opinions, and behaviours of the residents and that this can be changed with a better run WMS.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The aim of this research was to understand the Westcliff community's receptiveness to recycling initiatives or lack thereof. It evaluated this through examining three main objectives viz.: 1. the views and opinions of the residents, 2. the behaviours of the community and 3. the roles of external stakeholders in supporting the residents in their recycling. These objectives were satisfied through using the TPB to define and understand how each element interacts with each other to create the current recycling behaviours as well as how to improve the recycling behaviours.

5.2 How the study meets the objectives

Objective one related to three of the TPB constructs, that is; the attitudes of the residents, subjective norms and perceived power, which was analyzed through understanding the views and opinions of the residents. It was found that the participants are receptive to current recycling initiatives but are more receptive to future and improved recycling initiatives. Objective two investigated the current recycling behaviours prevalent in the Westcliff community. This parameter delved into the behavioural intentions and the perceived behavioural control. It was revealed that the participants only recycle goods that their curbside WMS provide them with, which is paper and plastic and is seen as predominantly unreliable. It was further found that all the TPB constructs work together in shaping the views and opinions of residents which in turn shape their behaviour.

Lastly, objective three interrogated the roles external key stakeholders (private recycling companies) play in influencing and supporting these recycling views and behaviours. This was further evaluated through the subjective norms and perceived power TPB constructs. The results found that the recycling companies lack effective communication strategies to inform residents about recycling. The government lack reliable and diversified recycling WMS to provide to residents. Additionally, it was seen that the external stakeholders helped shape the ineffectiveness of current recycling initiatives (lack of use by the residents).

Consequently, the findings of this study reveal that there is a receptiveness to the various recycling initiatives that are available but a lack of knowledge on how, where, and why to use these initiatives. The results deduced that recycling companies do not have much access to their market through the avenues they use to disseminate information of residential recycling and that social media may be a much more effective and far-reaching method of information dissemination (ineffective communication with residents. It was also established that curbside recycling is a preferred and well-known method of recycling domestic wastes, but that reliability and education on how the system works is needed. Other trends seen were that time is a major limiting factor, so the recycling tools such as bin bags and the knowledge on recycling should be actively given to the residents to encourage receptiveness of recycling initiatives.

There was a receptiveness by the recycling companies to give this service to residents, but education of residents on how, why and what to recycle was needed. It was also found that the physical sorting of wastes is a barrier to recyclers doing curbside collection, and that support from residents for separation at source is needed. However, residents showed a limited desire to do this due to space and time limitations. While environmental injustice was seen as a possible reason for a lack of municipal support of reliable curbside collection, this would be offset by the recycling companies who are willing to provide this service.

5.3 Study Recommendations

The study forwards the following recommendations: further research avenues into marketing strategies by recycling companies so that more residents can receive information on how, why and where to recycle. Secondly, similar research like this dissertation should be done from the perspective of smaller recycling companies who work in the area of Chatsworth. Research should also be done to understand and improve the orange bag recycling project (or similar) as this has shown great support by the residents. Lastly, an experimental study should be done with specific analysis of the recycling initiative itself, for example, the RVM should be discussed with a group of residents, and then an examination should be done on how many residents actually used these initiatives after they learnt how, why and where to use it.

Moreover, the dissertation is in the firm belief that if an impactful means of information dissemination and reliable WMS were provided to residents, recycling rates in the area could improve and create a long-standing recycling culture within the community. Furthermore, an entire societal shift is required to create a circular economy, so that when the goal is achieved that all residents recycle, there is continuation in collection due to mills having availability to receive more recycling material.

5.4 Conclusions

While this study has found that a linear economy has been a factor that could affect the effectiveness of recycling initiatives, and a societal shift is needed. It is beyond the scope of this dissertation to unpack this any further. Therefore, more research is required on the issue of a linear economy and its impacts to the effectiveness of recycling initiatives. However, it can be mentioned that if the municipality and the private recycling companies took up the responsibility to ensure effective recycling initiatives were provided to residents then the SDG's of: 1: No Poverty, 2: Zero Hunger, 8: Decent Work & Economic Growth, 9: Industry, Innovation & Infrastructure, 10: Reduced Inequality, 11: Sustainable Cities & Communities, 17: Partnerships to achieve the Goal, 3: Good Health & Well-being, 6: Clean Water, and Sanitation, 14: Life Below Water, 15: Life on Land, 4: Quality Education, 12: Responsible Consumption & Production, 7: Affordable and Clean Energy and 13: Climate Action, could be addressed. Thus, showing how many topics can emerge from this notion.

Consequently, Westcliff and the other stakeholders have proved to be a rich source of information for how society could encourage the country to improve its recycling rates, which would in turn save the terrestrial and marine environments from large amounts of pollution while also growing the economy through a sustainable way, and then provide more jobs for all. It can only be hoped that every individual in society would take up the cause of recycling in whichever way they can, as large strides cannot be taken without smaller steps first.

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APPENDIX 1: RESEARCH INSTRUMENT – SURVEY QUESTIONNAIRE

UNIVERSITY OF KWAZULU-NATAL

COLLEGE OF AGRICULTURE, ENGINEERING AND SCIENCE - SCHOOL OF
AGRICULTURAL EARTH & ENVIRONMENTAL SCIENCES

Consent to Participate in Masters Research Project

I **Mekara Naicker**, am a currently registered Masters student at the University of KwaZulu-Natal, School of Agricultural, Earth & Earth Sciences. I am conducting a research titled:

An investigation of community receptiveness to current recycling initiatives: The case of the Westcliff (Chatsworth) District in the eThekweni Municipality

The formulated objectives for the study are as follows:

1. To examine the views and opinions of Westcliff community members on current recycling initiatives.
2. To understand the factors affecting the community's recycling behaviour.
3. To analyse the roles other key stakeholders (government and private recycling companies) play in influencing and supporting these views and behaviours.

Participation in this study is undertaken with an understanding that:

- 1) Your anonymity and confidentiality will be ensured at all times.
- 2) Participation is voluntary and you have the right to choose **NOT** to participate in this survey at any given point. Should you decide not to participate, you will not be disadvantaged.
- 3) All the information you provide will be used for research purposes only.
- 4) All responses provided will be recorded in writing however no names will be attached to any particular response.
- 5) Your responses will aid in informing this research on recycling initiatives of the Westcliff area.
- 6) The data obtained from this exercise will be stored with the research supervisor, in a secure location at the University of KwaZulu-Natal for a period of five (5) years, after which it will be shredded.
- 7) Should you have further queries regarding this survey, or would like more information about the topic, please contact:

Researcher: Mekara Naicker - Supervisor: Dr F. Ahmed (PhD): ahmedf1@ukzn.ac.za; Tel: 031 260 3523

University of KwaZulu-Natal Research Ethics Office: HSSREC: Ms Mariette Snyman. Email: Snymanm@ukzn.ac.za; Tel: 031 260 8350; Fax: 031 260 4609

Copy for Participant (One available on Questionnaire for completion).

DECLARATION

I (Full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participate in the research project. I understand that I am at liberty to withdraw from the project at any time, should I desire.

I further understand that my information will be recorded through writing and verbally (may be visually during the focus group discussion and key informants interview).

Participant signature: _____

Date: _____

You are given time (should you want to, out of the presence of the investigator or to consult with friends and/ or family); to read and understand the questions and the information given here before giving your consent.

If you are interested in taking part in this survey, please click on the below survey document.

*Research instrument being utilised (please tick, relevant instrument):

- ☐ Household Questionnaire
- ☐ Focus Group Discussion with Residents
- ☐ Key Informant Interviews

If you are not interested in taking part in this survey, thank you for your time thus far, and may you have a good day further.

(*) A research instrument is the method the researcher uses to gather information from the participants being studied.

Household Questionnaire are for residents of Westcliffe Chatsworth.

Focus Group Discussion with Residents is explained in Household Questionnaire.

Key Informants Interview are for people in authority that have specific information on waste management in Westcliffe, Chatsworth.

Recycling Questionnaire for Household Residents

(Only Takes 6 minutes)

The following questions have been designed to analyse your community's receptiveness to recycling wastes.

Note: Participation in this research is voluntary and your responses will be confidential. Please find the Informed consent attached.

Section A: Demographic Information

Street address (number & road):										
Gender:	Female					Male				
Age of interviewee:	20-40		41- 60		61-90		> 80			
Education:	None		Primary		Secondary		Tertiary			
Current Occupation:	Formally Employed	Self-employed	Unemployed		Student		Retired			
The number of members in the household:	1		2		3		4		Greater than 4	
The number of children in the household:	None	1	2		3		4		Greater than 4	
How do you prefer receiving information?	 Social media  			 Television		 Radio		Newspaper	Magazines	

Section B: Waste Management Behaviour

How do you sort your waste?	I do not recycle waste	Separate recyclables only	Rinse recyclables only	Rinse and Separate recyclables
How reliable has the collection of your waste been in the last year?	Unreliable	Don't Know		Reliable
Do you pay for collection fees?	Yes			No
Would you be willing to pay for recycling waste collection services rendered?	Yes			No
What type of waste management do you currently receive?	No recycling (standard waste removal).			
	Coloured recycling bin bags for recyclables left at my kerbside and collected by Durban Solid Waste or a private recycling collector.			
	To sort my waste and privately take it to a drop off-site.			

	Please state who: _____			
Do you reuse any of your recyclables (e.g., margarine containers to store for etc.)?	Yes	No		
If yes, please explain how.				
What would your ideal waste disposal method be?	No recycling (standard waste removal).			
	Coloured recycling bin containers/bags for each recyclable left at my curbside.			
	To sort my waste and privately take it to a drop off-site.			
How many of the following waste categories do you recycle?	Nothing	About half	Almost all/Everything	
Glass				
Plastics				
Food waste /Organics				
Paper and Cardboards				
Metal Cans (food and drink tins).				
Polystyrene				
Scrap Metals				
Batteries				
Light bulbs				
e-waste (electronic waste such as wash machines and personal computers).				
Are you aware of this?	Recycling drop off containers		Yes	No
	Recycling buy-back centres		Yes	No
	Government Recycling initiatives		Yes	No
If Yes, please identify who/what:				
Which of these statements apply to you in terms of why you would or do recycle?	Environmental protection		Yes	No
	Job creation		Yes	No
	Encourage my family		Yes	No
	Earn some extra money		Yes	No
	None of the above does affect me.		Yes	No
Which of these statements apply to you in terms of why you do not recycle?	I do recycle		Yes	No
	I find recycling labour intensive		Yes	No
	I do not have time to recycle my goods		Yes	No

	I do not know how to recycle my goods	Yes	No
	I do not know where to recycle my goods	Yes	No
	I do not see a reason to recycle my goods	Yes	No
	I find recycling technologies such as bins, packets and cleaning materials a cost factor.	Yes	No

Would you recycle if:		
A curbside pickup of all mentioned recyclables was created.	Yes	No
Rinsing and separating recyclables were a prerequisite.	Yes	No
Rinsing and separating recyclables were not necessary.	Yes	No
A small personal financial reward was given for proper recycling of your waste.	Yes	No

Will you be prepared to participate in a focused group discussion in the next few weeks as a follow up to this questionnaire? <i>Note: Participation in this discussion is voluntary and your responses will be confidential but recorded for research purposes only.</i> The focused group discussion will be a short online meeting of 10 community residents, where you are encouraged to speak openly about your feelings about waste management and recycling in your community. It will be recorded but remain confidential. The selection process will be based on willingness to participate and statistical methods (i.e.: chosen "at random").	Yes	No
--	-----	----

Personal opinions and thoughts

Please feel free to write any limitations, thoughts and opinions you may have on recycling that were not asked above: _____

Thank You for your patience and participation 😊

APPENDIX 2: RESEARCH INSTRUMENT – FGD SCHEDULE OF MEETINGS

UNIVERSITY OF KWAZULU-NATAL

COLLEGE OF AGRICULTURE, ENGINEERING AND SCIENCE - SCHOOL OF AGRICULTURAL EARTH & ENVIRONMENTAL SCIENCES

Consent to Participate in Masters Research Project

I **Mekara Naicker**, am a currently registered Masters student at the University of KwaZulu-Natal, School of Agricultural, Earth & Earth Sciences. I am conducting a research titled:

**An investigation of community receptiveness to current recycling initiatives: The case of the Westcliff
(Chatsworth) District in the eThekweni Municipality**

The formulated objectives for the study are as follows:

4. To examine the views and opinions of Westcliff community members on current recycling initiatives.
5. To understand the factors affecting the community's recycling behaviour.
6. To analyse the roles other key stakeholders (government and private recycling companies) play in influencing and supporting these views and behaviours.

Participation in this study is undertaken with an understanding that:

- 8) Your anonymity and confidentiality will be ensured at all times.
- 9) Participation is voluntary and you have the right to choose **NOT** to participate in this survey at any given point. Should you decide not to participate, you will not be disadvantaged.
- 10) All the information you provide will be used for research purposes only.
- 11) All responses provided will be recorded in writing however no names will be attached to any particular response.
- 12) Your responses will aid in informing this research on recycling initiatives of the Westcliff area.
- 13) The data obtained from this exercise will be stored with the research supervisor, in a secure location at the University of KwaZulu-Natal for a period of five (5) years, after which it will be shredded.
- 14) Should you have further queries regarding this survey, or would like more information about the topic, please contact:

Researcher: Mekara Naicker - Supervisor: Dr F. Ahmed (PhD): ahmedf1@ukzn.ac.za; Tel: 031 260 3523

University of KwaZulu-Natal Research Ethics Office: HSSREC: Ms Mariette Snyman. Email: Snymanm@ukzn.ac.za; Tel: 031 260 8350; Fax: 031 260 4609

Copy for Participant (One available on Questionnaire for completion).

DECLARATION

I (Full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participate in the research project. I understand that I am at liberty to withdraw from the project at any time, should I desire.

I further understand that my information will be recorded through writing and verbally (may be visually during the focus group discussion and key informants interview).

Participant signature: _____

Date: _____

You are given time (should you want to, out of the presence of the investigator or to consult with friends and/ or family); to read and understand the questions and the information given here before giving your consent.

If you are interested in taking part in this survey, please click on the below survey document.

*Research instrument being utilised (please tick, relevant instrument):

- ☐ Household Questionnaire
- ☐ Focus Group Discussion with Residents
- ☐ Key Informant Interviews

If you are not interested in taking part in this survey, thank you for your time thus far, and may you have a good day further.

(*) A research instrument is the method the researcher uses to gather information from the participants being studied.

Household Questionnaire are for residents of Westcliffe Chatsworth.

Focus Group Discussion with Residents is explained in Household Questionnaire.

Key Informants Interview are for people in authority that have specific information on waste management in Westcliffe, Chatsworth.

Focus Group Discussion - Question Guide

University of KwaZulu-Natal, Westville
School of Environmental Science
MSc Environmental Science Research
Researcher – Mekara Naicker

Venue	Chatsworth Community Hall
Date	(TBC)
Time	(TBC)

Good Morning / Afternoon Residents of Westcliff Chatsworth

My name is Mekara Naicker, and I am Masters of Environmental Science student. I am doing my degree at the University of KwaZulu-Natal, Westville Campus. I am doing a research study on “**Community receptiveness to current recycling initiatives**” with Westcliff as my Case Study area.

As part of my investigation, I decided to collect information from your community and key individuals (informants) whom have specific knowledge on what the status quo of recycling is in your area and why.

The research will hope to benefit you, the various stakeholders and decision-makers with any information that may be used to improve the status quo.

Please feel free to be candid and vocal in this discussion as your opinions and views will be of great assistance to my understanding of the current experiences you are having.

All information you disclose is strictly confidential and your personal details will remain anonymous and protected. To ensure anonymity sude names will be given to each participant for ease of communication. You are free to withdraw your participation from this interview at any time, should you wish to.

Furthermore, this meeting will be recorded for research purposes only. Your faces will not be focused on, only the research and the research tools.

As a final note, this discussion is in a community hall face to face, and strict Covid-19 must be adhered to, as instructed by the community hall.

Thank you for your participation. Let’s begin.

Section 1: Who you are

- 1.1. Please may you fix your sude name to your shirt so I may address you accordingly.
- 1.2. Please state which street you live on in Westcliff.
- 1.3. What is your understanding of recycling your domestic waste and why it is or is not beneficial?

Section 2: Current waste management of your area

- 2.1. What current waste management practices do you carry out currently?
- 2.2. Why do you utilise this type of method?
- 2.3 How do you feel that your service provider has hampered or aided you in the current waste management services you receive?

Section 3: Conventional Waste Management

Wastes that get disposed of to landfills (in Durban, this means black bin bags that go to DSW).

3.1. What are your opinions on this type of waste management?

3.2. Do you prefer this type of waste management?

As a follow up, why or why not?

3.3. Do you think that your service provider is well equipped to render these services to you?

As a follow up, why or why not?

3.3. Is there anything further you would like to add this point, based on what was asked or discussed thus far?

Section 4: Recycling Waste Management

Wastes that get separated and/or rinsed (in Durban, this means colored bin bags that are transported by DSW).

4.1. What are your opinions on this type of waste management?

4.2. Do you prefer this type of waste management?

As a follow up, why or why not?

4.3. Do you think that your service provider is well equipped to render these services to you?

As a follow up, why or why not?

4.4. What barriers have you experienced with regards to this service?

4.5. What positive experiences have you had with this service?

4.6. What would you like to be done differently, or added for this service to be more user friendly to you?

4.7. Is there anything further you would like to add or relevant stories you would like to share about what has been discussed?

Section 5: Participatory Rural Appraisal (PRA)

Note to researcher: The following activities will be one using the PowerPoint “Section 5 Participatory Rural Appraisal”.



5.1. Researcher displays a chart depicting different categories of recycling domestic waste that contains its name, symbol and sample picture. Draw a tally mark.

Question 1: Please rank how familiar you are with each of these categories.

Question 2: How likely you would recycle each of these categories.

Question 3: How much understanding do you have of each of these categories.

Recyclable Items	Familiarity of categories	Likelihood of recycling categories	Understanding of this categories
Glass 	 None	None	None
Plastics 			
Food waste / Organics 			
Paper and Cardboards 	 Medium	Medium	Medium
Metal Cans (food and drink tins). 			
Polystyrene 			
Scrap Metals 			
Batteries 	 High	High	High
Light bulbs 			
e-waste (electronic waste such as wash machines, phones, cables, chargers and personal computers). 			

5.2. Researcher displays a map depicting of the Westcliffe Area. Draw star in the relevant area.

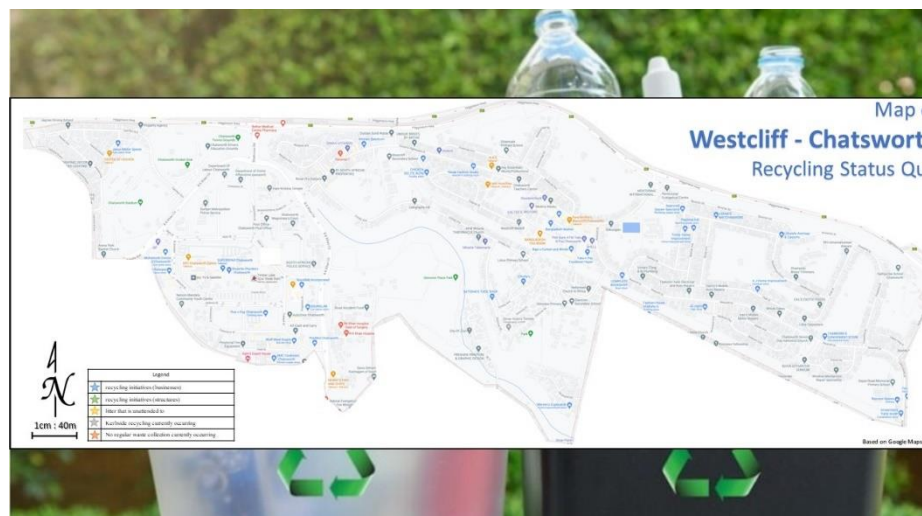
Question 1: Please indicate where you see kerbside recycling currently occurring.

Question 2: Please indicate where you do not see any regular waste management currently occurring.

Question 3: Please indicate where you see litter that is unattended to.

Question 4: Please indicate where you see other recycling initiatives (structures) currently occurring and what type. For example, large green Mpact domes etc.

Question 5: Please indicate where you see recycling initiatives (businesses) currently occurring and what type. For example, Babs Waste Paper.



5.3. Researcher displays a timeline, based from the establishment of Chatsworth to this date. Ask the group to jointly contribute to timeline verbally while researcher writes it in.

Task: Please indicate how you have noticed waste management services to have transformed overtime in your area. For example, small trucks, replaced by large trucks. People collecting goods on feet now use vehicles etc.



FGD to be set up in a circular manner to encourage discussion.

Section 6: Any final thoughts

** Researcher to jot down any insightful trends of thought that arise, and to discuss or elaborate on them here.

Thank You for your time, energy and thoughts share with me today.

Thank you participating in this discussion!!!

APPENDIX 3: RESEARCH INSTRUMENT – KEY INFORMANTS SCHEDULE OF MEETINGS

UNIVERSITY OF KWAZULU-NATAL

COLLEGE OF AGRICULTURE, ENGINEERING AND SCIENCE - SCHOOL OF
AGRICULTURAL EARTH & ENVIRONMENTAL SCIENCES

Consent to Participate in Masters Research Project

I **Mekara Naicker**, am a currently registered Masters student at the University of KwaZulu-Natal, School of Agricultural, Earth & Earth Sciences. I am conducting a research titled:

An investigation of community receptiveness to current recycling initiatives: The case of the Westcliff (Chatsworth) District in the eThekweni Municipality

The formulated objectives for the study are as follows:

7. To examine the views and opinions of Westcliff community members on current recycling initiatives.
8. To understand the factors affecting the community's recycling behaviour.
9. To analyse the roles other key stakeholders (government and private recycling companies) play in influencing and supporting these views and behaviours.

Participation in this study is undertaken with an understanding that:

- 15) Your anonymity and confidentiality will be ensured at all times.
- 16) Participation is voluntary and you have the right to choose **NOT** to participate in this survey at any given point. Should you decide not to participate, you will not be disadvantaged.
- 17) All the information you provide will be used for research purposes only.
- 18) All responses provided will be recorded in writing however no names will be attached to any particular response.
- 19) Your responses will aid in informing this research on recycling initiatives of the Westcliff area.
- 20) The data obtained from this exercise will be stored with the research supervisor, in a secure location at the University of KwaZulu-Natal for a period of five (5) years, after which it will be shredded.
- 21) Should you have further queries regarding this survey, or would like more information about the topic, please contact:

Researcher: Mekara Naicker - Supervisor: Dr F. Ahmed (PhD): ahmedf1@ukzn.ac.za; Tel: 031 260 3523

University of KwaZulu-Natal Research Ethics Office: HSSREC: Ms Mariette Snyman. Email: Snymanm@ukzn.ac.za; Tel: 031 260 8350; Fax: 031 260 4609

Copy for Participant (One available on Questionnaire for completion).

DECLARATION

I (Full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participate in the research project. I understand that I am at liberty to withdraw from the project at any time, should I desire.

I further understand that my information will be recorded through writing and verbally (may be visually during the focus group discussion and key informants interview).

Participant signature: _____

Date: _____

You are given time (should you want to, out of the presence of the investigator or to consult with friends and/ or family); to read and understand the questions and the information given here before giving your consent.

If you are interested in taking part in this survey, please click on the below survey document.

*Research instrument being utilised (please tick, relevant instrument):

- ☐ Household Questionnaire
- ☐ Focus Group Discussion with Residents
- ☐ Key Informant Interviews

If you are not interested in taking part in this survey, thank you for your time thus far, and may you have a good day further.

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Focus Group Discussion with Residents is explained in Household Questionnaire.

Key Informants Interview are for people in authority that have specific information on waste management in Westcliffe, Chatsworth.

Key Informant Interview Guide

University of KwaZulu-Natal, Westville

School of Environmental Science

MSc Environmental Science Research

Researcher – Mekara Naicker

Venue	Zoom Meeting Rooms
Meeting Link, Time and Date:	(TBC)
Date	(TBC)
Time	(TBC)

Good Morning / Afternoon Sir/Madame

My name is Mekara Naicker and I am Masters of Environmental Science student. I am doing my degree at the University of KwaZulu-Natal, Westville Campus. I am doing a research study on “**Community receptiveness to current recycling initiatives**” with Westcliff as my Case Study area.

As part of my investigation I decided to collect information from the Westcliff community and key individuals (informants) whom have specific knowledge on what the status quo of recycling is in in the area and why.

Please feel free to be candid and vocal in this interview as your opinions and views will be of great assistance to my understanding of the current status quo.

All information you disclose is strictly confidential and your personal details will remain anonymous and protected. You are free to withdraw your participation from this interview at any time, should you wish to.

Thank you for your participation. Let's begin.

Section 1: Who you are

1. please state your company name?
2. please state your occupation?
3. How are you involved in the waste management of the Westcliff area?
4. What type of experience or exposure do you have in this regard?

Section 2: The status quo of Westcliff

1. How do you believe that the Westcliff area has been enabled to recycle their domestic waste?
2. What barriers do you find when servicing the area for recycling?

3. What barriers do you find when servicing the area for conventional waste management services?
4. As a service provider, what would make servicing the community easier?
5. Is there much scope for improvement of recycling in this area?

As a follow up, why or why not?

6. What type of impact do you believe the area of Westcliff has on Durban and South Africa's waste to landfill initiatives?
7. The government had set a zero-waste to landfill target in the next few years, based on your institute what has been done towards achieving this?
8. As a follow up, how is does the Westcliff suburb fit into this?
9. Is there anything stories or thoughts you would like to add with regards to any discussed?
10. ** researcher to jot down any trends of thought and discuss it here.

Thank You for your time, energy and thoughts shared with me today.

Thank you participating in this discussion!!!