The effectiveness of environmental education on waste management practices in Mtumbane and Maheng townships in Port St. Johns, Eastern Cape

This work is submitted in fulfilment of the requirements for the degree of Master of Health Sciences: Environmental Health in the Faculty of Health Sciences at the Durban University of Technology

Innocent Dalumzi Njiva

8th November 2018

Supervisor	: _____	_____
	Ms. E.J. Kistnasamy	Date
Co-supervisor	: _____	_____
	Dr. T. Govender	Date

ABSTRACT

In this democratic era, two of the largest previously disadvantaged communities in Port St Johns i.e. Mtumbane and Maheng were still without waste collection services. Solid waste was dumped indiscriminately and posed risks to health and the environment. To help these communities to achieve better health, this study aimed to investigate the effectiveness of environmental education on waste management practices (WMP). The key objectives entailed establishing the knowledge, attitude and behaviour of sampled households towards WMP; evaluating the intervention of the 4Rs (reuse, reduce, recycle and recover) of WMP as taught to Grades 4 to 7 residing in the previously sampled households and assessing the impact of the intervention on WMP in these households.

This study was undertaken in three phases. The pre-intervention and post-intervention phases included questionnaire administration occurring over two months. The intervention comprised the teaching of the 4Rs of WMP and the completion of a daily diary by Grades 4 to 7 residing in the previously sampled households.This study focused on statistically significant differences that were reported between pre- and post-intervention. The differences were meant to establish if the respondents had any changes in knowledge regarding solid waste management.

Results showed that the use of plastic bags increased which showed a significant difference (p-value 0.034).Indiscriminate dumping of waste in Mtumbane decreased whereas in Maheng, there was no difference with their practices. Among the majority of respondents from Mtumbane, waste was regarded as something useful (p-value 0.003). The education associated with waste management for both townships increased by more than 15% and that made a significant difference (p-value 0.025). Further, more than half of the respondents in Mtumbane separated their waste. The results show that there was a significant difference (p-value 0.001) in Mtumbane and not in Maheng. This significant difference may be attributed to the distribution of adequate information as the two townships vary in distance from the municipal offices i.e. Mtumbane: three kilometres and Maheng: 15 km). It was found that the number of respondents willing to pay for waste collection services increased post-intervention (p-value 0.003).

It appears that in every aspect when pre- and post-intervention were reported, there was a positive difference after the intervention phase. Four recommendations are proposed: (1) organising solid waste cleaning campaigns and environmental education in schools and communities; (2) the introduction of the 4Rs to communities; (3) the provision of communal waste skips and (4) the use of incentives to foster proper waste disposal practices. It is important for all future studies to consider a method for disseminating important information to the community in order that waste management strategies can be fully and successfully implemented.

DECLARATION

I, Innocent Dalumzi Njiva, hereby declare that the thesis for Master of Health Sciences Degree in Environmental Health titled “The effectiveness of environmental education on waste management practices in Mtumbane and Maheng townships in Port St. Johns, Eastern Cape” is my own work and any other sources used have been acknowledged and referenced. This work has never been submitted in any university for academic purposes.

Signed: _____ Date: _____

I.D. Njiva

DEDICATION

I dedicate this work to the Creator, His Son Jesus Christ who died for my sins so that I may be free. He freed me indeed. This work shows my freedom through Him who gives me strength every day of my life. A dedication to my Spiritual Father and Mother, Pastor Martin and Pumza Mwape, for allowing me to be released from some of my church duties in order to pursue my studies. To my dear wife Bukeka Njiva who allowed me to do my study even if I did not have enough time for her, but did not complain.

My late mother Ntombencinci Njiva who had always encouraged me to study and to become someone better one day in life, my grandmother Nancy Njiva my father Jackson who was always behind me, teaching me to persevere even if I felt like giving up, to my children Sphesihle, Xola, Okuhle and Isivile my only son as they did not spend enough time with their father because of being busy with the study.

ACKNOWLEDGEMENTS

I would like to express my gratitude to:

- My supervisor Ms. Joy Kistnasamy who was patient with me during the time I was not sure which direction to take, but she took her timementoring and supporting me to the end.
- My co-supervisor, Dr. Thashlin Govender who took an extra mile to make this study a success.
- Statistician Mr. Deepak Singh whose cell phone was always open to me at any time of the day.
- Editor Dr. Steele with the excellent work performed on this thesis.
- The Ward Councillor Mr. Mhlabeni for assisting me to get access to the area through his ward committees.
- The Departmental Head: Department of Education Mr. Socikwa for granting me permission to enter these schools.
- The Principal of Gobindlovu Junior Secondary School Ms. Mjongile who supported me in every way she could.
- The Principal of Port St. John's Community School Mrs. Bam and
- The Principal of Chebenca Junior Secondary School Mrs. Tamako.

TABLE OF CONTENTS

TITLE

ABSTRACT.....i

DECLARATION.....iii

DEDICATION.....iv

ACKNOWLEDGEMENTS.....v

TABLE OF CONTENTS.....vi

LIST OF FIGURES.....ix

LIST OF TABLES.....xi

ABBREVIATIONS.....xii

LIST OF APPENDICES.....xiii

CHAPTER 1: INTRODUCTION.....1

1.1. Background.....1
1.2. Challenges.....1
1.3. Waste management status quo in Mtumbane and Maheng.....1
1.4. Problem statement and rationale.....4
1.5. Aims and objectives.....5
1.6. Study area.....6

CHAPTER 2: LITERATURE REVIEW.....7

Overview.....7

2.1. Introduction.....7
2.2. Knowledge of households regarding waste management practices.....7
2.3. Attitude of households regarding waste management practices.....9

2.4. Practices of households regarding waste management 11
2.5. Behaviour of households in waste management practices.....12
2.6. Waste management intervention strategies in schools and households.....13
2.7. Waste management intervention strategies: the 4Rs.....15
2.7.1. Waste management intervention strategies: reduce.....15
2.7.2. Waste management intervention strategies: re-use.....17
2.7.3. Waste management intervention strategies: recycle.....18
2.7.4. Waste management intervention strategies: recover.....20

CHAPTER 3: METHODOLOGY

Summary.....22

3.1. Planning stage.....22
3.2. Study population.....23
3.3. Sample size and selection.....23
3.4. Pre-intervention phase.....24
3.5. Intervention phase.....24
3.6. Post-intervention phase.....26
3.7. Data analysis.....26
3.8. Ethical considerations.....26

CHAPTER 4: DATA ANALYSIS AND RESULTS

4.1. Introduction.....28
4.2. Demographics.....28
4.2.1. Age of respondents.....28
4.2.2. Gender of respondents.....29
4.2.3. Ethnicity of respondents.....30
4.2.4. Occupation of respondents.....30
4.2.5. Education of respondents.....31
4.2.6. Income of respondents in the households.....32
4.2.7. Household size.....32
4.3. Intervention phase.....34

4.4. Pre- and post-intervention phase.....37
4.4.1. Solid waste storage materials in the households.....37
4.4.2. Methods of waste disposal.....40
4.4.3. Preferred time for solid waste disposal.....42
4.5. Attitude.....44
4.5.1. Attitude towards waste management.....44
4.5.2. Solid waste separation and reasons for not separating 46
4.5.3. Awareness associated with waste management.....48
4.5.4. Information dissemination.....48
4.5.5. Solid waste related information……49
4.5.6. Willingness to pay.....50

CHAPTER 5: DISCUSSION

5.1. Overview.....53

5.2. Demographics.....53

5.3. Knowledge, attitude and behaviour of sampled households regarding waste management practices.....54
5.4 The impact of the environmental education intervention on waste management practices in sampled households.....58

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion.....61
6.1.1. Limitations of this study.....61
6.1.2. Strengths of this study.....61
6.2. Recommendations.....62
6.2.1. Cleaning campaigns and environmental education.....62
6.2.2. The introduction of the 4Rs- reduce, re-use, recycle and recover.....62
6.2.3. The provision of communal waste skips.....62
6.2.4. The use of incentives to foster proper waste disposal practices.....62

References.....63

LIST OF FIGURES

Figure 1.1:Burning of refuse.....3

Figure 1.2: Dumping site.....3

Figure 1.3: Vacant plot dumping.....3

Figure 1.4: Burning of refuse.....3

Figure1.5: Refuse dump.....3

Figure 1.6: Along the road to the Gap.....3

Figure 4.1: Age distribution of respondents.....29

Figure 4.2: Gender of respondents- Mtumbane and Maheng.....29

Figure 4.3: Ethnicity of respondents - Mtumbane and Maheng.....30

Figure 4.4: Occupation of respondents - Mtumbane.....30

Figure 4.5: Occupation of respondents - Maheng.....31

Figure 4.6: Education of respondents -Mtumbane and Maheng.....31

Figure 4.7: Income of respondents in the households - Mtumbane and Maheng.....32

Figure 4.8: Household size- Mtumbane.....33

Figure 4.9 Household size – Maheng.....33

Figure 4.10 Daily diary results for newspapers and magazines.....36

Figure 4.11 Waste storage materials – Mtumbane.....39

Figure 4.12 Waste storage materials – Maheng.....39

Figure 4.13 Methods of waste disposal pre- and post-intervention: Mtumbane.....40

Figure 4.14 Methods of waste disposal pre- and post-intervention: Maheng.....41

Figure 4.15 Disposal times: Mtumbane……..….....43

Figure 4.16 Disposal times: Maheng……..…….....43

Figure 4.17 Willingness to pay for waste collection pre-intervention: Mtumbane.....51

Figure 4.18 Willingness to pay for waste collection post-intervention: Mtumbane.....51

Figure 4.19 Willingness to pay for waste collection pre-intervention: Maheng.....52

Figure 4.20 Willingness to pay for waste collection post-intervention: Maheng.....52

LIST OF TABLES

Table 1.1 Level of service in the areas.....2

Table 3.1 Minimum sample size.....24

Table 4.1 Results of daily diary showing significant figures.....35

Table 4.2 Solid waste storage materials in the household.....38

Table 4.3 Attitude towards waste management.....45

Table 4.4 Solid waste separation.....46

Table 4.5 Reasons for not separating waste.....47

Table 4.6 Awareness associated with waste management.....48

Table 4.7 Information dissemination.....49

Table 4.8 Solid waste related information.....50

LIST OF ABBREVIATIONS

CSIR	Council for Scientific and Industrial Research
DEAT	Department of Environmental Affairs and Tourism
EHP	Environmental Health Practitioner
FNQLSDI	First Nations of Quebec and Labrador Sustainable Development Institute
IDP	Integrated Development Plan
ILO	International Labour Organisation
JSS	Junior Secondary School
MSEs	Micro and Small Enterprises
NEM: WA	National Environmental Management: Waste Act
RHDHV	Royal HaskoningDHV
SPSS	Statistical Package for Social Sciences
UNICEF	United Nations Children's Fund
WMP	Waste Management Practices

LIST OF APPENDICES:

Appendix 1: Permission to conduct study (Ward Councillor).....80

Appendix 2: Permission to conduct study (Gobindlovu JSS).....81

Appendix 3: Permission to conduct study (Port St. John's Community School).....82

Appendix 4: Permission to conduct study (Dept. of Education).....83

Appendix 5: Permission to use Questionnaire.....84

Appendix 6: Letter of Information.....85

Appendix 7: Screening Questionnaire.....89

Appendix 8: Informed consent.....91

Appendix 9: Informed assent.....92

Appendix 10: Questionnaire.....93

Appendix 11: Diary.....109

Appendix 12 IREC approval 126

Appendix 13 Daily diary results.....127

CHAPTER 1: INTRODUCTION

1.1. Background

Before 1994, the town of Port St. John's in the Eastern Cape was governed by the then Transkeian government which had its origins in apartheid's segregation policies (Kepe, 2001). Under the apartheid era, Mtumbane and Maheng which were two large townships in Port St. Johns were not provided with waste collection, electricity, water and sanitation. Hence, they had to devise and implement their own waste disposal strategies (International Labour Organisation [ILO], 2005:5). However, due to a lack of appropriate resources; uncontrolled waste generation occurred and disposal was problematic.

1.2. Challenges

In the new democratic era, these areas still did not have municipal waste collection services (IDP, 2011: 38). This resulted in the indiscriminate disposal of solid waste in open spaces by households. Accumulated waste could cause diseases through vectors which could pose a serious health risk to residents (Maluleke, 2014:8). These unsightly waste sites then could become a threat to human health and the environment. An added challenge was poor roads (or no roads) in these townships which impeded or was hazardous to the movement of waste collection trucks.

1.3. Waste management status quo in Mtumbane and Maheng

Dumpsites were evident in certain areas of both townships and were related to the residents' consumption patterns. These townships were initially intended to be low-income settlements but evolved into middle-income households due to the upward professional mobility of members of households. Therefore, it could be deducted that those who are in the middle-income class generated more waste than those in the low-income class (Haile, 2011:53). Even though the Port St. Johns Local Municipality had a schedule for waste collection, it was sub-standard because of poor planning and budget constraints.

The Integrated Development Plan (IDP) review report stated that, "most villages in the municipality were not provided with this service and residents were responsible for disposing of their own waste, which was usually done by burning it or burying it."

A community survey report 2016 revealed that there was a huge decline on waste removal which was from 3.2% to 0.5% (IDP, 2017/2018). From the statistics in Table 1.1, noting that this may not necessarily reflect current practices, it was evident that weekly refuse removal by the local authority in Mtumbane and Maheng was poor. To compensate, the majority of residents then adopted practices as depicted in Figures 1.1 – 1.6.

Table 1.1: Level of service in the areas

Level of service	**period**	**Number. of households**	**%**
Removed by local authority at least once a week	2011	938	3.2
	2016	146	0.5
Removed by local authority less often	2011	118	0.4
	2016	59	0.2
Communal refuse dump	2011	323	1.1
	2016	703	2.4
Own refuse dump	2011	19090	65.1
	2016	22169	75.6
No rubbish disposal	2011	8093	27.6
	2016	5630	19.2
Other	2011	762	2.6
	2016	645	2.2
Total	**2011**	**29324**	**100**
	2016	**29352**	**100**

Source: Republic of South Africa: Statistics South Africa, (census 2011 and Community Survey 2016)

Figure 1.1: Burning of refuse (Njiva, 2016)

Figure 1.2: Dumping site (Njiva, 2016)

Figure1.3: Vacant plot dumping (Njiva, 2016)

Figure 1.4: Burning of refuse (Njiva, 2016)

Figure1.5: Refuse dump (Njiva, 2016)

Figure1.6: Along the road to the Gap (Njiva, 2016)

1.4. Problem statement and rationale

The Department of Environmental Affairs and Tourism (DEAT) defined litter and illegally dumped waste as “any waste found outside the formal waste management system” (Department of Environmental Affairs and Tourism [DEAT], 2006). The waste that was produced eventually returned to the natural environment- i.e. land, water or air. Peoples’ behaviour in this regard could be detrimental to the pollution or contamination of the surrounding natural resources (Maluleke, 2014:5). In Mtumbane and Maheng, waste management practices were a challengedue to a lack of proper waste collection services.

The trend of poor solid waste management practices by municipalities made it more difficult for the areas that received inadequate waste collection service or none at all. People in these areas threw household waste on the road verges, open plots and public open spaces. These behaviours were obseved in Port St. Johns which was a key tourist destination. Places such as the Gap and Second Beach attracted tourists who had to pass through these unsightly sites littered with household waste. Therefore, it was imperative that waste management and environmental degradation awareness activities needed to be initiated in these study areas and provided to residents.

Residents could use the information gained to create income earning opportunities from the waste that they generated. As waste generators, they could participate in recycling by forming for example co-operatives that could further reduce the amount of generated household waste and decrease poor disposal practices. Financially, the local authorities had insufficient funds to render the services that were needed by the residents. Additionally, due to the high unemployment rate; most residents were unable to pay for the services (International Labour Organisation, 2005:5). The burden then fell on the residents to dispose of their own household waste (Integrated Development Plan [IDP] 2017/2018).

The indiscriminate dumping of food, domestic waste and construction or demolition waste in residential streets, vacant plots and public spaces became a public health hazard (Mungure, 2008:8). There were signs of rodent and fly infestations which could contribute to disease transmission (Otoma, 2012:187).

Fly infestations at these dumpsites had -the potential to transmit diseases such as myiasis, diarrhoea, typhoid fever and cholera whilst the rodent infestation could potentially transmit diseases such as Lassa fever plague, leptospirosis and murine typhus (Adogu et.al. 2015:447). Given the potential for disease transmission and because of a lack of environmental education, residents needed to be educated about these environmental issues. If these communities could be educated regarding the dangers posed by indiscriminately dumping waste and provided with appropriate information and education, they could change their attitudes, practices and their behaviour.

Therefore, this study sought to introduce an intervention i.e. teaching Grade 4 to 7 children who are residents in these- townships, and attended Port St. Johns Community School and Gobindlovu Junior Secondary School. This intervention taught how to best manage household waste by using the 4Rs which was: reduce, reuse, recycle and recover. It was supposed that heads of households could then be persuaded or influenced by their children to introduce the 4Rs as best practices.

1.5. Aims and objectives

Aims

The aim of this study was to determine the effectiveness of environmental education on waste management practices in Mtumbane and Maheng in Port St. Johns, Eastern Cape.

Objectives

(a) To establish the knowledge, attitude and behaviour of sampled households regarding waste management practices (WMP).
(b) To evaluate the intervention of the 4Rs of waste management practices (reuse, reduce, recycle and recover) taught to Grades 4 to 7 residing in the previously sampled households
(c) To assess the impact of the environmental education intervention on waste management practices in these households.

1.6. Study area

The study area was composed of two demographically similar townships, namely Mtumbane and Maheng. Mtumbane was situated in the south eastern part of the study area about three kilometres out of the town of Port St. Johns, in the region of OR Tambo District, Eastern Cape. These areas were represented by a Ward Councillor in the municipal council and assisted by Ward Committee Members and Sub-Committees of the sub-units regarding the affairs of the community. The population of Port St. Johns was N= 6 441(Statistics South Africa, 2011). Mtumbane (n=2125) and Maheng (n=1605) were the two townships that housed nearly 58% of this population. The average estimated household size in Mtumbane and Maheng was 4.9 in 2011 and were mainly composed of people of African descent (Statistics South Africa, 2011).

The next chapter will review local, national and global literature as related to the aim and objectives of the study.

CHAPTER 2: LITERATURE REVIEW

Overview

This chapter reviewed studies that assessed solid waste management in residential communities. Additionally, literature on knowledge, attitude practices and behaviour of residents regarding solid waste was sourced and implementation strategies, with an emphasis on the 4Rs (reduce, re-use, recycle and recover) was noted.

2.1. Introduction

Poor solid waste management (which is defined as refuse from households, non-hazardous and yard waste) is a major global problem in urban and rural communities (Adogu et al., 2015:447). This was mostly influenced by the lack of knowledge, poor attitudes and practices that were not environmental friendly (Kamara, 2006:53). A study in New Jersey concluded that "The lack of knowledge, personal salience and efficacy were barriers interfering with the motivating effect of a person's sense of responsible action and conservation ethic" (Post, 2007:24). People acted irresponsibly due to a lack of participation in waste management programmes and receiving inadequate information on waste reduction strategies (Post, 2007:24). This irresponsible behaviour also had an adverse effect on people's attitudes.

2.2. Knowledge of households regarding waste management practices

The lack of knowledge about the composition and characteristics of waste generated caused difficulty in implementing household waste management strategies. This was evidenced in Haitian cities where public officials endeavoured to implement waste management strategies but found it problematic to do so (Philippe and Culot, 2009:73). Conversely, the Al Ghobeiry community in Beirut was aware that waste accumulation spread diseases, polluted water and produced offensive odours and they then changed the way they behaved regarding waste management practices (Karout and Altuwaijri, 2012:781). Similarly other communities were aware that they had an important role to play regarding waste collection but they also blamed the government for inadequate service provision (Post, 2007:112; Ezeah, 2010:127).

Regarding awareness of waste management, the residents of Ontario knew that it was their responsibility to reduce waste and were knowledgeable on recycling strategies. They were also fully aware that their consumption patterns needed re-assessing, as often bought goods were contained in non-recyclable packaging (Parizeau, von Massow and Martin 2014:212).

Gender, age, income and education levels also played a role in waste management practices. A survey in Port-Harcourt City by Agwu (2012:89) revealed that males were more aware of waste management practices whilst those less than 25 years of age had more knowledge on this aspect. Otoma et al. (2013:194) showed that households with a high income adequately managed waste in comparison with the low income group. Having knowledge and practising this in corresponding behaviours were not necessarily evident in other studies. Zvikaramba (2008:23) found that in Harare, there was a difference between those who had a tertiary and secondary education in terms of improper waste disposal and their existing knowledge that this could lead to diseases like malaria. Nonetheless, only less than 50% of the study sample was involved in recycling programmes.

In the case of Kampala, Uganda, even though households knew about waste segregation through many sources, some did not consider separating their waste as important but considered it “dirty” and “time-wasting” (Banga, 2011:32). However, most households realised that recycling could be a source of income and subsequently, separate degradable from non-degradable materials. Similarly, in Ghana, even though study participants seemed to be knowledgeable regarding waste management, there was no separation of stored solid waste (Yoada, Chirawurah and Adongo, 2014:7).

In the Philippines, it seemed as if they only had knowledge on recycling initiatives (Premakumara, 2011:13). Whilst in Malaysia though they knew about recycling, the recycling centres were far from residences (Omran et al. 2008:283). In a South African study, the residents of Msunduzi Municipality, KwaZulu-Natal had no knowledge of the adverse effects of their solid waste on the environment, for example the production of methane gas which polluted the air and contributed to global warming (Naidoo, 2009:103).

This lack of knowledge could be attributable to their socio-economic status as other areas that had attained a higher level of education had access to many information resources on environmental issues.

2.3. Attitudes of households regarding waste management practices

In any given situation, there would be different groups with different ideas and attitudes. The -attitude of the residents in Ghana was related to the payment of the services (Seth et al., 2014:76). They indicated that if they paid for waste collection, there was no need for them to sort their waste because this was the governments' responsibility as this was funded through their taxes. Banga (2011:8), found that residents in urban Kampala, Uganda, only separated their waste when there was a market for such waste. Residents' attitudes differed as some people thought that their health would not be affected by burning the waste or that there would be no fine or imprisonment for illegal dumping due to a lack of municipal collection.

Here, service delivery was a major challenge for municipalities due to the inadequacy of equipment, personnel and financial resources which limited waste collection and transportation. Disenfranchised communities had to find alternative means for handling their waste. This means that all types of waste including hazardous and healthcare waste were found in streams or thrown on to the dumpsites. However, in Sierra Leone, there were various waste management methods used including street bins, dumpsites, burial and burning in pits and disposing of waste in bags supplied by Freetown Waste Management Council (Sankoh, Yan and Tran, 2013:668). Furthermore, a common practice was said to be food waste grinding, component separation and composting.

In Peru, though waste was a problem, residents did not realise that they were part of the problem and were supposed to participate in problem solving (McAllister, 2015:53). To them, it was the local government or municipality's problem to deal with. In Cebu City, Philippines -most of the households acknowledged that they had a problem with their waste while the rest of the households thought that it was not a problem (Premakumara, 2011:13). They saw waste as only a problem when it had not been collected and households did not have any more space to store their waste.

This attitude of some communities were related to the payment of the services, and they indicated that if they paid for the collection of their waste, there was no need for them to sort their waste and it was the government's responsibility to provide door-to-door collection.

The residents in Kampala, Uganda, were concerned with issues such as separating their waste when they found out that there was a market for such waste (Banga, 2011:37). They practised waste recycling and benefitted from the sales and they also understood that plastics were non-biodegradable and needed to be removed from the waste stream. However, the attitude of Jamaicans differed as they considered other social issues such as employment, crime and cost of living as more important rather than having a clean community (Post, 2007:13). There was also a tendency to throw waste on the streets, and into drains and gullies as residents had no other means of disposing of their household waste.

The residents in Da Nang city did not know much about waste segregation but approximately 90% of them were willing to co-operate in the waste segregation practices (Otoma, et al, 2013:192). Migration of the people from rural to urban areas played a huge role in aggravating waste management problems in urban Accra (Yoada et al., 2014:8). In Malaysia even though more than 50% of the residents showed concern about waste management practices, the different demographics of these residents led to differences in attitudes. Also, the issue of the environment was never considered as important and ranked low in the hierarchy of priorities (Subhan, Ghani and Joarder, 2014:133).

Again as was mentioned in previous studies, the Al Ghobeiry community considered maintenance and cleanliness of their area as the responsibility of the municipality and they did not have an understanding that their health would be affected by solid waste management issues (Karout and Altuwaijri, 2012:782). In South Africa, the residents in Mamelodi East, Gauteng had a negative attitude towards the collection of their waste as it was collected infrequently (Nkosi, 2015:40). Residents with a higher education level knew that the dumping of waste was inappropriate and detrimental whilst those with a lower level of education continuously dumped their waste in open areas.

This behaviour is an indication that people's attitude towards waste management practices could be influenced by the payment of services and inadequate service delivery.

2.4. Practices of households in waste management

Anecdotal evidence suggested that as a result of the waste management practices in the study areas, solid waste is dumped indiscriminately in vacant plots. Storm water culverts and channels are blocked by the volume of the waste. A similar situation existed in Peru with its production of over 20 000 tons of solid waste per day where most of this waste is dumped indiscriminately in open dumps and waterways (McAllister, 2015:51). Further, the community in Peru did not consider littering a serious issue and this improper practice did not bother the community. The city of Cebu, Philippines, had an increasing rate of waste generation and the ratio of waste collection was approximately 80%, of which 57% was residential waste.

The waste disposal practice in this area was commonly open dumping, burning and burying (Premakumara, 2011:5). Post (2007) found that Jamaicans had various methods of handling their waste, with low-income households using any convenient container that could be used for solid waste collection such as cardboard boxes, milk crates, and small plastic bags. In the middle- and high-income communities, overflowing waste containers would be found at the kerbside until collection occurred. The inadequacy of equipment, personnel and financial resources facing all local authorities limits waste collection and transportation. This meant that all types of waste including hazardous and healthcare waste were found in the waste stream and was thrown on to the dumpsite (Ezeah, 2010:29).

The waste generated in Harare had a high moisture content and could be used for compost but this was not practiced (Zvikaramba, 2008:20) but instead of composting the waste was disposed of in open dumps on street corners and became unsightly. Residents in Harare preferred to burn their household solid waste and minimal waste was dumped or buried. In handling household waste in Can Tho City, Vietnam, a common practice was food waste grinding, component separating and composting (Nguyen, Matsui and Fujiwara, 2010:2308). Researchers found that the generated waste was dumped in open dumps without any sorting or treatment and was exposed to human and animal scavengers.

This practice posed a potential health risk. Burning and burying of solid waste seems to be the norm in developing countries, though almost half of the municipal budget is spent on solid waste management but less than half the population received the service (Memon, 2010:33). According to Yoada et al. (2014:8), some residents in Accra, Ghana disposed of their waste in nearby bushes, gutters and streets while the majority of the residents had their waste collected by private contractors or they used community bins when the collectors delayed.

Further those paying for municipal service had the challenge of irregular collection. Hoornweg and Thomas 1999 cited in Pillai and Shah (2014:23) noted that privately owned or public sector waste management systems in most developing countries failed in maintaining this important service to the communities. They further stated that the lack of knowledge and scarcity of studies in developing countries resulted in improper practices of solid waste management. Developing countries have a challenge when it comes to solid waste management, because of the complexity of the composition of waste.

Periathamby, Fauzia and Khidzir (2009:96) observed that the development of urban settings that took place in Malaysia led to an increase in the waste generation trends. Studies have shown that more waste was generated because of fast-growing populations, due to people migrating from rural areas and settling in slums (Kapepula et. al. 2006:1690). People in rural areas had inadequate employment opportunities. They then resorted to migrating to the nearest possible urban area to find employment. In this study, the subsidised housing inPort St. Johns did not cater for a large population. Migrants built their own mud structures or shacks in backyards leading to increased waste generation in the area.

2.5. Behaviour of households inwaste management practices

The study areas were characterised by waste that was randomly disposed of. This was similar to the findings in a study by Grazhdani, (2015:6) where the waste collection system was insufficient; causing the people to dispose of their solid waste randomly and there was no proper control of their waste. Age and literacy played a huge role in these behaviour patterns.

The elderly and illiterate did not care what was done with the waste whereas the young and educated knew about waste, though they did not have adequate knowledge as to how to manage it properly (Haile, 2011:51). Pirani et al. (2014) found that in their study, age had an effect on the behaviour of the sample group. The elderly and the young people generated more residential waste since they stayed longer at home and were not aware of ecological effects whereas the middle-aged adults were found to generate less residential waste.

In another study, the sample group believed that if the waste was not dumped anywhere close to the dwelling, it would not lead to disease transmissions and that diseases can be prevented by collecting waste in a closed container (Karout and Altuwaijri, 2012:782). In Turkey, Istanbul, solid waste was dumped at open sites or in the sea with no preventive measures and this had at one stage caused a serious accident that led to a loss of 39 lives (Getahun et. al. 2011:6344). Waste that was dumped in these dumpsites piled up and caused an explosion from the methane gas generated by the waste.

In South Africa, Kamara, (2006:63) noted that illiterate people living in Tshwane Metropolitan Area of Gauteng did not participate in any system or pay for the waste management services. Most of the less educated people (primary and junior secondary education) tended to litter and were not concerned about waste avoidance and minimisation. In Clermont, KwaZulu-Natal, residents used land filling or land spreading in the township for their solid waste disposal. This practice proved futile as residents did not keep to scheduled times for disposal (Ngeleka, 2010:77).

2.6. Waste management intervention strategies in schools and households

Waste should be targeted at source by technological means and by educating necessary stakeholders in order to reduce its generation. Education can start in schools and the knowledge can be conveyed to the public. Education in schools means that school-going children will gain knowledge which can be transferred to their parents (Kofoworola 2007:1142).

Literature has shown that from the ages of 9 to 12years, children are aware of the adverse effects of poor hygiene practices and if they are shown what is supposed to be done and how, they imitate this practice and behaviour (United Nations Children's Fund [UNICEF], 2012:8). If children are educated, they could influence their parents' knowledge, attitudes and behaviour. Damerell, Howe and Milner-Gulland (2013:3) conducted research which indicated that parents with children who had a background of environmental education gained knowledge of the environmental issues, without being aware of the fact. The transfer of knowledge from children to their parents means that children can be "effective agents for the environment".

Although children can be used to transfer knowledge, they are not able to make decisions in order to make changes in people's behaviour. Shared information on health risks was therefore an important collaborative tool (Post, 2007:129). Waste was and continues to be a result of human activities; therefore, the public needs to be brought on board in order to develop programmes for the management of waste. Collaboration would enhance educational awareness campaigns, behavioural change and participation in change.

For these public education campaigns Post (2007:129) recommended that:

- Environmental education should be incorporated in the schools' curriculum.
- Public awareness raising campaigns for the public to understand and conserve the natural environment.
- Participation needs to be encouraged by informing the public about household waste management methods.

Through the advent of educating children, South African communities can become aware, begin to understand and begin to participate in environmental planning, decision-making and in developing the appropriate policies which hold possible and known polluters to account (Godfrey, 2007:1666).

Solid waste clean-up campaigns held in communities such as Gaborone, Lobatse, Francistown, and Maun afforded them capacity to abate litter and have environmental awareness (Kgosiesele and Zhaohui, 2010:148). Waste mis-management is brought about by the government's incapability to manage the waste, not because of the amount accumulated in the cities. Waste managers need to keep up with the extent of the problem.

They have to engage informal structures as well as public and private organisations for the smooth running of the waste management system (Mungure, 2008:37). Kapepula et al. (2007) stated that waste collection volumes can be reduced by sorting the waste and removing organic from general waste. The people of urban Dakar were given receptacles in order to segregate the different types of household solid waste, the special receptacles being a way of keeping them motivated in the process of sorting their waste. In another study, it was found that about 60% of the population knew how to separate organic and inorganic waste (Otoma, et al, 2012:190).

Waste segregation should be done at source, separating the dry and the wet waste. Approximately 80% of the residents of urban Kampala had knowledge of waste segregation practices because they had been informed by scrap dealers who wanted them to separate metal, plastics, polythene and glass (Banga, 2011:32). Scrap dealers and waste vendors separated waste for efficient disposal or for composting. Thus, waste segregation was seen as one of the strategies that minimised waste in communities.

2.7. Waste management intervention strategies: the 4Rs

The intervention strategies noted in this study comprised four components namely: reduce, re-use, recycle and recover. The waste management hierarchy in South Africa encourages use of the four strategies, that is, reduce, re-use, recycle and recover (Council for Scientific and Industrial Research [CSIR], 2011:20). This minimises the use of natural resources and diminishes the environmental impacts.

2.7.1. Waste management intervention strategy: Reduce

The term “Reduce” refers to “products and materials that should be designed in a manner that minimises their waste components or in a manner that reduces natural material quantities used and potential toxicity of waste generated during the production and after use” (Department of Environmental Affairs and Tourism, 2011:9). Awareness of waste generators needed to be raised for the reduction of waste to be successful. The World Bank (cited in Memon, 2010:33) reported that approximately 20% to 50% of the municipal budgets in developing countries were spent on municipal solid waste services.

However, even then almost half of the population did not receive the service they deserve. In high-income countries waste treatment facilities have a bigger share of the budget and the costs for solid waste collection is reduced because they practise reduce and recycle strategies (Memon, 2009:33). Contrary to this, developing countries (China, South Korea, Malaysia and India) use the municipal budget for solid waste collection and were not able to use it for waste treatment facilities unless they requested external funding.

The consumption patterns of communities in Quebec helped to reduce the waste generated in their respective households (First Nations of Quebec and Labrador Sustainable Development Institute [FNQLSDI], 2008:5). Communities were informed that goods that needed much packaging generated a large amount of waste which was mostly plastic bags. This has lead to uncontrolled waste, littering the streets, lakes or beaches. Uncontrolled waste resulted in birds ingesting plastic and dying. Additionally, the communities were advised that if plastic bags were not properly managed, they were likely to cause floods due to blocked culverts and drains. Items bought tended to have unnecessary packaging, which amounted to throwing money into the refuse.

Using less packaging reduces the amount of refuse that would go to dumping or the landfill site thereby reducing the type of pollution and greenhouse gases which would eventually lead to global warming (Hennepin County Environmental Services, 2011:7). With the reduction of waste there is a number of benefits, such as saving natural resources and reducing costs. In Sri Lanka approximately 15% to 25% of the budget per annum goes to solid waste management and about 60% to 70% of this goes on collection and transportation (Ministry of Local Government and Provincial Councils [MLGPC], (2008:6). When waste reduction occurs, it meant more saving on spending for collection and transportation.

The waste management hierarchy in South Africa encouraged use of the four strategies, that is reduce, re-use, recycle and recover, this has a potential of reducing the use of natural resources as well as the environmental impacts and all this ultimately leads to waste reduction (Council for Scientific and Industrial Research [CSIR], 2011:20).

2.7.2. Waste management intervention strategy: Re-use

The term re-use refers to “utilise the whole, a portion of or a specific part of any substance, material or object from the waste stream for a similar or different purpose without changing the form or properties of such substance, material or object.” (National Environmental Management: Waste Act [NEM: WA], 2008). This means that one can extend the life of something that was considered to be useless, or give it a second life span though it was considered to be dead. The reasons behind this strategy were to reduce consumption patterns, reduce the volume of material which would go into the refuse bin and being disposed of at landfills which would preserve the environment with its raw materials.

Using organic waste for composting also helped reducing the waste generated from households, and adding back nutrients and minerals to the soil (Jamasb and Nepal, 2010:1342). In Lagos food waste which was putrescible and regarded as being useless comprised a large part of the waste stream, but it could be re-used as compost for conditioning the soil (Kofoworola, 2007:1142). In Bangalore, India segregated biodegradable and non-biodegradable materials had the potential of being sold in the form of compost. Public awareness drives could show how this could contribute to household income (Ravi Kumar, Jayaram and Somashekar, 2009:482-483).

Abdul-Rahman (2014:2) argued that people only thought of throwing away everything that they thought was useless to them, not giving a thought to how this material might make an impact at a later stage. The materials that were thought to be refuse were not actually refuse rather, they were a resource. As the saying goes “One person’s trash is another person’s treasure.” Therefore, money could be saved and resources conserved if we re-used whatever was thought to be unwanted. In Durban, South Africa building rubble had its dedicated area and was used to repair the fencing of the landfill site and crushed bricks were used in the landfill site cells for covering the refuse (Council for Scientific and Industrial Research, 2011:24).

Also, the city of Cape Town used tar which was removed from the roads during repair work, then re-used in the resurfacing of other roads. The South African government practises introduced a levy on plastic shopping bags so that people would re-use their plastic shopping bags (UrbanEARTH, 2013:4). One of the popular ways of re-using is the return of glass bottles; whenever a person bought a drink with a returnable bottle, a deposit was paid which was then refunded when returning the bottle to the seller. These bottles were then cleaned and re-used

2.7.3. Waste management intervention strategy: Recycle

The term recycle means “A process where waste is reclaimed for further use, and includes the separation of waste from a waste stream for further use and the processing of that separated material as a product or raw material” (NEM: WA, 2008). Singhirunnusorn, Donlakorn and Kaewhanin (2012:38) pointed out that, policies on recycling on their own did not reduce the waste being generated but when waste was treated as an “income generator” or as “a resource” it could change consumption patterns and bring about changes in the economy. The authors further stated that disposal costs could be reduced and recovery processes enhanced through being more efficient.

Gutbelert (2018:202) argued that waste is not taken serious as something that can be considered as a serious matter. This is seen as something which has to be considered by engineers whereas it needs to be looked at by all affected parties. This issue has to be involved in the list of priotities when talking about recycling as resource reclamation. According to Troschinetz and Mihelcic (2008:916), some people recycled because they either understood the reasoning behind recycling or they saw a need to recycle. Studies show that 95% of environmental impact of a product occurred during extraction of raw material manufacture, and before being discarded (Annepu, 2012:41).

For this reason, recycling could reduce the lifecycle of a product in the environment. Kerb-side recycling was commonly used for the collection and sorting of waste for recycling in developing countries. Waste pickers (previously referred to as scavengers) did the recycling in order to generate an income by selling their recyclable materials to recycling shops, intermediaries or exporters. In Macedonia waste pickers were impoverished but job creation could occur through this exercise if the community supported waste picking (Medina, 2004 cited in Finn, 2007:38). If people were informed of the benefits of recycling, they would become more willing to campaign for recycling programmes (Guerrero, Maas and Hogland, 2012:226). According to Godfrey and Oelofse (2017:8) the informal waste sector played a huge role in growing the economy through recycling and is still expected to see more growth of economy by the waste pickers.

Environmental conservation as well as reduction of waste going to the landfill could be achieved by recycling (Bao, 2011:17). Kofoworola (2007:1141) argued that in order to manage municipal solid waste in Lagos efficiently, a waste recycling approach was an appropriate strategy. Kofoworola further stated that the government did not give enough attention to recycling programmes as a form of managing waste and there was no facility specifically allocated for the recovery of the materials. Banar et al 2001 cited in Maluleke (2014:21) stated that recycling in Turkey was a business activity which people engaged in to make a living, with items such as glass and plastic being recyclable materials that could be used by industry.

The number of industries are increasing with the escalating amounts of materials being supplied and when this happened it meant that more jobs could be created for the unemployed in the recycling market as well as preserving the environment as less natural resources will be used (Abdul-Rahman, 2014:3). The recycling processes in South Africa were championed by co-operatives who drove these initiatives voluntarily, with funding from the government and were managed by an independent body (Muzenda, Ntuli and Pilusa, 2012:150). The co-operatives recycle materials such as metal beverage cans, paper and glass.

A study by Maluleke (2014: 47) revealed that in the municipality of Polokwane there was no recycling programme in place whereas cities such as Cape Town and Johannesburg had started such recycling programmes. In Grahamstown there were some local recycling programmes, but they were not supported by the local municipality (Etengeneng, 2012:11). Assistance from the municipality could sustain local businesses and informal recycling enterprises could provide financial relief for the formal waste management programme. Given the above studies, it can be concluded that, South Africa does not have an active formal recycling programme in place.

2.7.4 Waste management intervention strategy: Recover

“Recover” means the controlled extraction or retrieval of any substance, material or object from waste to produce a product. (NEM: WA, 2008). When dealing with the issue of waste recovery, various processes were used in the United Kingdom to treat municipal solid waste such as anaerobic digestion, composting and incineration (Garg et al, 2009:2289). Further, researchers have pointed out that waste (such as paper, plastic and wood) which would not be used as compost could be used for energy recovery because of their high calorific value. Research showed that in the United Kingdom an incinerator could process 200kt/y of the municipal solid waste, producing heat and electricity.

This waste could be used even if it has reached the landfill site. It is because when landfill gas is released from the waste which had decomposed it could be used as a fuel which would help engines to produce energy (Jamasb and Nepal, 2010:1343). In Europe and the United Kingdom there was a policy regarding waste which diverted it through the 4Rs before the remnant goes to landfill (Papageorgiou, Barton and Karagiannidis, 2009:3000). Furthermore, the waste that goes to the landfill has a potential of emitting greenhouse gases and the same gas can be used effectively with the technology of gasification and pyrolysis to recover energy.

The authors stated that with the use of technology, incineration could convert waste to energy with the heat used in turbines to generate electricity. In South Africa, recovery is one of the options for waste beneficiation but not all the waste material can be recovered for beneficiation. For the waste that could be recovered, there was a need to do waste segregation as certain materials could contaminate others. Diverting waste to produce energy could provide benefits in the form of revenue and power production (Royal HaskoningDHV, 2014:124).

The next chapter will describe/explain how the study was conducted, the phases of the study, study population, sample size and selection, inclusion and exclusion criteria, data analysis and ethical considerations.

CHAPTER 3: METHODOLOGY

SUMMARY

This chapter provides a description of how this study was designed to obtain informationon the effectiveness of an intervention i.e. environmental education on waste management practices in Mtumbane and Maheng. This study was undertaken in three phases i.e. pre-intervention, intervention and post-intervention.

Pre-intervention phase: It was firstly necessary to assess the knowledge, attitude and behaviour of sampled households regarding waste management practices by using a validated questionnaire.

Intervention phase: this included the teaching of the 4Rs (reduce, re-use, recycle and recover) of waste management practices and the completion of a daily diary by Grades 4 to 7 residing in the previously sampled households.

Post-intervention phase: the same validated questionnaire used in the pre-intervention phase was used to assess if the intervention changed waste management practices in these households.

Questionnaire administration occurred over a period of two months.

3.1. Planning Stage

Approval and ethics number [REC 36/16] was obtained from the relevant research committees at the Durban University of Technology. Permission was requested and granted by the relevant Ward Councillor (See Appendix 1) to conduct this study in the two townships. Further consultation and permission was obtained from the Department of Education and the respective principals of two schools i.e. Port St. John's Community and Gobindlovu Junior Secondary School (See Appendix 2 and 3). Additionally, data collection instruments were compiled and comprised:

a) A questionnaire which was used with permission from K.Butcher@ids.ac.uk (See Appendix 4) and
b) A diary (See Appendix 12) which was compiled from Stockport Metropolitan Borough Council at www.stockport.gov.uk/waste.

Both instruments were adapted to the South African context and were available in English and isiXhosa.

Piloting of these instruments and the proposed intervention were undertaken in a demographically similar area: i.e. Greenfields Township at Chebenca Junior Secondary School. Ten learners and their respective heads of households who met the inclusion criteria were the piloted sample group. Based on the pilot outcomes, all study instruments and the intervention were revised as needed for language, understanding and content. The study also required the use of trained interviewers who prior to interviewing, were given training on the aim and objectives of this study and on interviewing techniques.

3.2. Study population

The study population comprised learners of Port St. John's Community School and Gobindlovu Junior Secondary Schools who ranged from the ages of 9 to 12 years and were during the data collection phase in Grades 4 to 7. These schools were chosen because the children were from the two study areas (Mtumbane and Maheng). The ages and grades were chosen for the following reasons:

a) It was easier to communicate with this age group;
b) should any follow-up be required, the learners and their respective head of households could be easily contactable and
c) additionally, each learner that met the inclusion criteria would be invited together with their respective head of household to participate in this study.

The number of respondents to be interviewed in Mtumbane and Maheng was initially 41 and 59 respectively as the numbers were taken in the previous year. However, during the time of the actual fieldwork, the numbers had changed in both schools affecting the number of head of households that responded.

3.3. Sample size and selection

The population of Grades 4 to 7 in Port St. John's Community School and Gobindlovu Junior Secondary School was 82 and 118; respectively as noted in Table 3.1 below. The response distribution was 50% which gives the minimum sample sizes as stated in Table 3.1.

This was determined using Raosoft Statistical Software (RSS) at a 95% level of confidence. The two schools were selected because the learners were from these two study areas and they were the only schools in the study areas.

The sample size for the post-intervention phase was also determined by RSS at a 95% level of confidence.

Table 3.1: Minimum sample size

Name of School	**Grades 4-7**	**Minimum sample size**
Port St. John's Community School	82	41
Gobindlovu Junior Secondary School	118	59

Participants were selected by means of inclusion and exclusion criteria:

Inclusion criteria: learners residing in the townships of Mtumbane and Maheng who were between the ages of 9 to 12 years and were during the data collection phase, in Grades 4 to 7.

Exclusion criteria: learners not residing in the townships of Mtumbane and Maheng.

All learners from these schools who met the inclusion criteria and their respective heads of household were invited through a letter of information (See Appendix 6) and a screening questionnaire (See Appendix 7) to participate in this study. The respondents were sampled in accordance with the sampled learners. After informed assent and consent (See Appendices 8 and 9) was obtained, data collection commenced.

3.4. Pre-intervention phase

A validated questionnaire was administered by trained interviewers to each head of household who had consented to participate in the study. The key components of the questionnaire included: demographics questions relating to knowledge, attitudes, practices and behaviour regarding solid waste management.

3.5. Intervention phase

This phase included teaching of Grades 4 to 7, residing in the previously sampled households, the 4Rs of waste management practices (reduce, reuse, recycle and recover) and directions on how to complete the daily diary. This was piloted in Chebenca Junior Secondary School.

The sample groups from each school were given a week's training on the 4Rs by the researcher during the school break of each day.

Relevant stories and visual aids were used to introduce and operationalise the teaching of the intervention. To begin the teaching process, participants were asked the following questions:

- Do you recycle?
- What do you understand by the 4Rs (reduce, re-use, recycle and recover)?
- Why are these Rs important in our daily lives?
- What happens to the things that we throw away?

Visual aids included:

a) For *reduce:* disposable goods such as paper plate, plastic spoon, paper bowl, polystyrene cup, disposable diaper and a hand paper towel; while there were also durable goods such as plastic plate, metal spoon, plastic cup, dish cloth and a cloth diaper.
b) For *re-use:* items made from packaging and steel that could be used to hold pencils and pens.
c) For *recycling*: aluminium cans, paper, magazines and newspaper.
d) For *recovery:* paper, polystyrene plates and cups.

After each day's teaching, groups of learners were requested to enact scenarios regarding waste disposal and list some solutions which they could implement at home. After a week's training, each participant received a diary that was used to record information at their respective homes for two weeks thereafter, inclusive of weekends. For this time period, each participant recorded how various waste was reduced, reused, recycled, recovered and disposed of. The infomation to record was according to what the participants were doing each day as reagrds waste management practices. At the conclusion of two weeks, the diaries were collected as per the instruction given in the diary.

3.6. Post-intervention phase

After the completed diaries were collected, the trained interviewers using the same validated questionnaire as used in the pre-intervention phase, collected data from the head of households who had agreed to participate in this study. Data collected would assess the impact of the environmental education intervention on waste management practices in these households.

3.7. Data analysis

The Statistical Package for Social Sciences (SPSS) 23.0 was used for analysis. Data was presented as simple frequencies and percentages. Descriptive statistics in the form of tables and graphs was used to describe demographic, socio-economic status, levels of education, knowledge, attitudes, practices and behaviour in the sampled household towards waste management practices and the data from the completed diaries. Bivariate data analysis then followed where the relationship between two variables was analysed.

This allowed for the testing of association. Some examples of this technique included for example, comparing the outcome of interest i.e. the intervention. Inferential statistics was performed using the Fisher's Exact and Chi Square Tests and correlations related to participant demographics and household practices and behaviour as well as the impact of the intervention was determined.

3.8. Ethical considerations

Participation in this study was on a completely voluntary basis. Informed written assent and consent was obtained from the learners and the respective heads of household prior to any data collection occurring. Participants were free to withdraw from the study at any time or refuse to participate in any aspect of the study without penalty. Informed assent and consent included an explanation of the expected benefits and risks of participation in each aspect of the study.

To prevent personal or identifying information from becoming public, assurance was given that questionnaires and diaries would be kept in locked premises. All computer files identified study subjects by study identity number only.

All study instruments were stored in confidential files until the completion of the study and thereafter stored in a secured venue for a period of three years to allow for the research report to be written and scientific articles to be published.

The following chapter presents data obtained from the interviews and diaries. Key categories analysed: demographics, major components of waste generated, solid waste storage materials, methods of waste disposal, time for waste disposal, attitude towards solid waste management, solid waste separation, awareness associated with waste management, information dissemination and willingness to pay.

CHAPTER 4: DATA ANALYSIS AND RESULTS

4.1. Introduction

This chapter presents the findings after data was obtained cleaned, coded and entered in the Statistical Package for Social Sciences (SPSS) 24.0. The initial population from the two schools i.e. Port St. Johns Community School and Gobindlovu Junior Secondary School was 82 and 118 with a minimum sample size of 41 and 59 respectively. There were 44 respondents interviewed in Mtumbane and 42 in Maheng. Demographics will be presented first followed by the results obtained from the diaries. Thereafter a comparative analysis will show the outcomes for the pre- and post-intervention phases where the key components from the questionnaires are ranked according to their means.

4.2. Demographics

The demographic variables in this study are characterised as: age, gender, race, occupation, education, income and household size.

4.2.1. Age of respondents

The ages of respondents i.e. the head of household or their representative were grouped into six categories. In Figure 4.1 below shows the respondents between the ages 30-39 (34.1%) and 40-49 (48.9%) were the highest in Mtumbane and Maheng respectively. The Fisher's p-value indicated that there was no significant difference between the two groups.

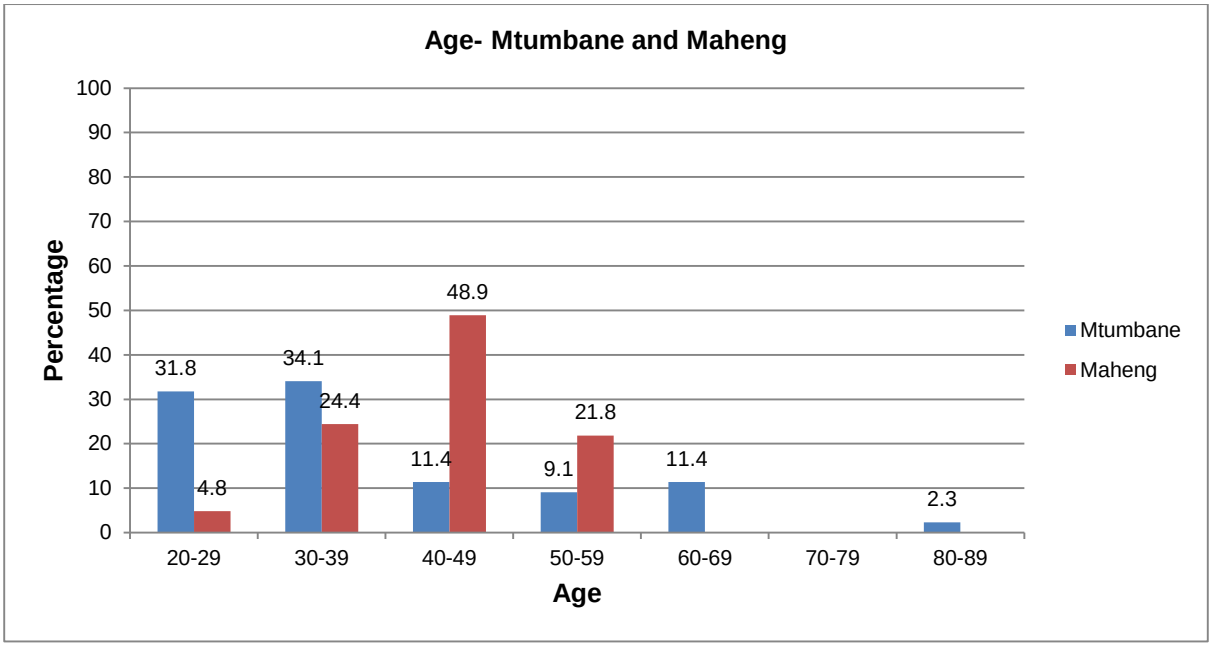


Figure 4.1: Age distribution of respondents

4.2.2. Gender of respondents

Nearly two thirds of the participants from both townships were female.

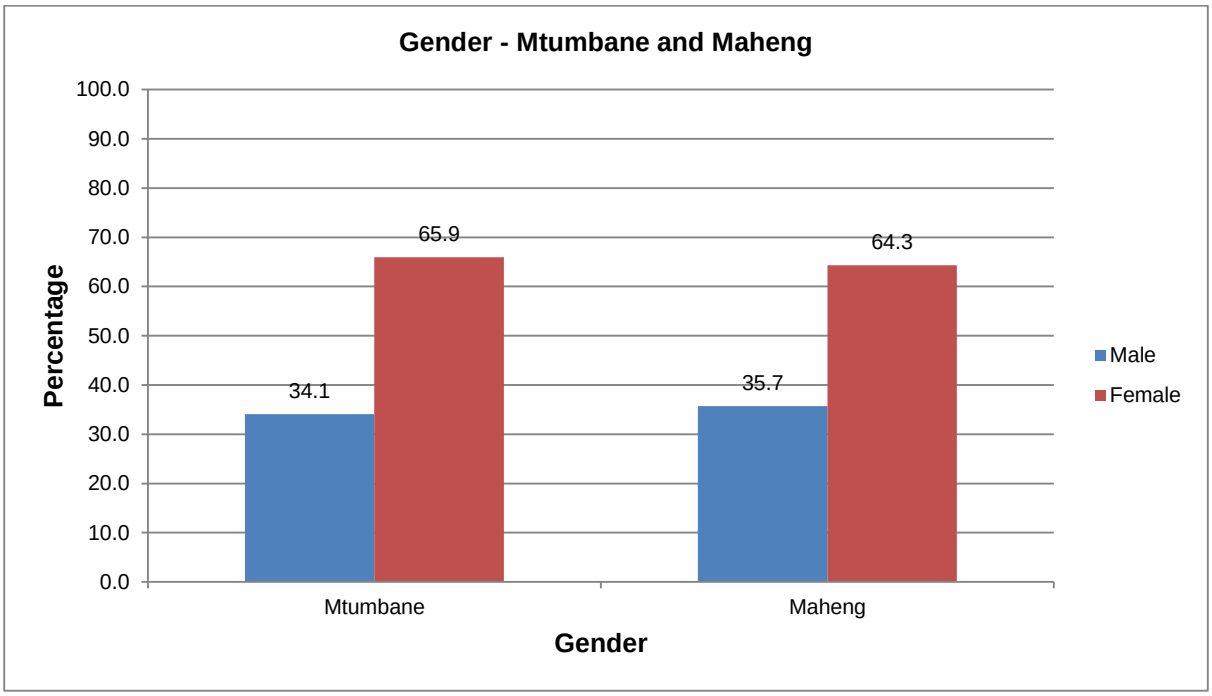


Figure 4.2: Gender of respondents - Mtumbane and Maheng

4.2.3. Ethnicity of respondents

Figure 4.3 highlights that Black respondents were in the majority in these townships Mtumbane (93.2%) and Maheng (92.9%).

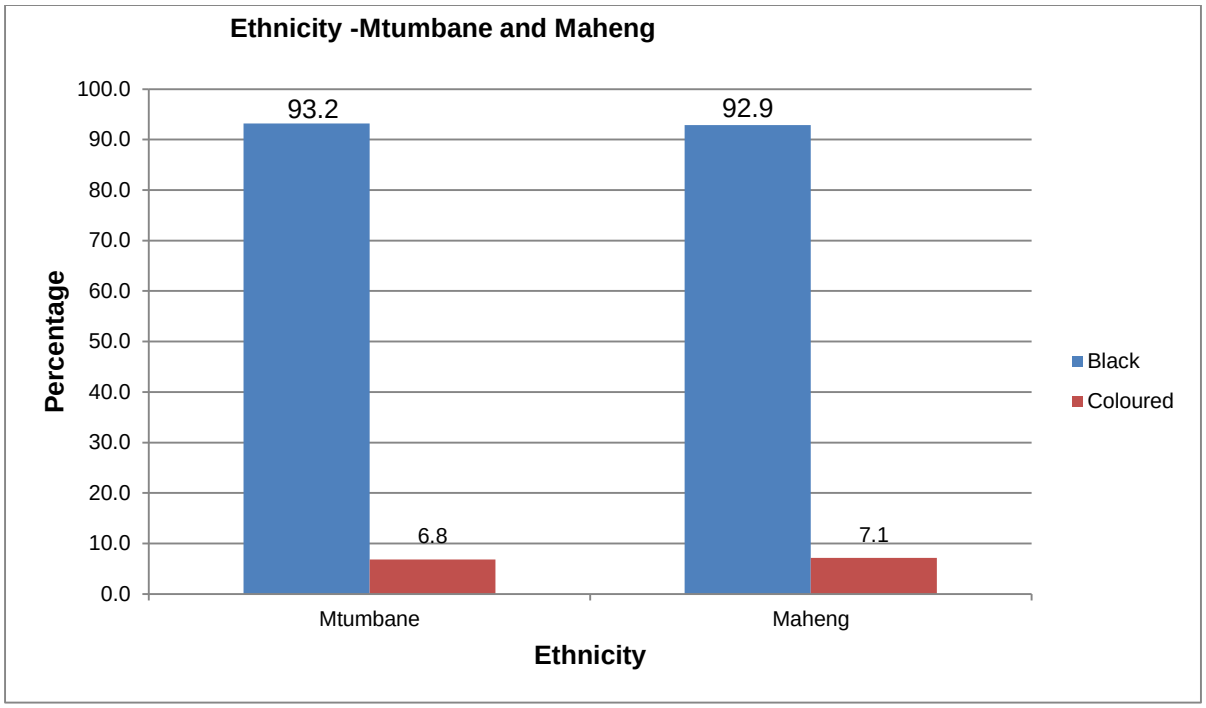


Figure 4.3: Ethnicity of respondents - Mtumbane and Maheng

4.2.4. Occupation of respondents

More than half of the respondents in both townships were unemployed with a small percentage having full time employment.

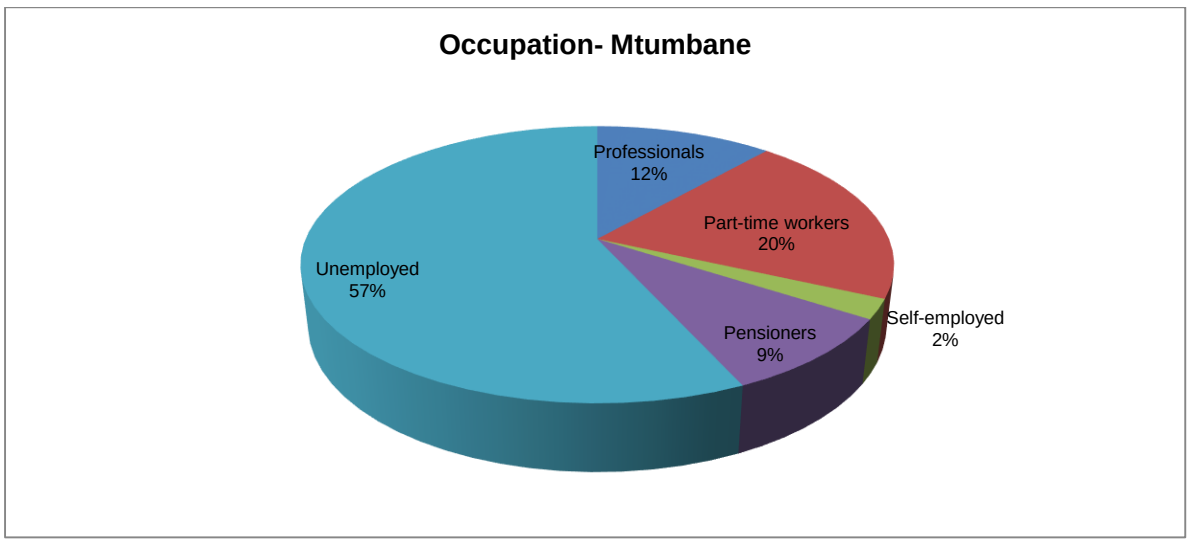


Figure 4.4: Occupation of respondents - Mtumbane

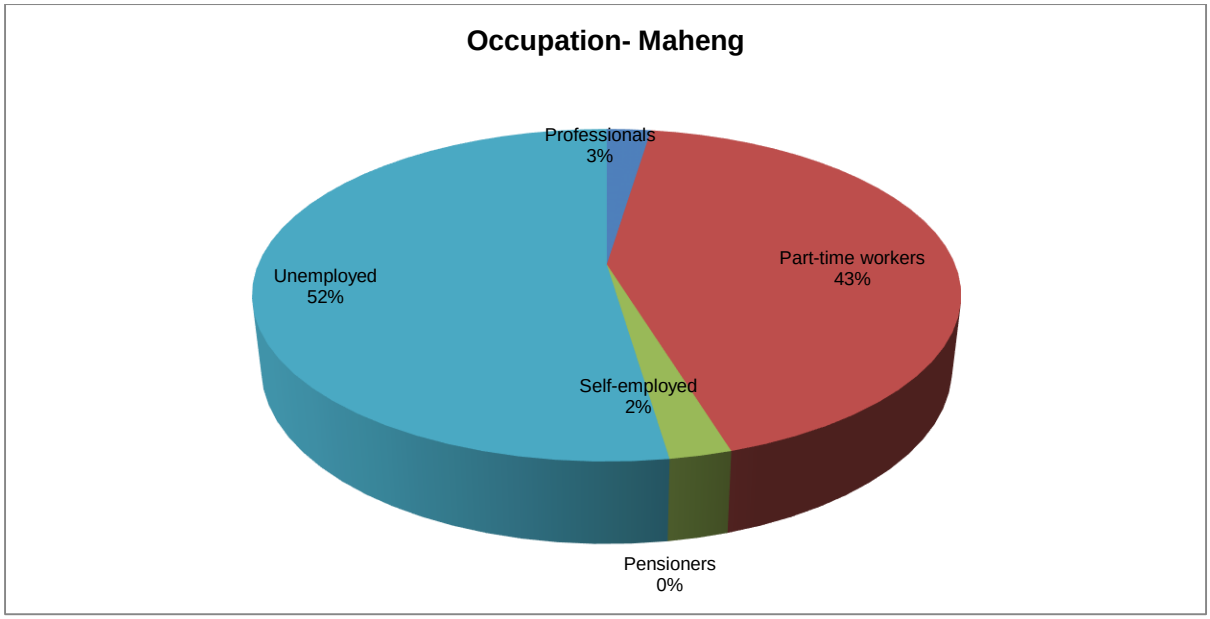


Figure 4.5: Occupation of respondents - Maheng

4.2.5. Education of respondents

Figure 4.6 shows that in Mtumbane, 7.1% of respondents were illiterate, 31% were in possession of primary education, (i.e. from Grades 1 to 7), while 47.6% had completed secondary education (i.e. from Grades 8 to 12) and 14.3% attained some form of tertiary education. In Maheng, 7.1% of respondents reported to be illiterate, while 28.6% completed primary school, 54.8% secondary education and 9.5% tertiary education.

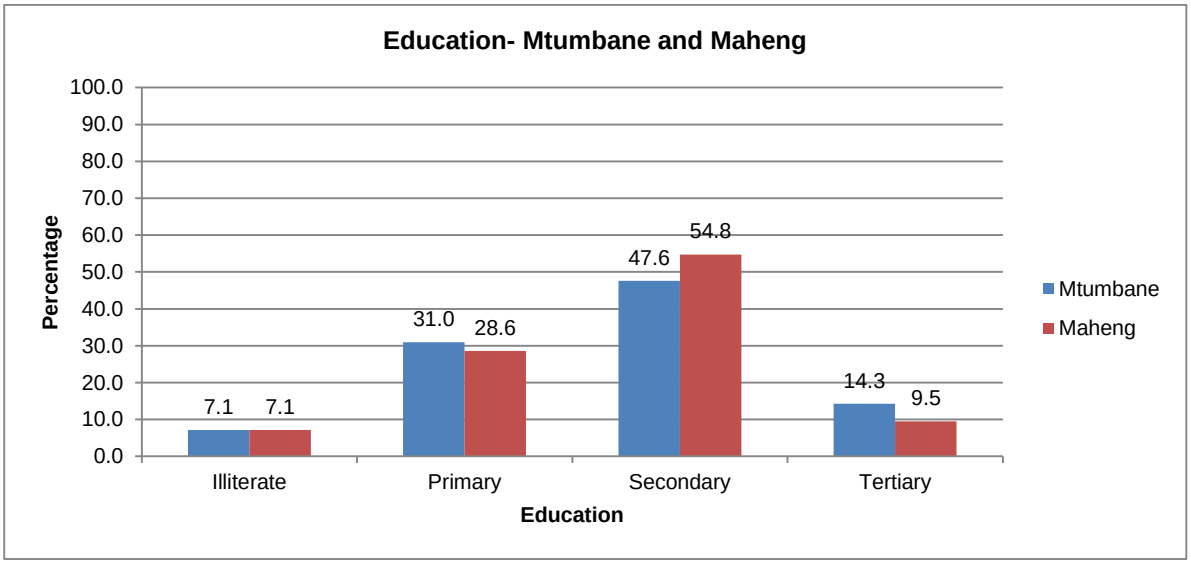


Figure 4.6: Education of respondents -Mtumbane and Maheng

4.2.6. Income of respondents in the households

Figure 4.7 shows that in Mtumbane, 26.5% of households had a monthly income of more than R3 000, whereas only 6.1% of households in the Maheng community reported a monthly income of more than R3 000. Most respondents in Mtumbane (44.1%) and Maheng (51.5%) had a monthly income between R500 and R1 000.

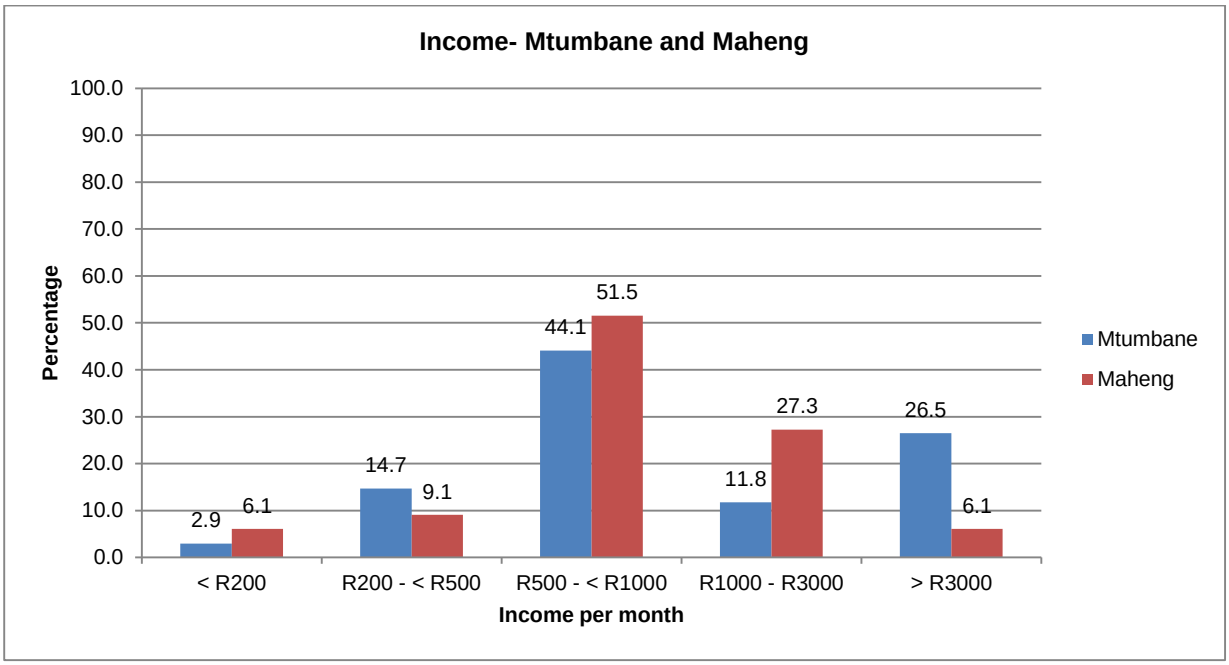


Figure 4.7: Income of respondents in the households - Mtumbane and Maheng

4.2.7. Household size

In Mtumbane (Figure 4.8) the highest number of inhabitants per household was for 2 to 4 people (31%) followed by 21.4% with 5 to 7 and 8 to 10 people. A reported 16.7% of people lived alone and in 9.5% of households, there were10 people or more. In Maheng, (Figure 4.9) 60% of households had between 2 to 4 people living in their home, followed by 25% with 5 to 7 residents**.**

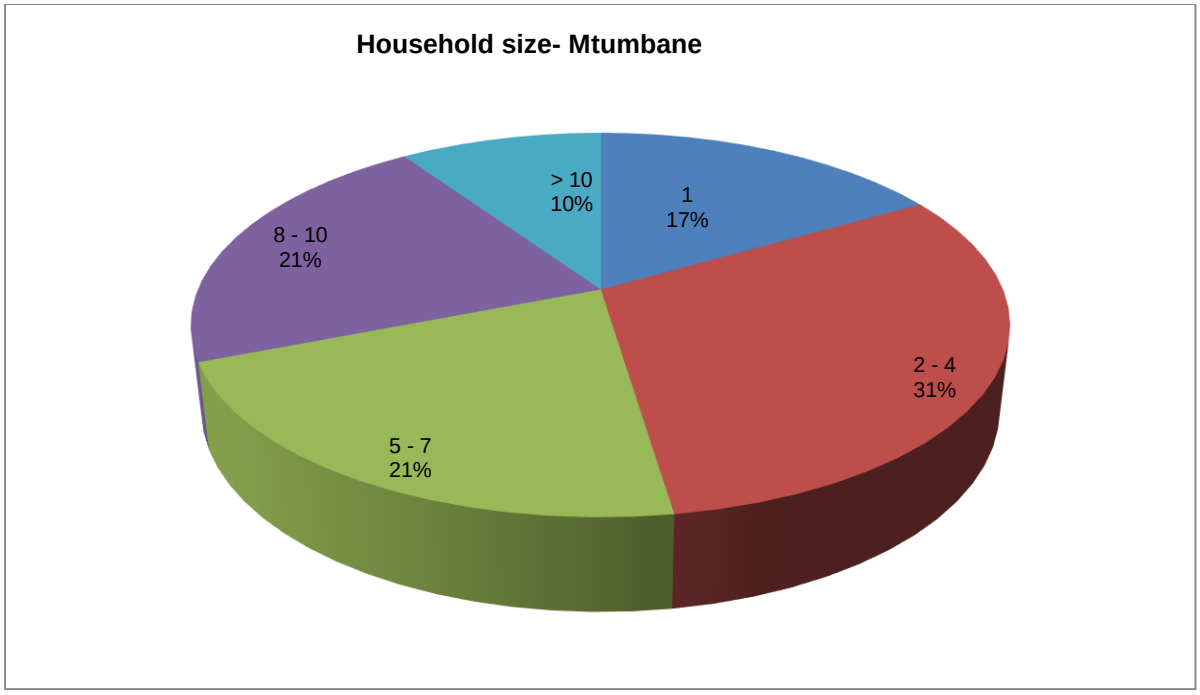


Figure 4.8: Household size- Mtumbane

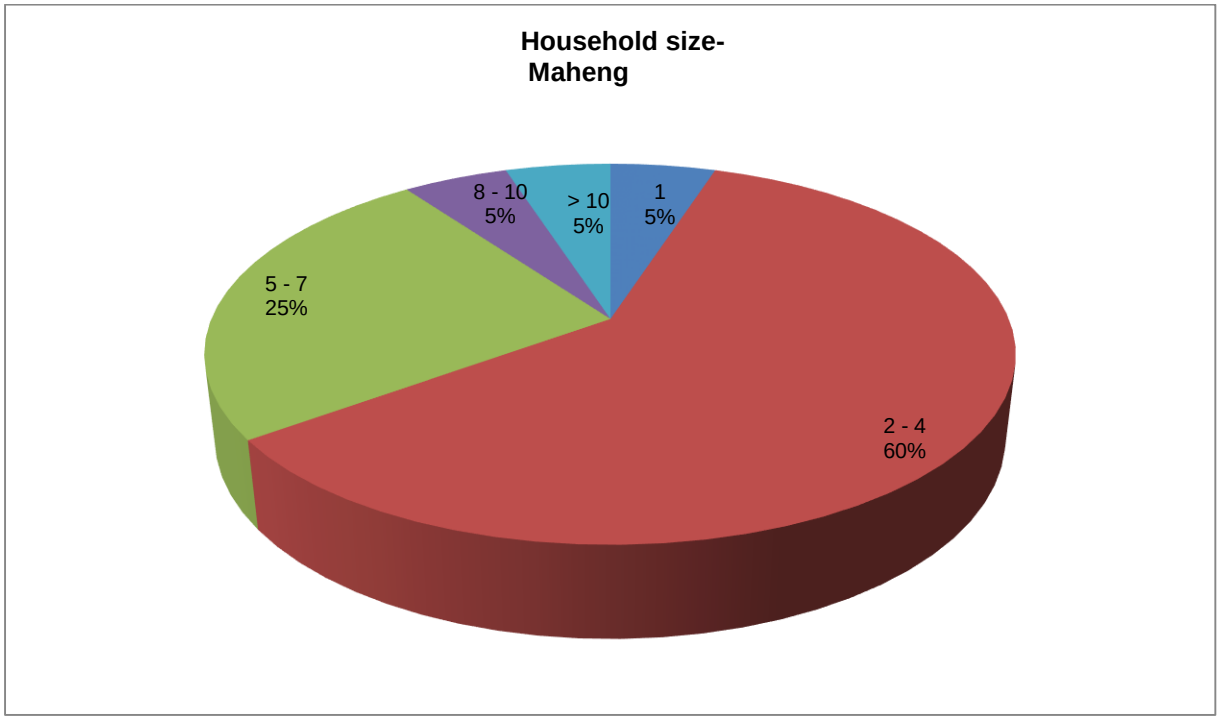


Figure 4.9: Household size- Maheng

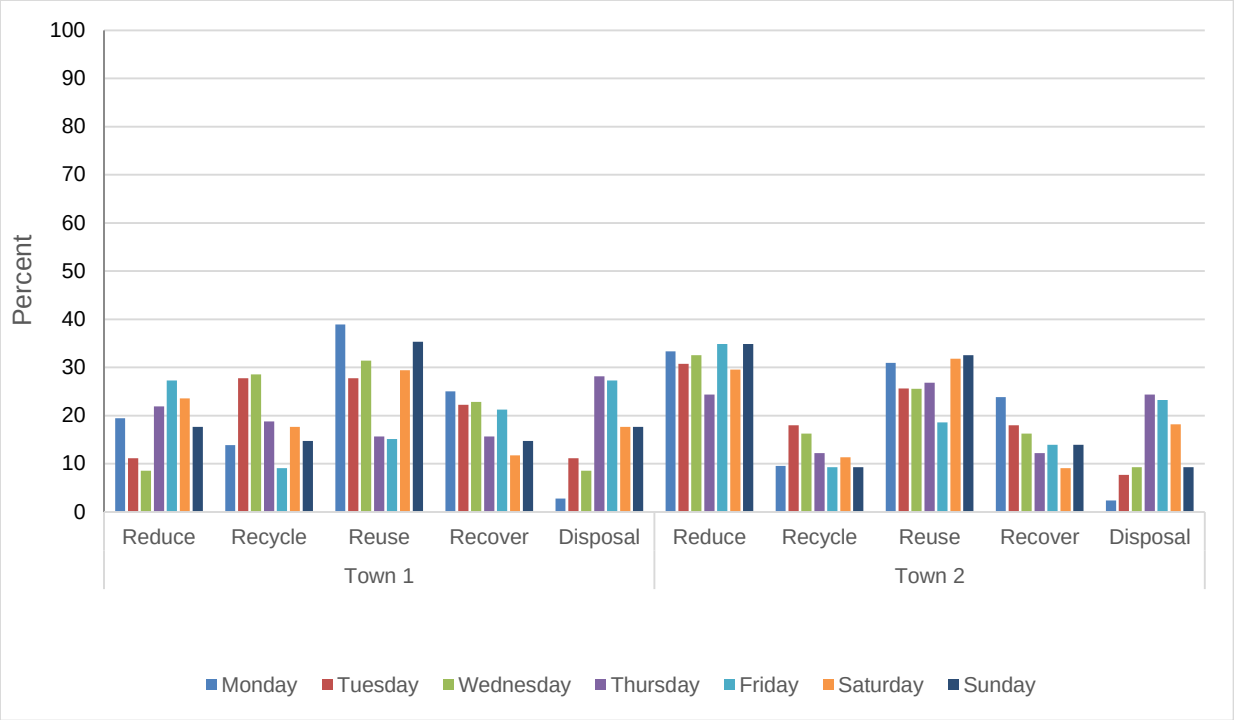
4.3. Intervention phase

There were 46 diaries that were distributed to the learners in Mtumbane and 44 questionnaires were returned, whereas there were 42 diaries and questionnaires distributed to Maheng learners and 36 diaries were returned. There were no reasons given by learners as to why some diaries were not returned. Given that participation was voluntary, the researcher had no recourse to request these diaries. However, this did not statistically influence the results.

Table 4.1 and Figure 4.10 reports on the trends or difference in activities as per the data collected from the daily diaries that were completed by the learners in this study over a two-week period, including weekends. From the 4Rs that were taught to learners, there appeared to be only three intervention strategies used in Mtumbane, including re-use, reduce and disposal; two intervention strategies were evident in Maheng i.e. reuse and recycling. In Mtumbane, drink cartons and food waste are reduced with greater frequency; newspapers and cardboard were recycled often. In Maheng, cardboard and cans seemed to be predominant waste material that was reused and reduced respectively. Table 4.1 shows only the results of the significant figures of the daily diary and the rest of the data is included as an annexure to this dissertation (See Appendix 13).

Table 4.1: Results of the Daily Diary showing significant difference

Intervention phase p – values: Mtumbane						**Interventionphase p – values: Maheng**					
Type of waste	***Day and activity***	***Frequency***	***Chi-square***	***df***	***Asymp. Sig.***	***Type of waste***	***Day and activity***	***Frequency***	***Chi-square***	***df***	***Asymp. Sig.***
Newspaper and magazine	Monday: reuse	14	12.889	4	0.012	Newspaper and magazine	Sunday: reduce	15	15.381	4	0.004
Cardboard	Friday: disposal	12	14.529	4	0.006	Cardboard	Thursday: reuse	16	14.529	4	0.006
Drink cartons	Wednesday: Reduce	14	17.688	4	0.001	Drink cartons	Monday: Recycle	14	11.784	4	0.019
Glass bottles	Tuesday	13	11.750	4	0.019	Glass bottles	Sunday: Recycle		10.162	4	0.038
Food and drinktins	Saturday: Reduce	12	9.879	4	0.043	Body spray and doom	Monday Reduce	16	14.000	4	0.007
Food waste	Tuesday: Reduce	14	13.000	4	0.011	Plastic bottles	Saturday: Reduce	14	15.684	4	0.003
Nappies	Monday: disposal	14	12.176	4	0.016						
Plastic packaging	Thursday: reduce	13	10.118	4	0.038						



Town 1= Mtumbane **Town 2= Maheng**

Figure 4.10: Daily diary results for newspapers and magazines

The results for the various types of waste (newspapers and magazines, cardboard, drink cartons, glass bottles, food and drink tins, body and doom spray cans, plastic bottles, food waste, nappies and plastic packaging) and other unspecified types of waste in Mtumbane, the p-value of 0.012 showed that a significant number of households (14, 38.9%) reuse newspapers and magazines. Table 4.1 indicates that there was a difference in the reuse of newspapers and magazines during the week. An inspection of the freqency table reveals that reuse was highest on Monday in Mtumbane, a similar trend was observed in Maheng with more newspapers and magazine reduction taking place on Sundays (34.9%) and Mondays (33.3%) compared to the other days of the week. The days which were significant were shown on the table as well as the other unspecified wastes were observed to have a significant difference on Tuesdays.

Table 4.1 shows that different activities took place on different days such as the disposal of nappies on a Monday as children who use nappies were at home and were not attending day-care centres. There was more disposal of cardboard, food and drink cans on a Friday than any other days of the week as for example more packaging would be brought into households due to weekly grocery shopping and the receipt of weekly wages.

In this study, only the trends or difference in activities were reported on, because the other results did not show anything that the respondents did differently. The results from the diaries show that the pre-intervention phase was successful because the results reflect that the learners did monitor the waste generated in the households. The results from the diaries also impacted the design of the study tools.

4.4. Pre- and post-intervention phase

The heads of households were interviewed, and the graphs below show the comparison of key responses in the pre- and post-intervention surveys. There were 46 respondents in Mtumbane who were interviewed in the pre-intervention phase and in the post-intervention phase, 44 respondents participated. In Maheng, there were 42 respondents pre-intervention and 36 respondents participated post-intervention. In the post-intervention phase, the some of the sample group that participated in the pre-interview phase were not available during the post-interview phase and this did not influence the results.

4.4.1. Solid waste storage materials in the households

Table 4.2 below reports on the findings on whether respondents had any temporary solid waste storage in their houses. The respondents used different types of materials to store their solid waste, the most common being plastic bags which was the case pre- and post-intervention. The results also reflected that the second most popular material was basket. The respondents in Mtumbane who were in possession of temporary storage for solid waste pre-intervention were 90.5% and increased to 95.3% post-intervention. The 9.5% pre-intervention responded by stating that they did not have a temporary storage for solid waste decreased to 4.7% post-intervention.

The respondents in Maheng who possessed temporary storage constituted 70.9% pre-intervention with 29.1 who had no storage, which changed to 72.5% post-intervention with 27.5% who did not have the temporary storage.

Table 4.2: Solid waste storage materials in the households

Mtumbane- Pre-intervention			**Post-intervention**		**Maheng: Pre-intervention**		**Post-intervention**	
Type of material	*Frequency*	*Percent*	*Frequency*	*Percent*	*Frequency*	*Percent*	*Frequency*	*Percent*
Basket	7	17.5	3	7.3	1	3.4	2	6.7
Sack	3	7.5	2	4.9	1	3.4	1	3.3
Plastic bag	30	75	36	87.8	27	93.2	27	90
Total	40	100.0	41	100.0	29	100	30	100

Figure 4.11 shows the type of storage respondents in Mtumbane used and revealed that 17.5% of the respondents used baskets pre-intervention and 7.3% post-intervention, 7.5% used a sack pre-intervention and 4.9% post-intervention, and 75% used plastic bags pre-intervention which increased to 87.8% post-intervention. Figure 4.12 shows that 93.1% of respondents in Maheng used plastic bags for the storage of their waste pre-intervention which changed to 90% post-intervention.

A reported 97.7% of the respondents in Mtumbane responded that they burned their refuse and 2.3% stated that they throw or dump their waste while in Maheng 86.9% burned their waste and 0.7% threw it on to vacant land. A reported 75% of the respondents in Mtumbane had waste storage containers outside their households provided on the street, 25% stated that they do not have waste storage containers. In Maheng 45.5% of the respondents stated that they do have containers in the street next to their households, while 54.5%, respondents stated that they do not have solid waste containers.

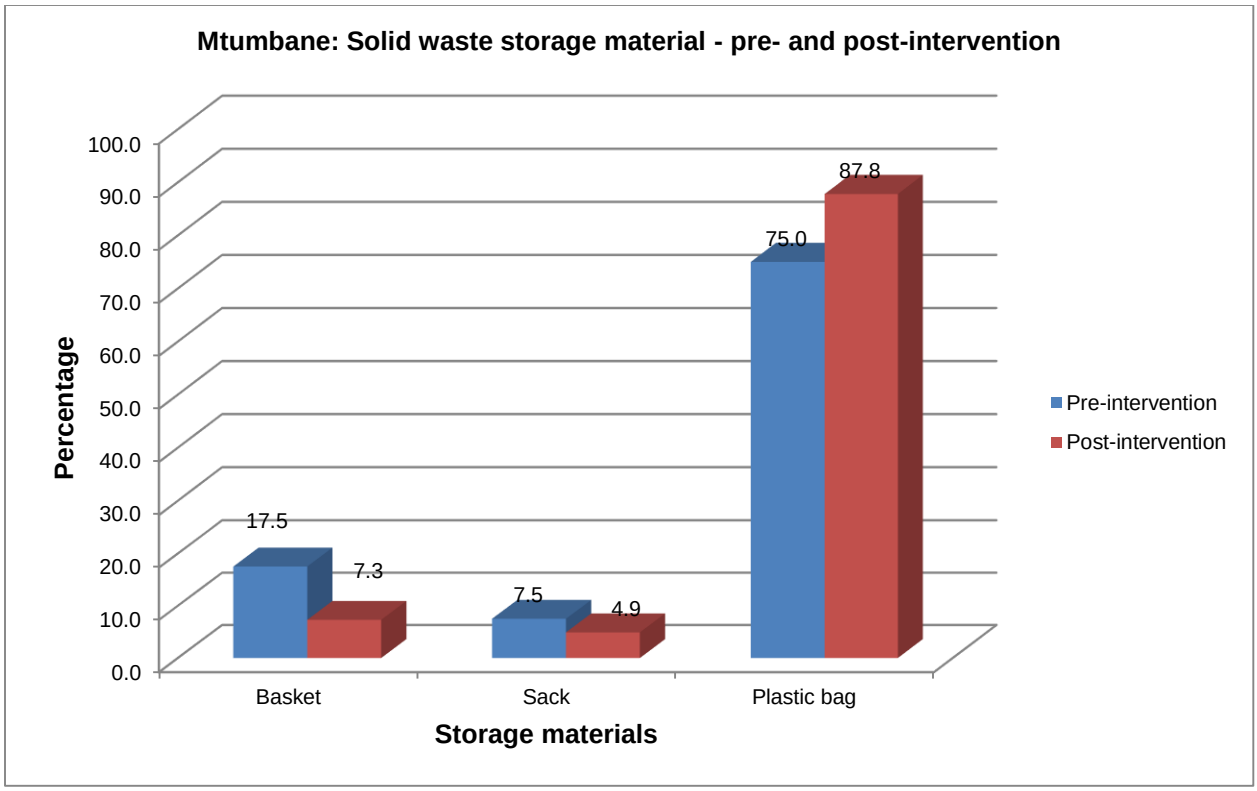


Figure 4.11: Waste storage materials- Mtumbane

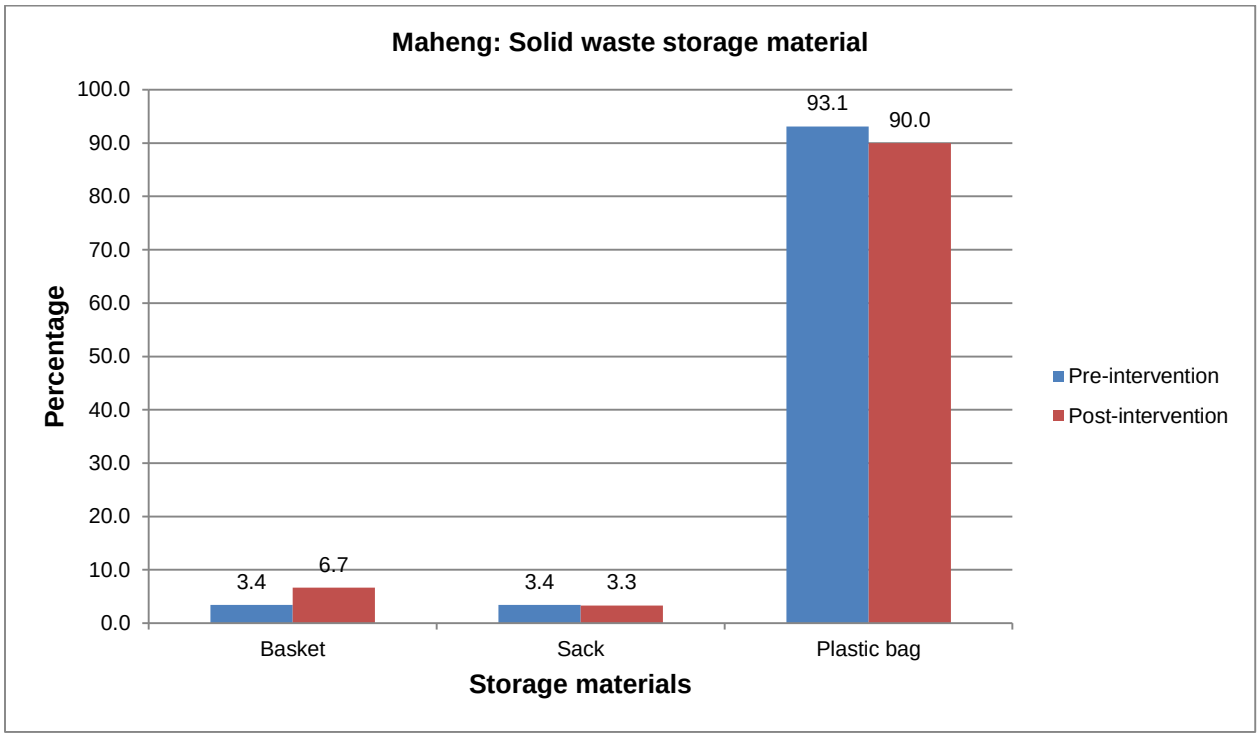


Figure 4.12: Waste storage materials- Maheng

4.4.2. Methods of waste disposal

Regarding methods used in waste disposal results indicated that in Mtumbane (Figure 4.13) in the pre-intervention phase, 4.5% burnt their solid waste in the backyard and 0% was reported post-intervention. Those who dumped their waste in an open space accounted for 88.6% pre-intervention and 0% reported post-intervention. Those who dumped their waste in a drain accounted for 4.5% pre-intervention and 2% post-intervention. Those respondents who stored their waste at home accounted for 2.3% pre-intervention and 98% post-intervention.

In Maheng (Figures 4.14), responses for storing waste at home was 5% pre-intervention and 2% post-intervention; burning their solid waste in the backyards 17% pre- and post-intervention; dumping their waste in an open space 76% pre-intervention and 79% post-intervention; and dumping it down the drains accounted for 2% pre- and post-intervention.

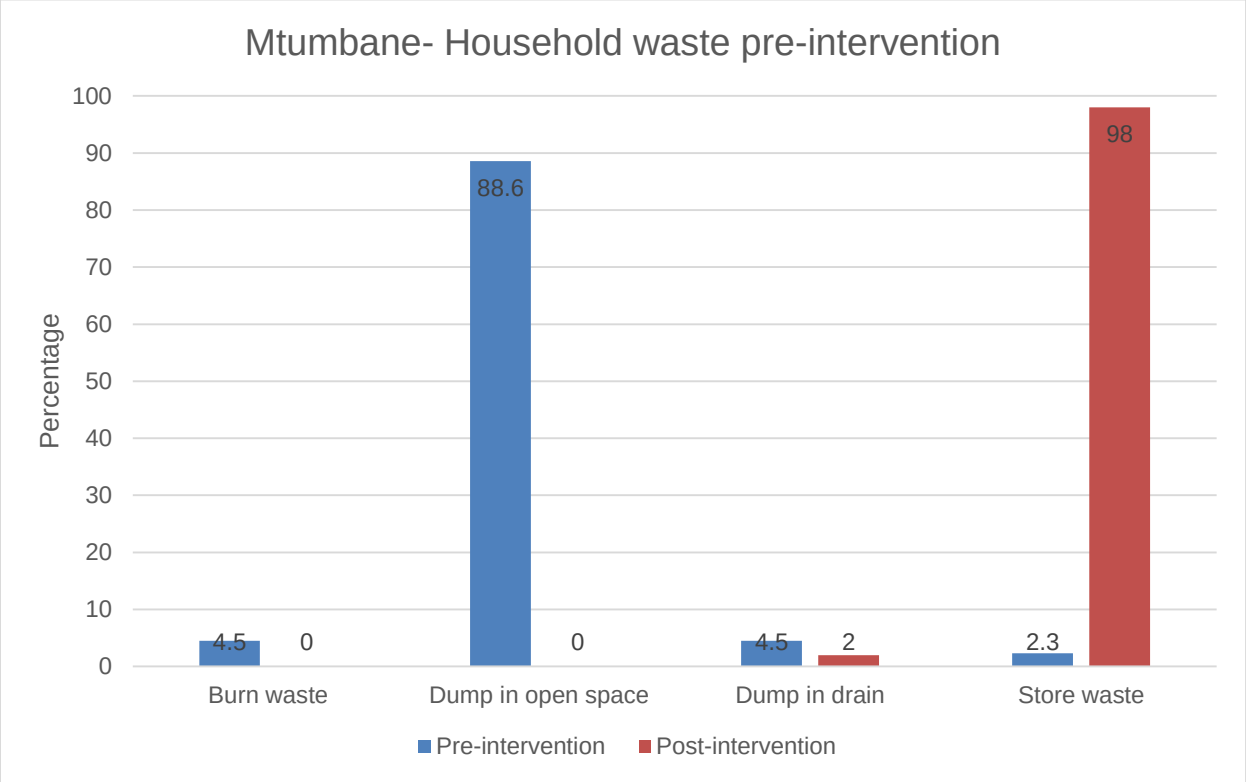


Figure 4.13: Methods of waste disposal

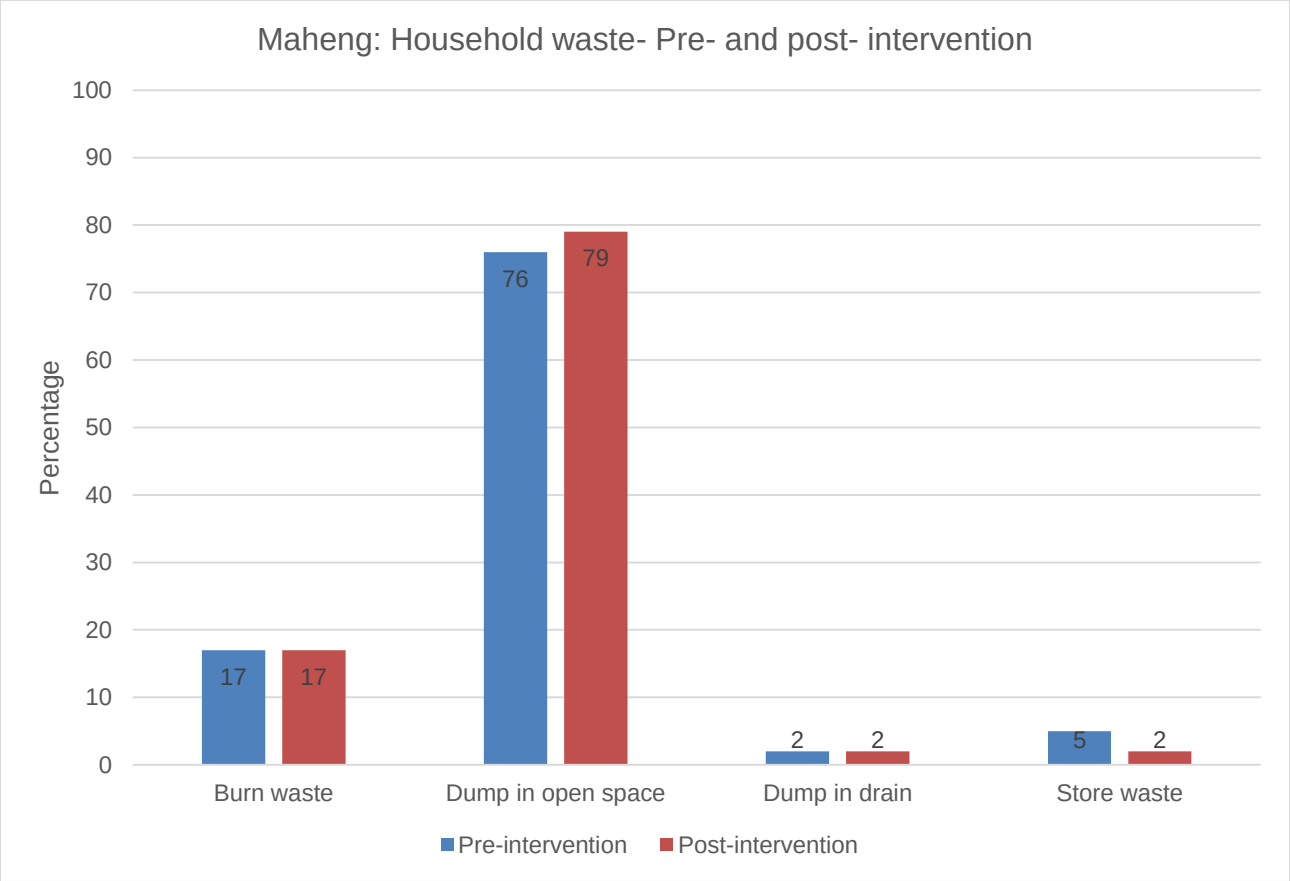


Figure 4.14: Methods of waste disposal-Maheng

4.4.3. Preferred time for solid waste disposal

Figure 4.15 shows that the most popular time in Mtumbane for disposing of waste material was in the early hours of the morning, with 53.7% respondents preferring to dispose of their waste early in the morning pre-intervention and 30.2% post-intervention. Those who preferred to dispose of their waste in the late morning accounted for 7.3% pre-intervention and 7% post-intervention; at noon, 7.3% pre-intervention and 4.7% post-intervention; in the afternoon 14.6% pre-intervention and (25.6%) post-intervention, the evening 9.8% pre-intervention and 27.9% post-intervention, 7.3% pre-intervention preferred to dispose of during the time of private waste collectors and 4.7% post-intervention**.** These respondents had hired people to collect their solid waste and dispose of their waste at the times that suited these collectors.

The results for Maheng (Figure 4.16) also show that the majority of residents preferred to dispose of the waste early in the morning, with 42.9% pre-intervention and 40.5% post-intervention. Those who preferred to dump in the late morning were at 11.9% pre-intervention and 9.5% post-intervention; at noon 7.1% pre-intervention and 7.1% post-intervention; in the afternoon 19% pre-intervention and 19% post-intervention; in the evening 19% pre-intervention and 19% post-intervention. Those respondents who preferred the time of private waste collectors accounted for 4.8% post-intervention with 0% report of times pre-intervention**.** These results show that most people prefer to dispose of their solid waste early in the morning and only a few prefer the services of private waste collectors.

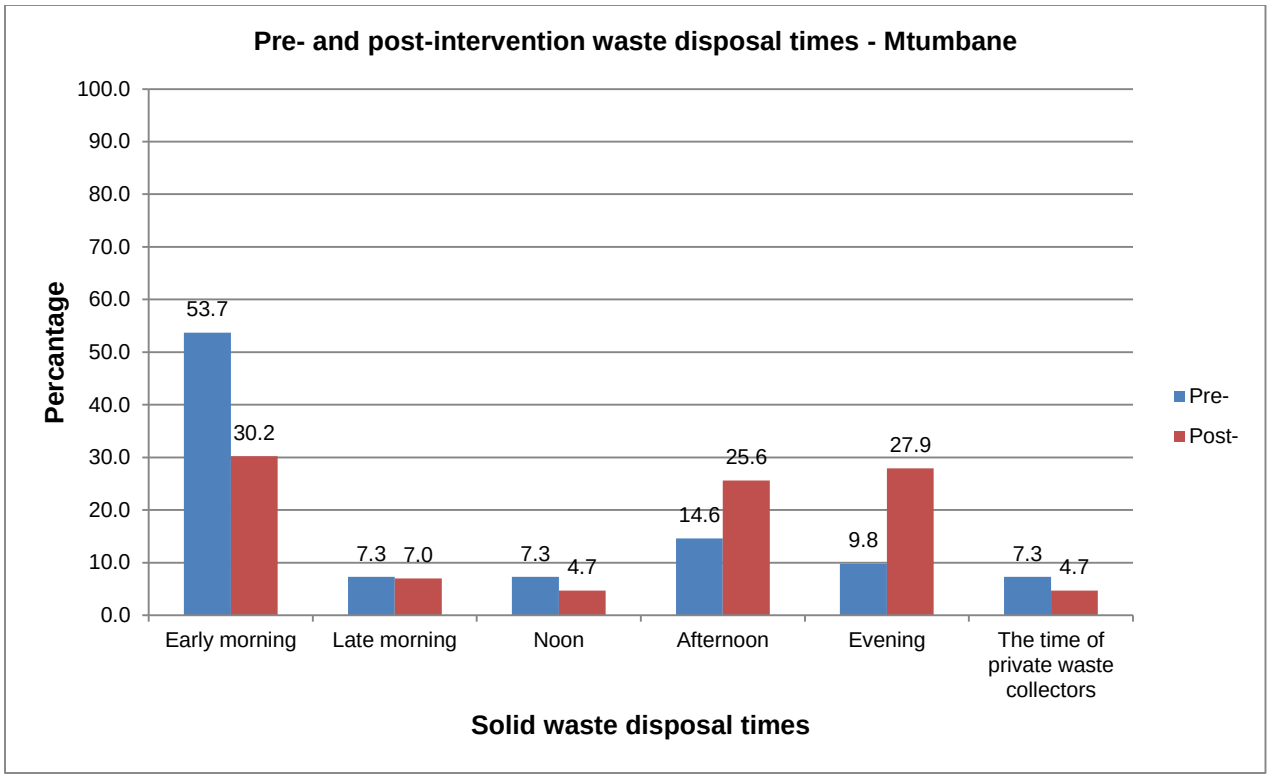


Figure 4.15: Pre- and post-intervention disposal times-Mtumbane

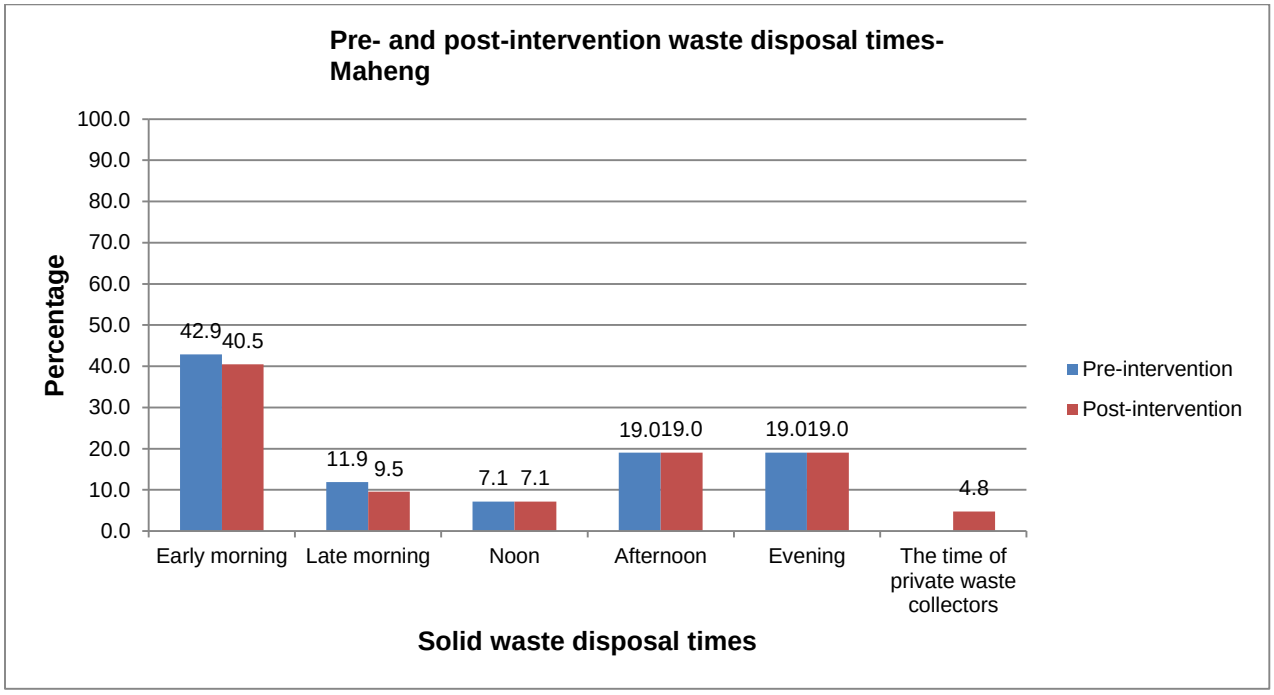


Figure 4.16: Waste disposal times- Maheng

4.5. Attitude

Participants in the study were interviewed regarding their attitudes towards solid waste management. The researcher wanted to establish in both areas if the micro and small enterprises' (MSEs) rendered satisfactory service to the respondents. A reported 28.9% of respondents were satisfied with the service and 71.1% indicated that the services were not satisfactory. There were 58.9% of the respondents that did not know about the MSEs in their area. The results show that 41.8% were not sure whether the reason for not getting the service from the MSEs was the location of their home or village, with 35% agreeing that the location of their homes was the reason for not getting the service, 11.9% strongly agreeing, 7.9% disagreeing and 3.4% strongly disagreeing.

4.5.1. Attitude towards waste management

Table 4.3 shows respondents' attitude towards waste management. Analysis of the attitude of respondents towards solid waste management reveals that although the residents did not receive a waste collection service, most of them regarded solid waste as something useful. There were fewer respondents that regarded solid waste as useless and this was in both townships. There also appears to be a significant change in attitude post-intervention.

Table 4.3: Attitude towards waste management

Mtumbane: Pre-intervention			**Mtumbane: Post-intervention**		**Maheng: Pre-intervention**		**Maheng: Post-intervention**	
In your view is waste	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Useless	7	16.3	4	9.3	14	33.3	17	40.5
Somewhat useful	15	34.9	7	16.3	20	47.6	12	28.6
Useful	21	48.8	32	74.4	8	19	13	31
Total	43	100	43	100	42	100	42	100

4.5.2. Solid waste separation and reasons for not separating

Table 4.4 reports on the findings regarding separation of solid waste in Mtumbane and Maheng. Respondents who did not practice waste separation accounted for 83.7% and decreased to 46.5% post-intervention. It shows that most respondents in Mtumbane stopped separating their waste post-intervention for a reason not specified in the study. It is evident from the results in Maheng that the majority of respondents reported that they did separate their solid waste.

Table 4.4: Solid waste separation

Mtumbane: Pre- and post-intervention					***Maheng: Pre- and post-intervention***			
Do you separate solid waste								
Pre-intervention			***Post-intervention***		***Pre-intervention***		***Post-intervention***	
Frequency		*Percent*	*Frequency*	*Percent*	*Frequency*	*Percent*	*Frequency*	*Percent*
Yes	7	16.3	23	53.5	6	14.3	8	19
No	36	83.7	20	46.5	36	85.7	34	81
Total	43	100	43	100	42	100	42	100

In addition, the researcher investigated the reasons for not separating waste and these are shown in Table 4.5 below. In Mtumbane 38.9% of the respondents, pre-intervention indicated that they did not have an understanding about waste separation which increased to 40% post-intervention.

A total of 52.8% of respondents, pre-intervention did not think it was their responsibility to separate their solid waste which increased to 55% post-intervention. In the pre-intervention phase 8.3% of respondents did not understand the importance of waste separation which changed to 5% post-intervention. In Maheng a reported 40.6% of respondents, pre-intervention and 46.8% post-intervention had no understanding of waste separation, while 31.3% pre-intervention and 31.3% post-intervention stated that they did not think it was their responsibility; and 28.1% pre-intervention and 21.9% post-intervention did not see the importance of waste separation.

Table 4.5: Reasons for not separating waste

Mtumbane: pre-intervention			**Mtumbane: Post-intervention**		**Maheng: Pre-intervention**		**Maheng: Post-intervention**	
	Frequency	*Percent*	*Frequency*	*Percent*	*Frequency*	*Percent*	*Frequency*	*Percent*
I do not understand waste separation	14	38.9	8	40	13	40.6	15	46.8
I did not think it was my responsibility	19	52.8	11	55	10	31.3	10	31.3
I did not see its importance	3	8.3	1	5	9	28.1	7	21.9
Total	36	100	20	100	32	100	32	100

4.5.3. Awareness associated with waste management

The researcher investigated whether the respondents had received any education regarding solid waste management. The frequency table shown in Table 4.6 indicates a significant increase from 77.8% pre-intervention not having received any awareness to 97.2% having awareness post-intervention, since the p-value is 0.008 and < 0.05, it means that there is a significant difference between the pre- and post-observations.

The respondents in Maheng who had some environmental education regarding solid waste pre-intervention were at 18.4% which increased post-intervention to 42.1%. The number of respondents who reported not to have been educated on waste management was at 81.6% pre-intervention and decreased to 57.9% post-intervention.

Table 4.6: Awareness associated with waste management

Mtumbane					**Maheng**			
	Pre-intervention		**Post-intervention**		**Pre-intervention**		**Post-intervention**	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Yes	28	77.8	35	97.2	7	18.4	16	42.1
No	8	22.2	1	2.8	31	81.6	22	57.9
Total	36	100	36	100	38	100	38	100

4.5.4. Information dissemination

According to the information about waste management practices in Table 4.7, respondents accessed the information from various media. Mtumbane residents reported receiving no information from children pre-intervention but this changed to 29.4% post-intervention. The results on this aspect were similar for Maheng residents who reported that they received no information from the children pre-intervention, but this changed to 69% post-intervention. The Fisher's Exact Test reflects that there was a significant difference between the pre- and post-intervention in the dissemination of the information.

Table 4.7: Information dissemination

Mtumbane:						**Maheng:**			
Pre-intervention			**Post-intervention**			**Pre-intervention**		**Post-intervention**	
	Frequency	Percent	Frequency	Percent		Frequency	Percent	Frequency	Percent
Community meeting	24	70.6	13	38.2		9	21.4	9	21.4
Health institution	5	14.7	2	5.9		4	9.5	3	7.1
Poster or photograph	5	14.7	4	11.8		14	33.4		
Children	0	0	10	29.4		0	0	29	69
Radio	0	0	5	14.7		15	35.7	1	2.4
Total	34	100	34	100		42	100	42	100

4.5.5. Solid waste related information

A question was posed whether the local municipality had ever given the respondents information or lessons, regarding waste trying to establish if the respondents do get the necessary information regarding waste (Table 4.8). The Fisher's Exact Test was 0.000 meaning that there was a significant difference between the pre- and post-intervention. The results show that most respondents in Mtumbane pre- and post-intervention were able to gather information from community meetings followed by Municipal general meetings and meetings by municipal health workers. The respondents in Maheng were also getting the information from these meetings and there was a significant difference post-intervention in both areas.

Table 4.8: Solid waste related information

Mtumbane:						**Maheng:**			
Pre-intervention			**Post-intervention**			**Pre-intervention**		**Post-intervention**	
	Frequency	Percent	Frequency	Percent		Frequency	Percent	Frequency	Percent
Municipal general meetings	11	39.3	7	41.2		6	30	6	50
Community meetings	13	46.4	8	47.1		5	25	5	41.7
Meeting by municipal health workers	4	14.3	2	11.8		9	45	1	8.3
Total	28	100	17	100		20	100	12	100

4.5.6. Willingness to pay

Figures 4.17 - 4.20 show the responses to paying for the services of solid waste collection pre- and post-intervention. In Mtumbane 22% of respondents were willing to pay for the service pre-intervention and 32% post-intervention. There were those who were not sure and they accounted for 42% pre-interventoion and 23% post-intervention.

In Maheng 20.5% agreed pre-intervention and 32.5% agreed post-intervention while 35.9% were not sure pre-intervention and 32.5% post-intervention.

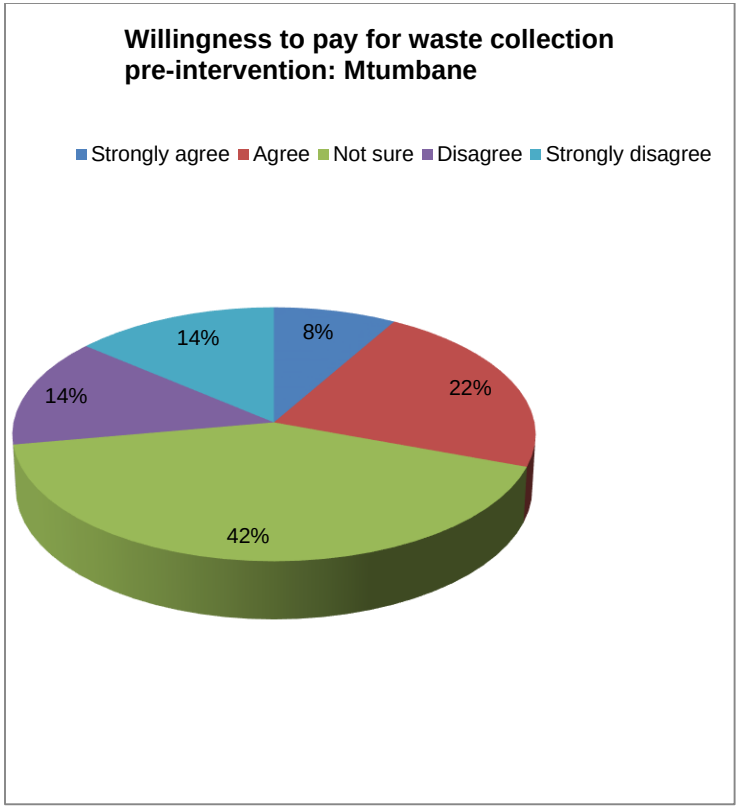


Figure 4.17: Mtumbane-Willingness to payfor waste collection

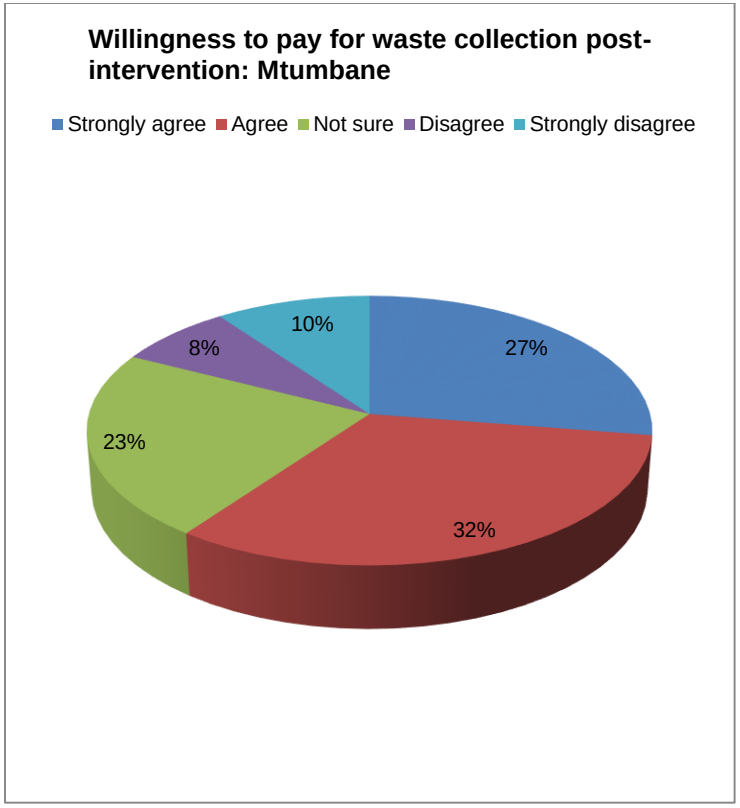


Figure 4.18: Mtumbane-Willingness to pay for waste collection

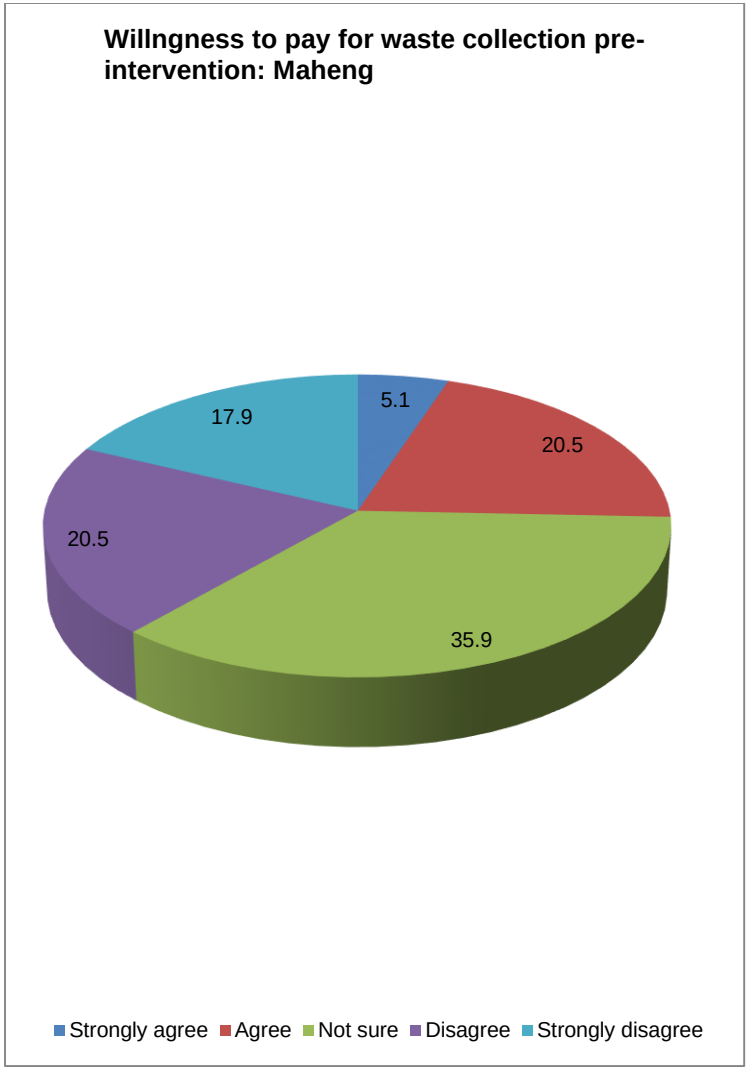


Figure 4.19: Maheng -Willingness to payfor waste collection

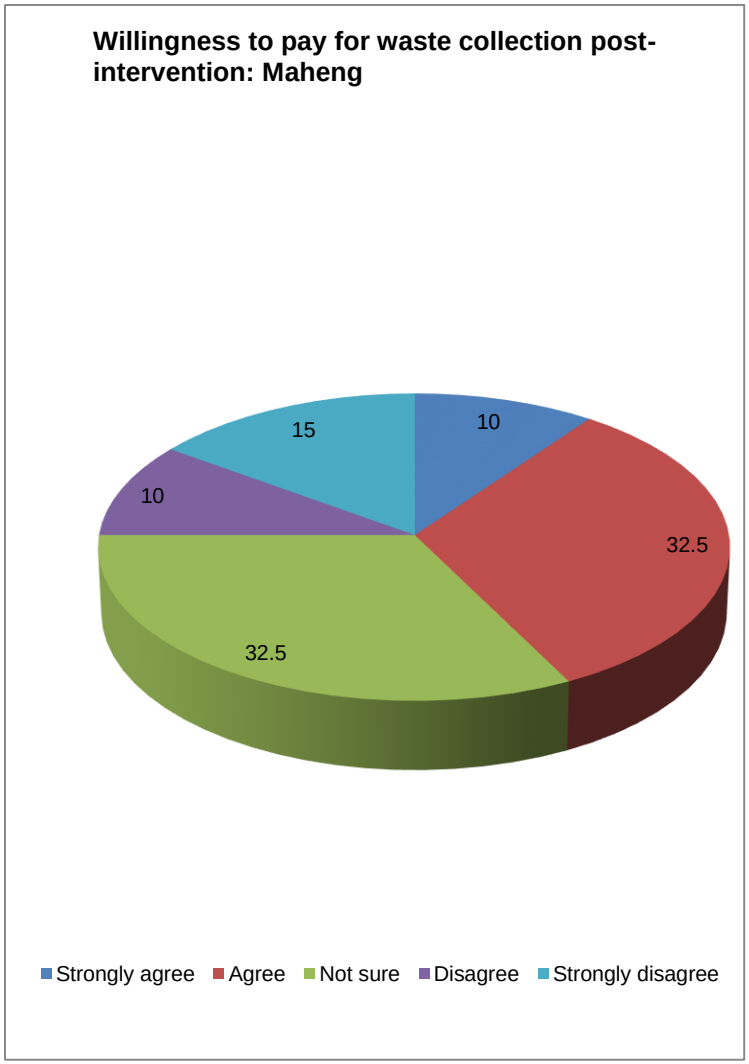


Figure 4.20: Maheng - Willingness to pay for waste collection

CHAPTER 5: DISCUSSION

5.1. Overview

The previous chapter focused on data analysis and presentation of results. In this chapter a critical analysis of the findings of this study and the relationship to other studies will be discussed. The aim of the study was to determine the effectiveness of environmental education in two communities in Port St. Johns. These communities lacked information on waste management. Waste collection was a challenge as household waste was found in public open spaces, road verges and drains. This study should create opportunities for Environmental Health Practitioners (EHPs) to identify the challenges which face South African municipalities that have similar demographics. They can then assist in how best to provide environmental education interventions in solving these challenges. The key points discussed are: demographics; knowledge, attitude and behaviour of sampled households regarding waste management practices and; the impact of the environmental education intervention on waste management practices.

5.2. Demographics

Given that nearly two thirds of the respondents were females, responses may mainly have reflected the knowledge and practices of females in the households. It could also be indicative that:

a) the majority were female-headed households;
b) the male head of household was living outside the townships due to work commitments or;
c) the female respondent was considered the ideal person to be interviewed due to her primary participation in household chores.

It is disconcerting to note the low socio-economic status as evidenced by the monthly income levels and high unemployment rates of more than 50% in both sample groups. It would therefore be prudent to think that in this democratic era and especially as these areas where tourism is a major source of income, that there were sufficient job opportunities.

This low socio-economic status would not be conducive for the sampled households to concern themselves about waste management practices when there were other necessary needs to attend to first (Post, 2007:13).

However, it appears as if respondents consider the waste generated (newspaper, plastic, glass and cardboard) as beneficial. Almost half of the respondents in Mtumbane regarded solid waste as useful and this could be attributed to the generation of income from recycling. This type of practice was also evidenced by poor workers in South Africa who used waste-picking as a source of income (UrbanEARTH, 2013:5). Waste pickers made their income from the waste picked in communities and this practice kept neighbourhoods clean. Therefore, waste collected for financial reward by the poor can be an alternative collection strategy in South Africa (Council for Scientific and Industrial Research, nd). Ward Councillors, municipal officials and community leaders should endeavour to collaborate with NGOs such as groundWork who campaign strongly for the rights of waste pickers. (groundWork, n.d.)

5.3 Knowledge, attitude and behaviour of sampled households regarding waste management practices

In the pre-intervention phase, baseline data was collected on the knowledge, attitude and behaviour of households regarding waste management practices. The head of household or his/her representative was interviewed by a trained interviewer through the administration of a validated questionnaire.

The findings show that households generated different types of solid waste. The major wastes were food waste, papers, plastics, cardboards, drink cartons, glass bottles, nappies, canned food and drink cans. Knowledge was assessed through asking respondents about: major component of solid wastes; solid waste storage in the household and methods of waste disposal. The findings in this study reported that there was lack of knowledge regarding waste management practices.

It was found that organic food waste had the highest volume in the waste stream. However, if respondents had been knowledgeable about waste management practices then this waste could be used for making compost at home. It would have then benefitted respondents in helping to create food gardens which could provide sustenance for households and opportunities for creating small businesses.

The findings in this study reveal that most respondents in the Mtumbane and Maheng communities kept their solid waste in temporary storage. They used different types of temporary storage materials including baskets, plastics and sacks of which mostly plastic bags were in the majority as also evidenced in similar studies (Maluleke, 2014: 90). A similar study found that respondents used sack, plastic bags and baskets as the temporal waste storage materials (Haile, 2011:45).

A large percentage of the sampled households (more than 85%) burned their waste. Similar studies show that in Sobantu in the Msunduzi Municipality, more than half of the respondents (53%) reported that they burn their waste (Naidoo, 2009:90). However, Maluleke (2014:82), in a similar study in Polokwane found that only one percent of the respondents burned their waste. This could be attributed to the collection patterns of waste.

Burning of waste pollutes the environment as noted by Nkosi (2015:39) who argued that the atmosphere was contaminated by the burning of waste and these actions were non-compliant with and in contravention of South African environmental legislation (National Environmental Management: Waste Act, 2008). The sampled households were unaware of the consequences of burning waste; therefore, there needs to be more information provided to the community on proper waste disposal techniques.

In this study, most respondents in both townships illegally dumped their waste in open spaces. This illegal practice could be attributed to the lack of communal waste collection. There was a micro and small enterprise (MSEs) for private waste collection service, which the majority of respondents in this study indicated that they were not satisfied with the service they rendered. More than half of respondents did not know about the MSEs in their area.

It shows that these MSEs were not properly introduced to the community by the authorities. Due to the location of Mtumbane and Maheng communities, MSEs are unable to collect waste from these communities during poor weather conditions. The municipality had contracted a private service provider to render the service but because they could not provide door-to-door service, due to the location, and the roads not being structured well, it was difficult for waste to be collected.

Therefore, there was a negative perception among the Mtumbane and Maheng respondents of MSEs. In a study completed in the Msunduzi community in 2009 it was found that municipal employees avoided the risk of vehicles being hijacked and therefore the community did not receive waste collection service (Naidoo, 2009:90). Studies show that it is common for rural communities to lack waste collection services (Etengeneng, 2012:23). More than 90% of the respondents reported that they were not satisfied with the waste collection service in that study (Naidoo, 2009: 90). Access to communities is a challenge that inhibits proper waste collection. Similar to the results in this study, Nkosi (2015:36) found that those who lived a distance from the collection points had a tendency of dumping.

When questioned on education received regarding solid waste management, the majority of respondents (68.3%) in Mtumbane indicated that they have received some form of environmental education by the local municipality. However, there appears to be very little (14.3%) forms of environmental education occurring in Maheng. The results from this study revealed that most information dissemination was accomplished through community meetings organised in most cases by the local municipality.

With this finding emanating from the study, it is important for all future campaigns to consider this method for disseminating important information to the community as it has been shown to be most effective (Haile, 2011:47). This was also evidenced by the study. It must be noted that both Mtumbane and Maheng are approximately three kilometres and 15km away respectively from the Port St. Johns municipal offices. Maheng does not receive sufficient environmental education from the municipality, even though it falls within the Municipal Health Services area of jurisdiction.

Community meetings are a main source of information dissemination in the Mtumbane community; the information is about the service delivery issues. This constitutes issues of water, waste and other pertinent issues. It appears the ward committee - through the input of the ward councillor - holds more information-sharing meetings with the residents of Mtumbane (as reported by 47.1% of respondents). Therefore, it seems as if municipality and ward councillors (political role-players) do not give sufficient consideration to Maheng because it is further away from the city centre.

The Tbilisi Declaration showed that environmental education is about getting people involved in order to solve an environmental problem (Chawla and Cushing, 2007:1). Community participation and buy-in is therefore important if the local municipality wants to solve the waste management issues in these communities.

For the establishment of the households' behaviour certain aspects were looked at with regards to: preferred time for solid waste disposal; waste separation and willingness to pay. It was found that the respondents preferred to dispose of their waste at different times of the day with the majority preferring early morning (Haile, 2011:48). This could be due to the African cultural practices as it dictates that household cleaning and chores generally begin in the morning.

Waste separation was not practiced by most respondents in Mtumbane. There were various reasons for not separating waste: a) the majority of respondents stated that it was not their responsibility and b) did not understand waste separation. These two points speak to the challenges expressed above namely: low socio-economic status, lack of environmental awareness campaigns and inadequate information dissemination. It therefore seems imperative that the community members of Mtumbane and Maheng are made aware that waste separation can become an income-generating activity.

Studies show that some respondents in Urban Kampala, Uganda practiced waste separation for various reasons. One of the reasons was that they made money out of it and some separate it for manure (Banga, 2011:32). The sample groups in Mtumbane were uncertain that it was their prerogative to pay for waste services rendered. This would be attributed to their behaviour regarding waste management; given that their community was not being serviced. With respect to the payment of the service, reluctance was due to them not having the money to pay.

Though economically active, unemployment was a challenge in the sampled households. The respondents in this study reported that it was their understanding that waste collection was the governments' responsibility; therefore, the government had to offer the service. Similarly, in another study in Mamelodi Township in Pretoria, the community did not pay for the service as they perceived waste collection a service offered by the government (Kamara, 2006:56).

A similar study in Akuapem North District in Ghana showed that communities were not willing to pay because of the mode of collection (Amfo-Otu et al 2012:47).

5.4 The impact of the environmental education intervention on waste management practices in sampled households

The interventions of the 4Rs (reduce, re-use, recycle and recover) of waste management practices were taught to Grades 4 to 7 residing in Mtumbane and Maheng. Thereafter, respondents completed a diary over two weeks inclusive of weekends and general waste was sorted according to the instructions. The diary was used to record these activities and the children monitored the waste management practices in their households as per the interventions taught to them at school. Results show that on different days of the week, Mtumbane had some of its waste reduced on Tuesday, Wednesday, Thursday and Saturday.

This was also reported in Maheng. This took place on Monday, Saturday and Sunday. The various types of waste were body spray and doom, plastic bottles, newspaper and magazines. The various types of waste reduced were food, drink cartons, plastic packaging food and drink cans. Food that was wasted on a Tuesday could be due to spoilage or loss of its quality. This was noticed after the intervention was introduced to the children in school. Examples of reuse could be using papers to wrap some gifts, clean windows and can keep it for future chores around the house. Striepe (2011) states that paper can be reused in cleaning windows, making a weed barrier, and if there is any under-ripe fruit; then paper can be used to ripen it.

Maheng reused cardboards (37.2%) on a Monday which implies that over the weekend there was cardboard packaging when shopping was done, as it is common that respondents were paid their wages on Fridays. It could be that they gained knowledge to change practices from the information shared by the children regarding available interventions. Glass bottles were recycled on a Tuesday. This would be from the households who received their wages on a Friday and bought themselves beverages over the weekend. Glass bottles were not dumped the way other waste types were dumped because there was cash associated with the return of glass bottles.

The incentive placed on glass items is an interesting concept and perhaps it is worth exploring a similar strategy for other waste items. For example, if a similar strategy was followed for plastic, this would encourage the recycling of plastic significantly. This study has focused its results on statistically significant differences that were reported between pre- and post-intervention. The differences were meant to establish if the respondents had any changes in knowledge regarding solid waste management. Based on the findings of the pre-intervention, major components of solid waste in the household were examined and contrasted.

It was found that food waste ranked higher in terms of proportion in both townships, followed by paper and plastics and there was no significant difference. This then means that there was no change in knowledge with regards to their practices. The survey revealed that the respondents had temporary solid waste storage and the number increased but with no significant difference. Results show that the use of plastic bags increased which showed a significant difference (p-value 0.034). The results show the same trend in Maheng although the numbers differ but among the majority of respondents, knowledge about temporary storage was insignificant.

The interviews revealed that the indiscriminate dumping of waste in Mtumbane decreased and was stored at home whereas in Maheng there was no difference with their practices. The difference that was shown by respondents in Mtumbane would be the results of the education obtained by the children. Based on the results in Mtumbane, among the majority of respondents, waste was regarded as something useful. This attitude had a positive change as there was a significant difference (p-value 0.003) regarding solid waste. The number of respondents in Maheng that regarded waste as useless increased.

According to the findings of this study, most information dissemination was accomplished through the meetings. The education associated with waste management for both townships increased by more than 15% and that made a significant difference (p-value 0.025). It shows that, though they received information from the meetings pre-intervention, their children were the source of information post-intervention. This is in line with the results from the information dissemination responses.

Most respondents who preferred to dispose of their refuse early in the morning were reported to have decreased and disposed of in the afternoon and evening. The same was reported for Maheng but with not much change. It shows that there was a significant difference in Mtumbane (p-value 0.003) but there was no significant difference in Maheng (p-value 0.310). These changes could be related to the activities performed by the children but to some this was impractical. This test was performed to analyse the way households handle their waste, i.e. to determine whether their waste disposal was done freely, or they knew that their practices were illegal.

The findings had shown that waste separation was not practiced by the sampled households as they previously mentioned that it was not their responsibility and did not understand it. These results show that more than half of the respondents in Mtumbane separated their waste which differed with Maheng. The results show that there was a significant difference (p-value 0.001) in Mtumbane and not in Maheng.

The subject of willingness to pay was highlighted through this study. Respondents were under the impression that they did not have to pay for the services. It was found that the number of respondents willing to pay for waste collection services increased post the education intervention (p-value 0.003). In other studies, in Gauteng and Free State the respondents were willing to pay for the waste collection service (Oyekale 2015: 15890). This was not the case in the Mtumbane and Maheng communities.

The next chapter will focus on concluding statements, limitations and strengths followed by recommendations.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion

In this study, the objectives were to establish the knowledge, attitude and behaviour of sampled households regarding waste management practices. It was established that the respondents had little knowledge regarding the management of waste. Most respondents were positive towards solid waste and regarded waste as useful. It was found that in the pre-intervention phase the participants had a different approach to dealing with waste compared to the post-intervention phase.

The results from this study suggest that environmental education was necessary for these households. It appears that in every aspect when pre- and post-intervention were reported, there was a positive difference after the intervention phase. The intervention of the 4Rs of waste management practices (reduce, reuse, recycle and recover) that was taught to Grades 4 to 7 residing in the previously sampled households was evaluated in these communities. The children were able to see the importance of solid waste separation. According to the findings of this study, environmental education via school children in these townships was effective.

6.1.1. Limitations of this study:

- Some questions were not answered by the respondents
- Some houses had no occupants during the time of interview.

6.1.2. Strengths of this study

- It appears that in every section when pre- and post-intervention were reported there was a positive difference after the intervention phase.
- The environmental education intervention on waste management practices in these households was found to have impacted the community.

6.2. Recommendations

Arising from the findings of this study, the following recommendations are proposed:

6.2.1. Cleaning campaigns and environmental education

To curb the existing problem, the Port St. Johns municipality needs to organise solid waste cleaning campaigns and environmental education in schools as well as communities in Mtumbane and Maheng.

6.2.2. The introduction of the 4Rs- reduce, reuse, recycle and recover

Public participation should be at the centre of environmental education and the 4Rs should be introduced more broadly to Mtumbane and Maheng communities so that residents may be able to make a living from recyclable waste. There is a need to educate the public in both townships and all the surrounding areas of Port St. Johns, encouraging people to separate waste at the source, promoting recycling of recyclable materials and composting of the materials that can nurture gardens.

6.2.3. The provision of communal waste skips

The majority of respondents stated that they needed waste containers in their neighbourhood, therefore waste containers such as skips or any other type of container that will store solid waste until the waste collectors collect should be provided.

6.2.4 The use of incentives to foster proper waste disposal practices

Incentivising good waste practices might be a way of getting the community to change their behaviour when dealing with the disposal of household waste. It is recommended that further research be undertaken to understand what incentives will promote positive waste management practices.

It is important for all future studies to consider a method for disseminating important information to the community in order for waste management strategies to be fully and successfully implemented.

References:

Abdul-Rahman, F. 2014. Reduce, reuse, recycle: *alternatives for waste management,* Available: http://www.aces.nmsu.edu. (Accessed 13 July 2016).

Adogu P.O.U., Uwakwe, K.A., Egenti, N.B., Okwuoha, A.P. and Nkwocha I.B. 2015. Assessment of waste management practices among residents of Owerri Municipal Imo State, Nigeria. *Journal of Environmental Protection*, 6(5):446 & 456.

Agwu, M.O. 2012. Issues and challenges of solid waste management practices in Port Harcourt City, Nigeria- a behavioural perspective. *American Journal of Social and Management Sciences*, 3(2): 83-92

Amfo-Otu, R., Waife, E.D., Kwakwa, P.A. and Akpah-Yeboah, S. 2012. Willingness to pay for solid waste collection in semi-rural Ghana: a logit estimation. *International Journal of Multidisciplinary Research, 2 (7):*41-49*.*

Annepu, R.K. 2012. Sustainable waste management in India. Master of Science in Earth Resources Engineering. Columbia University. Available: http://www.seas.columbia.edu/earth/wtert/sofos/Sustainable%20Solid%20Waste%20Management%20in%20India_Final.pdf.

Banga, M. 2011. Household knowledge, attitude and practices in solid waste segregation and recycling: the case of urban Kampala. *Zambia Social Science Journal* (Online), 2(1). Available: http://scholarship.law.cornell.edu/zssj/vol2/iss1/4

Bao, R. 2011. Waste and recycling attitudes and behaviour of students in Turku. Master of Environmental Sciences, University of Turku. Available: https//www.lsjh.fi/wp-content/uploads/Rina-Bao_masters-thesis_print.pdf

Chawla, L. and Cushing, D.F. 2007. Education for strategic environmental behaviour. *Environmental Education Research,* 13 (4): 437-452. Available: DOI: 10.1080/13504620701581539. (Accessed 14 April 2017).

Council for Scientific and Industrial Research (CSIR). 2011. Municipal waste management- good practices. Pretoria: CSIR. Available: http://climateinfo.pk/frontend/web/attachments/data-type/CSIR%20(2011)%20Municipal%20waste%20management%20-%20good%20practices.pdf.

Damerell, P., Howe, C., Milner-Gulland, E.J. 2013. Child-orientated environmental education influences adult and household behaviour. *Environmental Research Letters*, 8: 2.Available: http://iopscience.iop.org/1748-9326/8/1/015016/pdf/1. (Accessed 16 April 2015).

Etengeneng, D. 2012. Municipal solid waste management in Grahamstown, Republic of South Africa. Bachelor of Natural Resources, Novia University of Applied Sciences. Finland. Available: https://www.theseus.fi/bitstrem/handle/10024/46677/Etengeneng_Dickson.pdf?sequence=1.

Ezea, C. 2010. Analysis of barriers and success factors affecting the adoption of sustainable management of Municipal Solid Waste in Abuja, Nigeria. Doctor of Philosophy, Wolverhampton University. Available: https://www.sciencedirect.com/science/article/pii/S030147971200103X

Finn, K.R. 2007. A study of the household's willingness to contribute to an improved solid waste management program in Kratovo, Macedonia. Master of Science in Environmental Engineering, Michigan Technological University. Available: https://mtu.edu/peacecorps/programs/civil/pdfs/katrina-finn-thesis-final.pdf

First Nations of Quebec and Labrador Sustainable Development Institute(FNQLSDI). 2008. Reduce, Reuse, Recycle and Recover waste: A 4R's Guide for the First Nations communities of Quebec and Labrador. Available: http://fnqlsdi.ca/wp-content/uploads/2013/05/4rsguide_eng.pdf. (Accessed7 June 2016).

Garg, A., Smith, R., Hill, D., Longhurst, P.J., Pollard, S.J.T. and Simms, N.J. 2009. An integrated appraisal of energy recovery options in the United Kingdom using solid recovered fuel derived from municipal solid waste. *Waste Management,* 29 (8): 2289-2297

Getahun, T., Mengistie, E., Haddis, A., Wasie, F., Alemayehu, E., Dadi, D., Van Gerven, T., Van der Bruggen, B. 2011. Municipal solid waste generation in growing urban areas in Africa: current practices and relation to socio-economic factors in Jimma, *Ethiopia. Environmental Monitoring and Assessment*, 184(10): 6341- 6345.

Godfrey, L. 2007. Facilitating the improved management of waste in South Africa through a National waste information system. *Waste Management*, 28 (9): 1660-1671.

Godfrey, L and Oelofse, S. 2017. Historical review of waste management and recycling in South Africa. Available: http://doi:10.3390/resources6040057. (Accessed 14 September 2018)

Google Earth. 2016. Mtumbane, 31º 39' 51" S, and 29º 31' 0"E. Available: https://www.google.co.za/maps/place/Mtumbane/@-31.6370499,29.5419086,21517m/data=!3m1!1e3!4m13!1m7!3m6!1s0x1e5efbf6cc3618f5:0x74f67d7f652a3138!2sMtumbane!3b1!8m2!3d-31.6434806!4d29.5274462!3m4!1s0x1e5efbf6cc3618f5:0x74f67d7f652a3138!8m2!3d-31.6434806!4d29.5274462 (Accessed 27 January 2016)

Grazhdani, D. 2015. Assessing the variables affecting on the rate of solid waste generation and recycling: an empirical analysis in Prespa Park. *Waste Management,* 48: 3-13.

groundWork. United we progress, divided we fall: a waste picker's guide to organising. Available: http://www.groundwork.org.za/Documents/waste/groundWork%20SAWPA%20Waste%20pickers%20organising%20booklet.pdf.

Guerrero, L.A., Maas, G. and Hogland, W. 2012. Solid waste management challenges for cities in developing countries. *Waste Management*, 33(1):220-232.

Gutberlet, J. 2018. Waste in the city: Challenges and opportunities for urban agglomerations. Available: http://dx.doi.org/10.5772/intechopen.72047. (Accessed 14 September 2018).

Haile, A. 2011. Determinants of effective household solid waste management practices: the case of Ambo Town- West Showa Zone. Master of Arts, Mekele University.

Hennepin County Environmental Services. 2011. Environmental Education Toolkit for Youth Programs. Available: http://www.hennepin.us/~/media/hennepinus/Business/work-with-hennepin-county/environmental-education/youth-programs-toolkit-52011.pdf. (Accessed 12 March 2016).

International Labour Organisation. 2005. Organising waste management workers: The South African experience (Online). Athlone: International Labour Organisation. Available: http://www.inclusivecities.org/wp-content/uploads/2012/07/Budlender_ILO_SA_Waste_Collectors_manual.pdf. (Accessed 1 April 2015).

Jamasb, T. and Nepal, R. 2010. Issues and options in waste management: a social cost-benefit analysis of waste-to-energy in the UK. *Resources, Conservation and Recycling,* 54(12): 1341- 1352.

Kamara, A.J. 2006. Household participation in domestic waste disposal and recycling in the Tshwane Metropolitan Area: An Environmental Education Perspective. Master of Education, University of South Africa. Available: http://uir.unisa.ac.za/bitstream/handle/10500/1460/dissertation.pdf

Kapepula, K.M., Colson, G., Sabri, K. and Thonart, P. 2006. A multiple criteria analysis for household solid waste management in the urban community of Dakar. *Waste Management, 27:1690-1705.* Available: http://www.elsevier.com/locate/wasman.(Accessed 22 April 2014)

Karout, N and Altuwaijri, S. 2012. Impact of health education on community knowledge, attitudes and behaviour towards solid waste management in Al Ghobeiry, Beirut. *Eastern Mediterranean Health Journal,* 18 (7) 777- 785.

Kepe, T. 2001. *Waking up from the dream: the pitfalls of 'fast-track' development on the Wild Coast*. Cape Town: Programme for Land and Agrarian Studies. Available: www.plaas.org.za/sites/default/publications-pdf/RR8.pdf

Kgosiesele, E. and Zhaohui, L. 2010. An evaluation of waste management in Botswana: achievements and challenges*. Journal of American Science* 6(9) 144-150.

Kofoworola, O.F. 2007. Recovery and recycling practices in municipal solid waste management, in Lagos, Nigeria. *Waste Management.* 27(9):1141-1143.

Maluleke, P.H. 2014. A review of solid waste management practices in Polokwane City. Master of Science, University of South Africa.Available: https://core.ac.uk/download/pdf/43173826.pdf

Mannie, N.M. and Bowers, A. 2014. Challenges in determining the correct waste disposal solutions for local municipalities- A South African overview. *Institute of waste management of Southern Africa.*6-10 October 2014*:* 427- 434. Available: https://www.infrastructurene.ws/wp-content/uploads/sites/4/2016/01/Mannie-N.M.-and-Bowers-A.-42.pdf. (Accessed 11 October 2016)

McAllister, J. 2015. FactorsInfluencing Solid Waste Management in the Developing World*.* Master of Science, Utah State University.Available: https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1537&context=gradreport

Memon, M.A. 2010. Integrated solid waste management based on the 3R approach. Journal of Material Cycles and Waste Management 12(1):30-40

Ministry of Local Government and Provincial Councils. 2008. *Solid waste reduction:* Service delivery training module 2 of 4, Sri Lanka (Online). (Available: https://asiafoundation.org/resources/pdfs/06SolidWasteReduction.pdf. (Accessed 01 August 2016)

Mungure, J.M. 2008. Governance and community participation in Municipal Solid Waste Management, case of Arusha and Dar es Salaam, Tanzania. Master of Sciences Environmental Management, Aalborg University.Available: http://vbn.aau.dk/files/14465580/Final_Thesis.pdf

Muzenda, E., Ntuli, F. and Pilusa, T.J. 2012. Waste management, strategies and situation in South Africa: an Overview.*International Journal of Environmental, Chemical, Ecological, Geological and Geophysical Engineering,*6(8):552-558. Available: http://waset.org/publications/14607/waste-management-strategies-and-situation-in-south-africa-an-overview. (Accessed 25 July 2016).

Naidoo, K. 2009. An analysis of Municipal solid waste management in South Africa using the Msunduzi Municipality as a case study. Master of Science, University of KwaZulu-Natal.Available: https://researchspace.ukzn.ac.za/xmlui/bitstream/handle/10413/2164/Naidoo_Kaminee_2009.pdf?sequence=1&isAllowed=y

Ngeleka, S.P. 2010. An investigation into solid waste management in townships: the case study of Clermont, KwaZulu-Natal. Master of Science, University of Kwa-Zulu Natal. Available: https://researchspace.ukzn.ac.za/xmlui/bitstream/handle/10413/6286/Ngeleka_Precious_S%27thabile_2010.pdf?sequence=1&isAllowed=y

Nkosi, L.F. 2015. An evaluation of the municipal solid waste management system within City of Tshwane Metropolitan Municipality, in Mamelodi East Township, Gauteng Province, South Africa. Master of Science, University of Pretoria. Available: https://repository.up.ac.za/ bitstream/handle/2263/46145/Nkosi_Evaluation_2015.pdf?sequence=1

Nguyen, P.T., Matsui, Y. and Fujiwara, T. 2010. Household waste generation and characteristic in a Mekong Delta city, Vietnam. *Journal of Environmental Management*, 91(11):2307-2321.

Otoma, S., Hoang, H., Hong, H., Miyazaki, I. and Diaz, R. 2012. A survey on municipal solid waste and residents' awareness in Da Nang city, Vietnam. *Journal of Material Cycles and Waste Management.* 15(2): 187-194. DOI: 10.1007/s10163-012-0109-2.

Omran, A., Mahmood, A., Abdul Aziz, H. and Robinson, G.M. 2008. Investigating households' attitude toward recycling of solid waste in Malaysia: case study. *International Journal of Environmental Research,*3(2): 275-288

Oyekale, A.S. 2015. Factors explaining households' cash payment for solid waste disposal and recycling behaviours in South Africa.*Sust*ainability, 7: 15882- 15899. Available: DOI:10.3390/su71215795 (Accessed 27 August 2017)

Papageorgiou, A., Barton, J.R. and Karagiannidis, A. 2009. Assessment of the greenhouse effect impact of technologies used for energy recovery from municipal waste: A case for England. *Journal of Environmental Management*, 90(10):2999-3012.

Parizeau, K., von Massow, M. and Martin, R. 2014. Household-level dynamics of food waste production and related beliefs, attitudes and behaviours in Guelph, Ontario. *Waste Management,* 35: 207-217.

Periathamby, A., Fauzia, S.H. and K. Khidzir. 2009. Evolution of solid waste management in Malaysia: impacts and implications of the solid waste bill, 2007. Journal *of Material Cycles and Waste Management, 11:96-103*

Pillai, R. and Shah, R. 2014. Municipal solid waste management: current practices and futuristic approach. *SCMS Journal of Indian Management*. 11(4): 72-78.

Pirani, S.I., Al-Khatib, I.A., Halaweh, R., Arafat, M.A. and Arafat, H.A. 2014. Household-level determinant of residential solid waste generation rates: a study from Nablus-Palestine. *Journal of Material Cycles and Waste Management,* 17(4):725-735

Philippe, F. and Culot, M. 2009. Household solid waste generation and characteristics in Cape Haitian City, Republic of Haiti.Resources, Conservation and Recycling 54(2): 73-78.

Post, J.L. 2007. Solid Waste Management in Jamaica: An investigation into waste reduction strategies. Master of Science, Michigan Technological University. Available: https://www.mtu.edu/peacecorps/programs/civil/pdfs/jennifer-post-thesis-final.pdf

Premakumara, D.G.J., 2011. *Survey of Household Solid Waste Generation and Public awareness on Waste Separation and Composting Practices in Cebu City:* Philippines.Online. Available: https://pub.iges.or.jp/pub_file/cebusurveyreportfinalpdf/download. (Accessed 17 June 2014)

Ravi Kumar, P., Jayaram, A. and Somashekar, R.K. 2009. Assessment of the performance of different compost models to manage urban household organic solid wastes. *Clean Technologies and Environmental Policy*, 11(4):473-484.

Republic of South Africa. Statistics South Africa. 2011. *Census* 2011 and Community Survey 2016. Pretoria: Government Printer. Available: http://www.stastssa.gov.za. (Accessed 05May 2018).

Republic of South Africa. Department of Environmental Affairs and Tourism. 2006. *Guideline on waste collection in high density and unserviced areas.* Pretoria: Government Printer.Available: sawic.environment.gov.za/documents/231.pdf

Republic ofSouth Africa. Department of Environmental Affairs and Tourism. 2008. National Environmental Management: Waste Act, 59 of 2008. Government Gazette 32000: 10 March. Cape Town: Department of Environmental Affairs and Tourism.Available:http://www.environment.gov.za/sites/default/files/legislations/nema_amendment_act59.pdf. (Accessed 13 May 2015).

Republic of South Africa. 2011. *Integrated Development Plan*. Pretoria: Government Printer. Available: http://archive.org/details/pment_plans_2017-18_02_local_municipalities_ec154_port_st_johns_ec154_port_st_johns_-idp_-_1718_pdf

Royal HaskoningDHV [RHDHV]. 2014. Municipal solid waste diversion and beneficiation opportunities at Nelson Mandela Bay Metro Municipality, Feasibility study final report. Available: http://www.rhdhv.co.za/media/2016%2004%2019/NMBMM%20Feasibility%20Study_30%20Nov%202014FINAL%20(1).pdf

Sales, M.G.F., Delerue-Matos, C., Martins, I.B., Serra, I., Silva, M.R. and Morais, S. 2006. A waste management school approach towards sustainability*. Resources, Conservation and Recycling 48(2):197-207*

Sankoh, F.P., Yan, X. and Tran, Q. 2013. *Environmental and* health impact of solid waste disposal in developing cities: a case study ofGranville Brook Dumpsite, Freetown, Sierra Leon. Journal of Environmental Protection, 4(7).

Seth, K., Cobbina, S.J., Asare W. and Duwiejuah, A.B. 2014. Household demand and willingness to pay for solid waste management service in Tuobodom in the Techiman-North District, Ghana. *American Journal of EnvironmentalProtection*2 (4): 74-78.

Singhirunnusorn, W., Donlakorn, K. and Kaewhanin, W. 2012. Household recycling behaviours and attitudes toward waste bank project: Mahasarakham Municipality. *Journal of Asian Behavioural Studies,* 2(6): 36-47.

Striepe, B., 2011. *15 Ways to reuse newspaper.* Available: https://www.care2.com/greenliving/15-ways-to-reuse-newspaper.html (Accessed 16 November 2017).

Subhan, M., Ghani, A.B.A. and Joarder, M.H.R. 2014. Urban community willingness to pay for improved solid waste management in Malaysian Municipality: a choice modelling approach. *Asian Social Science*, 10(18): 133.

Troschinetz, A.M. and Mihelcic, J.R. 2008. Sustainable recycling of municipal solid waste in developing countries. *Waste Management,* 29(2): 915-923.

United Nations Children's Fund. 2012.*Climate change and Environmental EducationA companion to the Child Friendly schools manual*. New York: UNICEF. Available: https://www.unicef.org/publications/index49574.html. (Accessed 8 March 2017).

urbanEARTH. 2013. *South African waste snapshot.* Pretoria: Department of Environmental Affairs.Available: http://urbanearth.co.za/sites/default/files/urban_earth_sa_waste_snapshot.pdf

Wagner, T. and Arnold, P. 2008. A new model for solid waste management: an analysis of the Nova Scotia MSW strategy. *Journal of Cleaner Production.*16 (4): 410-421.

Yoada, R.M., Chirawurah, D. and Adongo, P.B. 2014. Domestic waste disposal practice and perceptions of private sector waste management in urban Accra. *BMC Public Health*, 14:697.

Zvikaramba, J.C.M. 2008. Exploring the potential for community participation in solid waste management in Highfields, Harare. Master's dissertation, University of Pretoria. Available: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.914.6285&rep=rep1&type=pdf.

LIST OF APPENDICES

Appendix 1	Letter to Ward Councillor: Permission to conduct study
Appendix 2	Letter to Gobindlovu JSS: Permission to conduct study
Appendix 3	Letter to Gobindlovu JSS: Permission to conduct study
Appendix 4	Letter to Port St. Johns Community School: Permission to conduct study
Appendix 5	Permission to use Questionnaire
Appendix 6	Letter of Information
Appendix 7	Screening Questionnaire.
Appendix 8	Informed consent
Appendix 9	Informed assent
Appendix 10	Questionnaire
Appendix 11	Diary
Appendix 12	IREC approval
Appendix 13	Daily diary results

Appendix 1: LETTER TO WARD COUNCILLOR - PERMISSION TO CONDUCT STUDY

Enq. : Njiva I.D. (Mr.)
Ref. No : nji-01/04/14
Cell No : 082 728 3130
Email : njiva_id@yahoo.com
Fax : 086 662 3801

1093 New Look Street
Mtumbane Township
Port St. John's
5120

30th April 2014

The Ward Councillor
P.S.J. Municipality
Port St. John's
5120

Dear Sir

Re: Permission to conduct a study on waste collection at Mtumbane and Maheng Townships

I am a student at Durban University of Technology studying Master of Technology in Environmental Health, and would like to conduct a survey in the waste collection system that is being practised in Mtumbane and Maheng Townships. This study is aimed at improving service delivery for the community regarding waste management with no ulterior motives.

I am hoping that this correspondence will receive your favourable consideration.

Thanking you in anticipation

Yours faithfully
Innocent Dalumzi Njiva (Mr.) – Principal Investigator

_____ _____
Signature Date

Appendix 2: LETTER TO PRINCIPAL (Gobindlovu Junior Secondary School)– PERMISSION TO CONDUCT STUDY

Enq. : Njiva I.D. (Mr.)
Ref. No : nji-02/04/14
Cell No : 082 728 3130
Email : njiva_id@yahoo.com
Fax : 086 662 3801

1093 New Look Street
Mtumbane Township
Port St. John's
5120

30th April 2014

The Principal
Gobindlovu Junior Secondary School
Port St. John's
5120

Dear Sir/Madam

Re: Permission to conduct a studyon waste collection at Mtumbane and Maheng Townships

I am a student at Durban University of Technology studying Master of Technology in Environmental Health, and would like to conduct a survey in the planned teachingof the 4Rs(reduce, reuse, recycle and recover) of waste management practices in Mtumbane and Maheng Townships. This study is aimed at improving service delivery for the community regarding waste management with no ulterior motives.

I am hoping that this correspondence will receive your favourable consideration.

Thanking you in anticipation

Yours faithfully
Innocent Dalumzi Njiva (Mr.) – Principal Investigator

_____ _____
Signature Date

Appendix 3: LETTER TO PRINCIPAL (Port St. John's Community Primary School- PERMISSION TO CONDUCT STUDY

Enq. : Njiva I.D. (Mr)
Ref. No : nji-03/04/14
Cell No : 082 728 3130
Email : njiva_id@yahoo.com
Fax :086 662 3801

1093 New Look Street
Mtumbane Township
Port St. John's
5120

30th April 2014

The Principal
Port St. John's Community Primary School
5120

Dear Sir/Madam

Re: Permission to conduct a study on waste collection at Mtumbane and Maheng Townships

I am a student at Durban University of Technology studying Master of Technology in Environmental Health, and would like to conduct a survey in the planned teachingof the 4Rs(reduce, reuse, recycle and recover) of waste management practices in Mtumbane and Maheng Townships. This study is aimed at improving service delivery for the community regarding waste management with no ulterior motives.

I am hoping that this correspondence will receive your favourable consideration.

Thanking you in anticipation

Yours faithfully
Innocent Dalumzi Njiva (Mr.) – Principal Investigator

_____ _____
Signature Date

Appendix 4: DEPARTMENT OF EDUCATION - PERMISSION TO CONDUCT STUDY

Enq. : Njiva I.D. (Mr)
Ref. No : nji-04/04/14
Cell No : 082 728 3130
Email : njiva_id@yahoo.com
Fax :086 662 3801

1093 New Look Street
Mtumbane Township
Port St. John's
5120

30th April 2014

The Departmental Head
Department of Education
Port St. John's
5120

Dear Sir

Re: Permission to conduct a study on waste collection at Mtumbane and Maheng Townships

I am a student at Durban University of Technology studying Master of Technology in Environmental Health, and would like to conduct a survey in the planned teachingof the 4Rs(reduce, reuse, recycle and recover) of waste management practices in Mtumbane and Maheng Townships. This study is aimed at improving service delivery for the community regarding waste management with no ulterior motives.

I am hoping that this correspondence will receive your favourable consideration.

Thanking you in anticipation

Yours faithfully
Innocent Dalumzi Njiva (Mr.) – Principal Investigator

_____ _____
Signature Date

Appendix 5: Permission to use questionnaire

On Friday, October 30, 2015 2:16 PM, Karen Butcher <K.Butcher@ids.ac.uk> wrote:

Dear Njiva,

Ashenafi Haile (2011) *Determinants of Effective Household Solid Waste Management Practices: the Case of Ambo Town – West Showa Zone*, Thesis. Mekelle:MU.

Thank you for your enquiry; I apologise for my delayed response.

You are most welcome to use the questionnaire quoted above under the terms of the licence: http://creativecommons.org/licenses/by-nc-nd/3.0/legalcode (summary at http://creativecommons.org/licenses/by-nc-nd/3.0/).

Best wishes,

Karen

Karen Butcher

Repository Coordinator

BLDS (British Library for Development Studies)

Institute of Development Studies at the University of Sussex

Brighton BN1 9RE

Tel. +44 (0)1273 915701

Email: k.butcher@ids.ac.uk

Website: www.blds.ids.ac.uk

Catalogue: http://bldscat.ids.ac.uk/

Working days: Monday, Wednesday, Thursday, Friday

BLDS is funded by DFID (through the Global Open Knowledge Hub Programme) and IDS.

From: Dalumzi Njiva [mailto:njiva_id@yahoo.com]
Sent: 29 October 2015 21:23
To: Karen Butcher <K.Butcher@ids.ac.uk>
Subject: PERMISSION TO USE A QUESTIONNAIRE

Good evening Ms. Butcher, I hope that you are doing well. I am writing this email just to find out if I can carry on with the use of the questionnaire: "Determinants of effective solid waste management practices: The Case of Ambo Town- West Showa Zone by Ashenafi Haile

Thanking you in anticipation

Njiva

Appendix 6: LETTER OF INFORMATION

Title of the Research Study :
The effectiveness of environmental education on waste managementpractices in Mtumbane and Maheng townships in Port St. John's, Eastern Cape.

Principal Investigator/researcher : Mr. I.D. Njiva, BTech: Environmental Health

Co-Investigator/supervisors : Ms. E.J. Kistnasamy (MTech; BCom) and Dr. T. Govender (PhD)

Brief Introduction and Purpose of the Study:

This study will look at how uncollected waste can contribute to the illnesses that the people of these areas are suffering from and determine the effectiveness of environmental education on waste management practices. It will also help to find out the reasons for the waste not to be collected in this area. With this study the authorities will be made to know as to what the uncollected waste can do to the health of the individual. I would like whoever is taking part in this study to cooperate and give whatever information he/she has in order to dig deep to the problems encountered.
Your child will be given a diary which he/she will fill every day for three weeks, separating all the waste types, putting them in different containers in order to find out how much waste is produced for each household use.
The study aims to achieve the following objectives:

(a) To establish the knowledge, attitude and behaviour of sampled household towards waste management practices (WMP)
(b) To evaluate the intervention of the 4Rs of WPM (reuse, reduce, recycle and recover) taught to grades 4-7 residing in the previously sampled households
(c) To assess the impact of health education on WPM in these households.

Outline of the Procedures:

Responsibilities of the participant

I would like you to assist me by signing this letter that I am going to give you to read and sign it if you are willing to participate in the study.

The importance of signing the letter is to ensure that you were part of the study. You will also be asked to answer the questionnaire.

When we are done with the study one copy of the report will be available in our study records if you are interested you may have a copy to keep for yourself.

Consultation/interview/survey details

The ward Councillor has been consulted as regards this study and is aware that there is a study of this nature taking place in this area.

Venue details

This study will be taking place in Maheng and Mtumbane townships.

Inclusion/exclusion criteria

The participants of this study will be people of Maheng and Mtumbane townships. These participants will be full time residents of these areas (Mtumbane and Maheng). People who are visitors or tenants in these areas will be excluded from the study.

Explanation of tools and measurement outcomes

Standardized questionnaires which have categories on knowledge, attitude, practices and behaviour will be used to conduct this survey

This will allow for the testing of association for example, demographic characteristics and exposure characteristics.

Evaluation and comparison of selected alternatives based on technical, environmental, social and economic criteria.

A possible solution is to implement focussed training and environmental awareness campaigns in both communities.

The identification of components within the waste management hierarchy such as reduce, recycle, reuse and recover, methods which are potentially suitable for use in planning.

There will be two publications for this research

How much time required of participant

Answering these questionnaires will take approximately 15 minutes to complete and I would like you to spare me these few minutes.

What is expected of participants?

The participants are expected to co-operate with the interviewer and ask questions where necessary.

Randomization/group allocation

The study is stratified as there are sections in these areas of study.

Risks or discomfortsto the participant

There are no anticipated risks associated with participation in this project.

Benefits :

There is no direct benefit received from your participation in this study, but your participation will help the investigator better understand:

- The identification of job creation opportunities.
- The identification of components within the waste management hierarchy and methods which are potentially suitable for use in planning.
- Evaluation and comparison of selected alternatives based on technical, environmental, social and economic criteria.
- The researcher will publish two publications.

Reasons Why the Participant May Be Withdrawn from the Study:

The participant may be withdrawn due to Non-compliance, illness, adverse reactions etc. There will be no adverse consequences should you choose to withdraw from the study.

Remuneration:

There is no financial compensation to be offered for participation in the study.

Cost of the Study:

The participant is not expected to pay anything towards the study.

Confidentiality:

Every effort will be made to maintain the confidentiality of your study records. The data collected from the study will be used for educational and publication purposes, however, you will not be identified by name. The participant's documentation for this research project will be maintained and safeguarded by the Principal investigator for a minimum of three years after completion of the study. After that time, the participant's documentation may be destroyed.

Research-related Injury:

There is no anticipated research-related injury in this study.

Persons to Contact in the Event of Problems or Queries:

Ms. E.J. Kistnasamy by e-mail:JoyK@dut.ac.za. Please contact the researcher on 082 728 3130/083 349 1548, my supervisor on 031- 373 2249/2696 or the Institutional Research Ethics Administratoron 031- 373 2900. Complaints can be reported to the Director: Research and Postgraduate Support, Prof.S. Moyo on 031-373 2577 or moyos@dut.ac.za.

General:

Participation in this study is voluntary and nobody is forced to participate and you are not waiving any of your legal rights by participating in this research. The number of participants will be approximately 100.

Appendix 7: SCREENING QUESTIONNAIRE

The effectiveness of environmental education on waste management practices
Please tick ☑ in the correct box for each question.

BACKGROUND INFORMATION:

Name of School: _____

1. Child's current grade _____ in _____

2. Is your child: □1 Male

□2 Female

3. Race of child: □1 African

□2 Coloured

□3 Indian

□4 White

□5 Other (Specify: _____)

4. Age of child: □1 6 – 8 yrs.

□2 9 -10 yrs.

□3 11 – 12yrs

□4>12 yrs.

5. Language spoken at home: □1 English

□2 Zulu

□3 Xhosa

□4 Other (Specify :_____)

6. Parent/guardian/Head of Household name:

_____

First Surname

7-8. Telephone number of person completing this questionnaire:

Home: _____ Work: _____

Cell: _____

9. Please provide a phone number of a relative or close friend in case we have trouble contacting you: _____

10. What is the complete physical address of the householdwhere the child lives?

_____

House No. Road/Street

_____

City Postal Code

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE!

Please place the questionnaire in the accompanying envelope and seal it.

Please have your child return this envelope

latest, Wednesday, 18May 2016, 8amto his or her teacher.

On receipt of this questionnaire, you will be contacted within the next few weeks by researcher

Appendix 8: INFORMED CONSENT

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, Dalumzi Njiva, about the nature, conduct, benefits and risks of this study- Research Ethics Clearance Number: **REC36/16**
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

_____	_____	_____	_____
FullName of Participant	**Date**	**Time**	**Signature/Right Thumbprint**

I, Dalumzi Njiva herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

Dalumzi Njiva	_____	_____
Full Name of Researcher	**Date**	**Signature**

_____		
Full Name of Witness (If applicable)	**Date**	**Signature**

_____	_____	_____
Full Name of Legal Guardian	**Date**	**Signature**

Appendix 9: ASSENT FORM

Title of Study The effectiveness of environmental education on waste management practices in Mtumbane and Maheng townships in Port St. John's, Eastern Cape.

Principal Investigator Njiva I.D (Mr.)
School of Health Sciences
082 728 3130; e-mail: njiva_id@yahoo.com

You are being asked to help me. Your parents or guardian say it is okay, but it is up to you if you want to help or not. You may stop at any time by telling me and it is okay. If you want to know more about helping, you may ask me.

Purpose I am asking you to help me on this so that I may know the waste collection system that is being practised in your home and have aims to improve the way it is done.

Procedures you will be asked to fill in the waste diary on the activities that you perform at home. This diary will be filled for two weeks looking at how the waste is being treated. This diary will help us to know how much waste goes to the dumpsite or if you recycle, reuse, recover or reduce waste by burning it. It will take about two weeks to help.

I will do everything to make sure that you do not get hurt in any way. I will be the only person who knows what you say and do. There will be no risks in whichever way in this exercise.

If you understand what you are asked to do and you want to help, you are asked to sign your name below.

Printed Name and Signature of Child Assenting Date

Signature of Witness of Child's Assent Date Signature of the Investigator Date

THE DURBAN UNIVERSITY OF TECHNOLOGYCOMMITTEE FOR PROTECTION OF PARTICIPANTS HAS REVIEWED AND APPROVED THIS PROJECT. ANY QUESTIONS REGARDING YOUR RIGHTS AS A RESEARCH PARTICIPANT MAY BE ADDRESSED TO THE DUT COMMITTEE FOR THE PROTECTION OF PARTICIPANTS. ALL RESEARCH PROJECTS THAT ARE CARRIED OUT BY INVESTIGATORS AT DUT ARE GOVERNED BY REQUIREMENTS OF THE UNIVERSITY.

Appendix 10: QUESTIONNAIRE

I seek to improve the waste collection standard of this area. To help me do this, I seek your views. I would be grateful if you could spend few minutes answering some questions. By completing this questionnaire you can help to make the collection service more suited to your needs.

Study Identification No.:____ **Township: Mtumbane□1**
Maheng□2

A) DEMOGRAPHICS:

1. **Name** : _____

2. **Address** : _____
_____

Tel. : (H) _____
(C) _____
Email: _____

3. **Age** : _____ **Gender:** Male □1 Female □2

4. **Ethnicity** : Black □1 White □2 Indian □3 Coloured□4 Other_____

5. **Occupation** : _____

6. **Education** : 1□None 2□Primary 3□Secondary4□Other

7. **Income per month** : 1□<R200 2□R200<R500 3□R500<R1000 4□R1000-R3000 5□>R3000

8. **Household size** : 1□1 2-4□2 5-7□3 8-10□4 10>□5

9. **Children (under16yrs)** : 1□Males ____ 2□Females_____
Adults : 1□ Males_____ 2□Females___

B) PRACTICES IN HOUSEHOLD SOLID WASTE MANAGEMENT

(a) KNOWLEDGE

10. What are the major solid wastes that your household averagely generates per month?
(Rank them in terms of higher proportion in volume of all of the wastes)
1= highest; 10= lowest

Ash	□1
Food wastes	□2
Wood	□3
Grass and leaves	□4
Paper	□5
Bones	□6
Metals	□7
Plastics/textile	□8

11. Have you ever heard of reducing, recycling, reusing and recovering?
Yes □1 No □2

12. If yes, do you have any intentions to reduce, recycle reuse and recover?
_____
___

13. Do you have a temporary solid waste storage in your house?
Yes □1 No □2

If no, go to question 15

14. What kind of storage do you use?
i. Basket □1
ii. Sack □2
iii. Plastic bag □3

iv. Other _____ □4

15. If no, how do you store solid wastes or what do you do with the solid waste storage problem?

_____
_____
_____

16. Is solid waste disposing container available in your neighbourhood?

Yes □ No □

(b) BEHAVIOUR

17. If your answer in No. 15 is "NO" what other means do you use to dispose of the solid waste of your household?

i. Throw it on an open space, in sewerage or street □1
ii. Digging a hole around the house and burn it □2
iii. Disposing on the backyard of the house □3
iv. Throw it into the river nearby □4
v. Private collectors take it □5
vi. Other, please specify _____ □6

18. Have you ever seen solid waste from residential area thrown away (dumped) on streets, sewerages or nearby rivers?

Yes □1 No □2

19. If yes, how often do you come across this illegal dumping?

i. Always □1
ii. Many times □2
iii. Sometimes □3
iv. Rarely □4

20. How frequent do you dispose your waste other than dumping?

i. Everyday □1
ii. Every 2 to 3 days □2
iii. Every 4 to 5 days □3
iv. Every week □4
v. Fortnightly □5
vi. Every three weeks □6
vii. Every month □7
viii. Other _____ □8

21. What time do you prefer to dispose of your household waste?

i. Early morning □1
ii. Late morning □2
iii. Noon □3
iv. Afternoon □4

v. Evening □5
vi. The time of private waste collectors □6

22. Is there any micro and small enterprise (MSE) that collects solid wastes via door-to-door in your area?
Yes □1 No □2

23. If yes, how long have you been getting the service?
i.< a year □1
ii.For one year □2
iii.For two years □3
iv.For three years □4
v.Other _____ □5

24. How often do MSEs collect solid waste from your house?
i.Weekly □1
ii.Monthly □2
iii.Twice a month □3
iv.Other _____ □4

25. How much do you pay for these services in South African rand? R_____

(c) ATTITUDE

26. Is the service rendered by the MSEs satisfactory?
Yes □1 No □2

27. If the answer in question 20 was "no", what do you think might be the problem?
_____

28. If we are not getting the service from the MSEs, the location of our home/village is one factor that prevents us from getting the services?
Strongly agree □1 agree □2 not sure □3 disagree □4 strongly disagree □5

29. What do you think would be the reason for not getting the solid waste collection service?

---

30. What do you do with the household solid waste if the MSE or the municipal truck does not come at the right time and find your temporal storage full?

i.I keep the waste at home until the collectors come using some other means of storage □1
ii.I burn it at the backyard □2
iii.I dump it on open space far from the main road □3
iv.I dump it on a sewerage □4

v.Other, please specify _____ □5

31. To what extent do MSEs discharge their responsibility?

No.	MSE	1	2	3	4	5
		Strongly agree	Agree	Not sure	Disagree	Strongly disagree
31.1	Treating all households equally					
31.2	Have adequate capacity to serve the given area					
31.3	Have the required skill to collect and manage household waste effectively					
31.4	Collect wastes from households at the right/needed time					
31.5	Payment received from household is fair					
31.6	Generally they are committed in providing their services					

32. What do you think of solid waste? Do you think they are:

i.Useless □1
ii.Somewhat useful □2
iii.Useful □3

33. I agree with the importance of solid waste management?
Strongly agree □1 Agree □2 not sure □3 disagree□4 strongly disagree □5

34. Does your household practice waste separation?
Yes □1 No □2

35. If yes, how do you separate it? _____

36. If no, what do you think the reason is?

i. I do not have understanding about waste separation □1
ii. I did not think that it was my responsibility □2
iii. I did not visualise the importance of waste separation □3
iv. Other ,please specify _____ □4

37. I know that our solid waste generation is affected by or related to our consumption pattern?
Strongly agree □1 Agree □2 not sure □3 disagree□4 strongly disagree □5

38. Who do you think is responsible for solid waste management?
i. The municipality □1
ii. The private waste collectors □2
iii. The households □3
iv. The household and the private waste collectors □4
v. The municipality and the private waste collectors □5
vi. The municipality and household □6
vii. All of the above bodies are responsible □7

39. How do you evaluate the efforts made by the municipality so far to provide solid waste management services?
i. Very good □1
ii. Good □2
iii. Fair □3
iv. Poor □4
v. Very poor □5

40. Which of the following do you think is the best institute to handle solid waste in Port St. John's?
i. The municipality □1
ii. Private enterprises □2
iii. Other, please specify_____ □3

41. What is your major justification to choose the above institution?

_____

42. What do you think is the current number of private waste collectors and how accessible are they to you?
i. Not at all □1
ii. Not adequately accessible □2
iii. Adequately accessible □3

43. Do you know that there are solid waste rules and regulations in Port St. John's?
Yes □1 No □2

44. How do you evaluate the follow-up by the responsible bodies to practice the rules and regulations of solid waste disposal in Port St. John's?

i. Not at all □1
ii. The regulation is weak □2
iii. The regulation is strong □3

45. Have you at any stage observed those violating the solid waste management rules and regulations being penalised?

Yes □1 No □2

46. If yes, how do you evaluate the appropriateness of the penalty to prevent violators of the solid waste management rules and regulations?

i. Very strong □1
ii. Strong □2
iii. Fair □3
iv. Weak □4
v. Very weak □5

47. Have you ever come across any form of lesson associated with solid waste management?

Yes □1 No □2

48. If yes, how was the information disseminated?

i. In a community meeting □1
ii. In a health institution □2
iii. In a poster or photograph □3
iv. Other_____ □4

49. Did you ever get any information or lesson regarding waste from the local municipality?

Yes □1 No □2

50. If yes, in what way did you get solid waste related information from your local municipality?

i. In a local municipal general meetings □1
ii. In community meetings □2
iii. Meeting organised by municipal health workers □3
iv. Other, please specify_____ □4

51. Specifically, the given information concentrated on (you can tick more than once):

i. The impact of solid waste on the environment □1
ii. The importance of appropriate solid waste management □2
iii. The diseases because of inappropriate waste disposal □3
iv. The way to manage solid wastes effectively □4
v. Other_____ □5

52. Have you ever lodged any complaint to the municipality when the private waste collectors or municipal trucks did not come at your household at the right time?

Yes □1 No □2

53. If no, what action did you take to solve the problem?

---

54. I am willing to pay for the private collectors' service for the improvement of solid waste disposal practices in my area?
Strongly agree □1 Agree □2 not sure □3 disagree□4 strongly disagree □5

55. Based on the following information, evaluate the municipal service with the evidence of its collection or management system

No.	**Do you observe disparity in service provision between:**	**Yes**	**No**	**If yes, which areas are better served**	
55.1	Lower income and higher income residents			Lower income □	Higher income □
55.2	The area at or near the main road or the area far from the main road			Nearer to the main road □	Far from the main road □
55.3	The area of higher official residents and ordinary people			Higher official residents □	Ordinary people □
55.4	The residential area and the commercial area			Residential □	Commercial □

56. Comments: do you have any comments regarding waste management practices in your area, if yes, please feel free to say whatever it might be in order to solve the problem faced by the community

_____
_____
_____
_____

Appendix 10: TRANSLATED QUESTIONNAIRE

Ndinqwenela ukuphucula indlela yokuthutha inkunkuma kulendawo.ukuze ndincedakale ekwenzeni lonto, ndidinga izimvo zakho. Ndingavuya xa unokuthatha imizuzwana uphendule imibuzo.Ngokuphendula le mibuzo unganceda ngokwenza uthutho lwenkunkuma lumelane neemfuno zenu.

.**Uphawu lwesifundo No.:**____ **Indawo: Mtumbane□1**
Maheng□2

A) UBUME:

1. **Igama** **:** _____
2. **Idilesi** **:** _____
_____
Umnxeba **:** (H) _____
(C) _____
Email: _____
3. **Iminyaka** **:** _____ **Isinir:** Ndoda□1 Bhinqa□2
4. **Ubuhlanga** **:** Ntsundu□1 Mhlophe□2 Ndiya□3 Owebala□4 Olunye_____
5. **Umsebenzi** **:** _____
6. **Amabanga** **:** 1□Alikho 2□Aphantsi 3□Aphezulu 4□Okunye
7. **Ingeniso** **:** <R200□1 R200<R500□2 R500<R1000□3R1000-R3000□4 >R3000□5
8. **Nibangaphi ekhaya** **:** 1□1 2-4□2 5-7□3 8-10□4 10>□5

9. **Abantwana(ngaphantsi kweminyaka-16)** **:** 1□Ndoda ____ 2□Bhinqa_____

Abadala **:** 1□Ndoda_____ 2□Bhinqa___

B) UHLOBO ESIGCINA NGALO INKUNKUMA EKHAYA

(a) ULWAZI

10. Zintoni ezona zinto zibangela inkunkuma ekhaya ekumyinge wenyanga? (Zidwelise ngokohlobo ezibaninzi ngalo. U-1= eninzi; U-10= encinci

i. Uthuthu □1
ii. Ukutya okuchithwayo □2
iii. Iinkuni □3
iv. Ingca namagqabi □4
v. Amaphepha □5
vi. Amathambo □6
vii. Iintsimbi □7
viii. Iiplastiki/umqhaphu □8

11. Wake weva ngokunciphisa, ukuphindisela, ukuphinda usebenzise nokuvuselela?
Ewe□1 Hayi□2

12. Ukuba impendulo ngu ewe, ingaba unazo iinjongo zokunciphisa, ukuphindisela, ukuphinda usebenzise nokuvuselela?
_____

13. Ingaba unayo indawo yokugcina inkunkuma okomzuzwana ekhaya?
Ewe□1 Hayi□2

Ukuba impendulo ngu hayi gqithela kumbuzo-15

14. Uyigcina luhlobo luni?
i. Umnyazi/Ibaskidi □1
ii. Ingxowa □2
iii. Ingxowa yeplastiki □3
iv. Olunye _____ □4

15. Ukuba impendulo ngu hayi, uyigcina njani inkunkuma okanye wenza ntoni ngengxaki yokugcina inkunkuma?
_____
_____

16. Ingaba ukhona umgqomo wenkunkuma okufutshane?
Ewe□1 Hayi□2

INDLELA YOKUZIPHATHA

17. Ukuba impendulo ku-15 ngu “Hayi” yiyiphi enye indlela oyisebenzisayo ukulahla inkunkuma?

i. Uyilahla kwindawo eselubala, kwimibhobho yelindle okanye esitalatweni □1
ii. Umba umngxuma uyitshise □2
iii. Uyilahla emva kwezindlu □3
iv. Uyilahla kumfula okufutshane □4
v. Iqokelelwa ngabantu abaqeshelwe oko □5
vi. Olunye uhlobo, cacisa _____ □6

18. Wake wayibona inkunkuma apha ekuhlaleni ilahlwa esitalatweni, kumbhobho welindle okanye kumfula okufuphi?

Ewe□1 Hayi□2

19. Ukuba impendulo ngu ewe, udibana kangakanani nenkunkuma elahlwe dlakadlaka?

i. Rhoqo □1
ii. Kaninzi □2
iii. Maxawambi □3
iv. Kunqabile □4

20. Uyiqokelela kangakanani inkunkuma kunokuyilahla dlakadlaka?

i. Yonke imihla □1
ii. Kwintsuku ezimbini ukuya kwezintathu □2
iii. Kwiintsuku ezine ukuya kwezintlanu □3
iv. Veki zonke □4
v. Emva kwee veki ezimbini □5
vi. Kwiiveki ezintathu □6
vii. Nyanga zonke □7
viii. Olunye _____ □8

21. Ukholwa kukuyichitha xesha nini inkunkuma yakho?

i. Ekuseni □1
ii. Ngentlazane □2
iii. Emin’emaqanda □3
iv. Emalanga □4
v. Ngokuhlwa □5
vi. Ngexesha lothutho ngabantu abaqeshelwe oko □6

22. Ingaba bakhona abamashishini amancinci abaqokelela inkunkuma bengena umnyango nomnyango?

Ewe □1 Hayi □2

23. Ukuba impendulo ngu ewe, ziqale nini ezinkonzo?

i. Ngaphantsi konyaka □1
ii. Sezinonyaka □2
iii. Imika emibini □3

iv. Iminyaka emithathu □4
v. Okanye _____ □5

24. Aba bamashishini amancinane bayiqokelela kangaphi inkunkuma emakhaya?
i. Ngeveki □1
ii. Ngenyanga □2
iii. Kabini ngenyanga □3
iv. Okunye _____ □4

25. Uhlawula malini ngezinkonzo ngokwemali yalapha eMzantsi Africa? R_____

(d) UVAKALELO KWISIMO

26. Ingaba lamashishini aqokelela inkunkuma iyanelisa inkozo yawo?
Ewe □1 Hayi □2

27. Ukuba impendulo kumbuzo -20 ibingu "Hayi" ucingela ukuba yintoni enobayingxaki?
_____
_

28. Ukuba asizifumani iinkonzo kubaqokeleli-nkunkuma, yilendawo yethu engunobangela woko?
Injalo kanye□1 ndiyavuma□2 andiqinisekanga□3 andivumi□4 andivumi konke-konke□5

29. Ucingela ukuba yintoni unobangela wokungathuthwa kwenkunkuma?

---

30. Wenza ngenkunkuma xa abaqokeleli benkunkuma bengafikanga kwangethuba ibe indawo obeka kuyo inkunkuma izele?
i. Ndiyayigcina de bafike abathuthi-nkunkuma ndisebenzisa macebo wambi okugcina inkunkuma □1
ii. Ndiyayitshisa emva kwezindlu □2
iii. Ndiyilahla kwindawo endiyibonayo kude nomgwaqo □3
iv. Ndiyilahla kwimibhobho yelindle □4
v. Olunye uhlobo, cacisa _____ □5

31. Banenkathalo abathuthi-nkunkuma?

No.	MSE	1	2	3	4	5
		Injalo kanye	Ndiyavuma	andiqinisekanga	Andivumi	Andivumi konke-konke
31.1	Imizi yonke iphathwa ngokulinganayo					
31.2	Bayakwazi ukumelana nommandla abawunikiweyo					
31.3	Banesakhono esifunekayo sokuthutha banakekele inkunkuma ngokuthe ngqo.					
31.4	Bayithutha inkunkuma ngexesha elililo					
31.5	Intlawulo efumaneka kumakhaya iyaxolisa					
31.6	Bazimisele ekunikeni iiinkonzo					

32. Ucinga ntoni ngenkunkuma? ucinga ukuba:

i. Akukho msebenzi wayo □1
ii. Ingaluncedo □2
iii. Iluncedo □3

33. Ndiyavumelana nokubaluleka kothutho lwenkunkuma.
Kunjalo kanye□1ndiyavuma□2 andiqinisekanga□3 andivumi□4andivumi kone-konke □5

34. Ingaba apha ekhaya iyenziwa into yokwahlula inkunkuma?
Ewe □1 Hayi □2

35. Ukuba impendulo ngu-ewe, uyahlula kanjani?
_____

36. Ukuba ngu hayi, ucingela ukuba sithini isizathu?

i. Akukho nto ndiyiqondayo ngokohlula inkunkuma. □1
ii. Bendicinga ukuba asiloxanduva lwam olo □2
iii. Andizange ndabanombono wokubaluleka ukohlula inkunkuma □3
iv. Esinye, cacisa _____ □4

37. Ndiyazi ukuba inkunkuma yethu ibangelwa luhlobo esitya ngalo?
Kunjalo kanye□1Kunjalo□2 andiqinisekanga□3 akunjalo□4 andivumi konke-konke □5

38. Ucingela ukuba ngubani onoxanduva lothutho lwenkunkuma?

i. NguMasipala □1
ii. Ngabathuthi-nkunkuma babucala □2
iii. Likhaya □3
iv. Likhaya nabathuthi-nkunkuma babucala □4
v. Ngumasipala nabathuthi-nkunkuma babucala □5
vi. NguMasipala nekhaya □6
vii. Bonke abangasentla apha banoxanduva □7

39. Uyijonga njani imizamo eyenziwa nguMasipala ukunika iinkonzo zokuthutha inkunkuma?

i. Mihle kakhulu □1
ii. Mihle □2
iii. Ingcono □3
iv. Ayikho □4
v. Akukho kwahlobo lomzamo □5

40. Ucingela ukuba yiyiphi eyona ndawo ilungileyo enokujongana nothutho lwenkunkuma e Port St. John's?

i. NguMasipala □1
ii. Zinkampani zabucala □2
iii. Enye, cacisa_____ □3

41. Yintoni eyona nto ikubangela ukuba ukhethe le ndawo?

_____

42. Ucingela ukuba lithini inani labathuthi-nkunkuma babucala kwaye bafumaneka njani kuwe?

i. Abafumaneki kwabona □1
ii. Abafumaneki ngokwaneleyo □2
iii. Bayafumaneka □3

43. Uyayazi into yokuba kukho imithetho nemigqaliselo yothutho lwenkunkuma ePort St. John's?

Ewe □1 Hayi □2

44. Uyibona njani into yokulandelelwa kwemithetho ngabasemagunyeni kuthutho lwenkunkuma apha ePort St. John's?

i. Akukho msebenzi wayo □1
ii. Lo mthetho uyekelele □2
iii. Lo mthetho uqinile □3

45. Kukhona abantu owake wababona besaphula lo mthetho wothutho lwenkunkuma betshutshiswa?

Ewe □1 Hayi □2

46. Ukuba impendulo ngu-ewe, ukujonga njani ukugwetywa kwabo ukuze kunqandwe abophuli-mthetho bothutho lwenkunkuma?

i. Uqine kakhulu □1
ii. Uqinile □2
iii. Ubuqina □3
iv. Uyekelele □4
v. Uyekelele kakhulu □5

47. Sowuke wadibana nemfundiso enokwenza nothutho lwenkunkuma?

Ewe □1 Hayi □2

48. Ukuba impendulo ngu-hayi, ifumaneke le mfundiso

i. Kwindibano zasekuhlaleni □1
ii. Kwisakhiwo sezempilo □2
iii. Kuxwebhu okanye emfanekisweni □3
iv. Kwenye_____ □4

49. Wake wayifumana inkcazelo okanye isifundo esinokwenza nenkunkuma kulomasipala wasekhaya?

Ewe □1 Hayi □2

50. Ukuba impendulo ngu-ewe, walufumanisa njani ulwazi ngenkunkuma kumasipala?

i. Kwintlanganiso zikawonke-wonke zikamasipala □1
ii. Kwiintlanganiso zasekuhlaleni □2
iii. Kwintlanganiso ezikhwetywe ngoonompilo bakamasipala □3
iv. Olunye, cacisa _____ □4

51. Ngokucacileyo, olulwazi lungqale (ungachonga impendulo nokuba zingaphi):

i. Kokwenziwa yinkunkuma kwindalo □1
ii. Kukubaluleka kokuthuthwa kwenkunkuma □2
iii. Kwizifo ngenxa yokungachithwa kakuhle kwenkunkuma □3
iv. Kwindlela egqibeleleyo yothutho lwenkunkuma □4
v. Kwenye_____ □5

52. Wawuke wasifaka isikhalazo kumasipala xa abathuthi-nkunkuma babucala okanye iinqwelo zikamasipala zingalibambanga ixesha lokufika?

Ewe □1 Hayi □2

53. Ukuba impendulo ngu-hayi, wenza ntoni ukukhawulelana nalengxaki?

---

54. Ndizimisele ukuhlawula inkonzo kubathuthi-nkunkuma babucala ukuze kuphucuke uhlobo esenza ngalo apha ekuhlaleni?
Kakhulu□1ndizimisele□2 andiqinisekanga□3 andizimiselanga□4 andisoze □5

55. Ngokwalengcaciso ingezantsi apha, khawuthelekiseinkonzo zikamasipala kunye nobungqina bokuthutha okanye uhlobo abenza ngalo

No.	**Uqaphela ukungalingani ukunikezelwa kweenkonzo phakathi :**	**Ewe**	**Hayi**	**Ukuba ngu-ewe ziziphi iindawo ezifumana iinkonzo ezingcono**	
55.1	Kwabahlali abamkela kancinci nabamkela kakhulu			Abamkela kancinci□	Abamkela kakhulu□
55.2	Kwabahlala kufutshane nendlela okanye abakude nendlela			Abakufuphi nendlela □	Abakude nondlela□
55.3	Kwindawo yamagosa aphezulu nakubantu bomgquba			Amagosa aphezulu□	Abantu bomgquba□
55.4	Kwindawo yokuhlala neyokushishina			Eyokuhlala□	Eyoshishino □

56. Chaza nayiphi na ingxaki oyiqapheleyo enokwenza nothutho lwenkunkuma uphawule ukuze kunyuswe umgangatho.

_____
_____
_____

Appendix 11: DIARY - HOUSEHOLD WASTE MANAGEMENT

Study Identification No.: _____

Name of child : _____ _____

First Middle Last **Day MonthYear**

INSTRUCTIONS:

1. Please fill this diary for each type of waste for each day.
2. Tick the ONE category that BEST describes what happens on each day to that particular waste. For example, if on Monday you or your family reused newspapers, then TICK reuse.

Week 1 **Date from: _____ to: _____**

Type of waste	No.	Monday	No.	Tuesday	No.	Wednesday	No.	Thursday	No.	Friday	No.	Saturday	No.	Sunday
Newspapers and magazines	1	Reduce	1	Reduce	1	Reduce	1	Reduce	1	Reduce	1	Reduce	1	Reduce
	2	Recycle	2	Recycle	2	Recycle	2	Recycle	2	Recycle	2	Recycle	2	Recycle
	3	Reuse	3	Reuse	3	Reuse	3	Reuse	3	Reuse	3	Reuse	3	Reuse
	4	Recover	4	Recover	4	Recover	4	Recover	4	Recover	4	Recover	4	Recover
	5	Disposal	5	Disposal	5	Disposal	5	Disposal	5	Disposal	5	Disposal	5	Disposal
Cardboard	1	Reduce	1	Reduce	1	Reduce	1	Reduce	1	Reduce	1	Reduce	1	Reduce
	2	Recycle	2	Recycle	2	Recycle	2	Recycle	2	Recycle	2	Recycle	2	Recycle
	3	Reuse	3	Reuse	3	Reuse	3	Reuse	3	Reuse	3	Reuse	3	Reuse

	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	
	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	
Drink cartons	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	
	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	
	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	
	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	
	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	
Glass bottles	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	
	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	
	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	
	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	
	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	
Food tins and drink	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	
	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	
	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	

	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover
	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal
Body spray and doom	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce
	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle
	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse
	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover
	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal
Plastic bottles	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce
	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle
	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse
	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover
	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal
Food waste	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce
	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle
	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse

	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover
	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal
Nappies	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce
	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle
	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse
	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover
	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal
Plastic packaging	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce
	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle
	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse
	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover
	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal
Other	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce
	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle
	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse
	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover

	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal

Week 2 **Date from: _____ to: _____**

Type of waste	No.	Monday	No.	Tuesday	No.	Wednesday	No.	Thursday	No.	Friday	No.	Saturday	No.	Sunday
Newspapers and magazines	1	Reduce	1	Reduce	1	Reduce	1	Reduce	1	Reduce	1	Reduce	1	Reduce
	2	Recycle	2	Recycle	2	Recycle	2	Recycle	2	Recycle	2	Recycle	2	Recycle
	3	Reuse	3	Reuse	3	Reuse	3	Reuse	3	Reuse	3	Reuse	3	Reuse
	4	Recover	4	Recover	4	Recover	4	Recover	4	Recover	4	Recover	4	Recover
	5	Disposal	5	Disposal	5	Disposal	5	Disposal	5	Disposal	5	Disposal	5	Disposal
Cardboard	1	Reduce	1	Reduce	1	Reduce	1	Reduce	1	Reduce	1	Reduce	1	Reduce
	2	Recycle	2	Recycle	2	Recycle	2	Recycle	2	Recycle	2	Recycle	2	Recycle
	3	Reuse	3	Reuse	3	Reuse	3	Reuse	3	Reuse	3	Reuse	3	Reuse
	4	Recover	4	Recover	4	Recover	4	Recover	4	Recover	4	Recover	4	Recover
	5	Disposal	5	Disposal	5	Disposal	5	Disposal	5	Disposal	5	Disposal	5	Disposal
Drink cartons	1	Reduce	1	Reduce	1	Reduce	1	Reduce	1	Reduce	1	Reduce	1	Reduce
	2	Recycle	2	Recycle	2	Recycle	2	Recycle	2	Recycle	2	Recycle	2	Recycle
	3	Reuse	3	Reuse	3	Reuse	3	Reuse	3	Reuse	3	Reuse	3	Reuse
	4	Recover	4	Recover	4	Recover	4	Recover	4	Recover	4	Recover	4	Recover
	5	Disposal	5	Disposal	5	Disposal	5	Disposal	5	Disposal	5	Disposal	5	Disposal
Glass bottles	1	Reduce	1	Reduce	1	Reduce	1	Reduce	1	Reduce	1	Reduce	1	Reduce
	2	Recycle	2	Recycle	2	Recycle	2	Recycle	2	Recycle	2	Recycle	2	Recycle
	3	Reuse	3	Reuse	3	Reuse	3	Reuse	3	Reuse	3	Reuse	3	Reuse

	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover
	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal
Food tins and drink	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce
	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle
	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse
	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover
	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal
Body spray and doom	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce
	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle
	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse
	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover
	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal
Plastic bottles	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce
	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle
	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse
	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover
	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal
Food waste	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce
	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle
	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse

	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover
	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal
Nappies	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce
	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle
	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse
	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover
	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal
Plastic packaging	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce
	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle
	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse
	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover
	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal
Other	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce	1		Reduce
	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle	2		Recycle
	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse	3		Reuse
	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover	4		Recover
	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal	5		Disposal

THANK YOU FOR COMPLETING THIS DIARY

PLEASE:

a) Place the completed diary in the accompanying envelope and seal it.
b) Return the sealed envelope by latest _____ to your teacher.

Appendix 11: TRANSLATED DIARY

Inombolo echaza isifundo.: _____

Igama lomntwana : _____ _____

Igama Ifani U**suku** **Inyanga** **Unyaka**

Imiyalelo:

1. Nceda ugcwalise le ncwadana ngohlobo ngalunye lwenkunkuma ngosuku ngalunye.
   1. Phawula KANYE kulendawo ichaza ukuba kwenzeka ntoni ngosuku ngalunye kolohlobo lwenkunkuma. Umzekelo, ukuba ngoMvulo wena okanye ilungu losapho niphinde nasebenzisa amaphepha, PHAWULA kwindawo yokuphinda usebenzise.

<u>Iveki 1</u> **Ukususela: _____ ukuya: _____**

Hlobo lwenkunkuma	**No.**	**Mvulo**	**No.**	**Lwesibini**	**No.**	**Lwesithathu**	**No.**	**Lwesine**	**No.**	**Lwesihlanu**	**No.**	**Mgqibelo**	**No.**	**Cawa**
Amaphephane Magazini	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa
	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa 2		Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa
	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise 3		Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise
	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela
	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla

Ikhalibhothi	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa
	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa
	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise
	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela
	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla
Igobhoza lesiselo	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa
	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa
	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise
	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela
	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla
Iibhotile	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa
	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa
	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise
	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela
	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla
Ukutya nesiselo	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa
	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa

esinkonkxiweyo	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise			
	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela			
	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla			
Iziqholo zomzimba nesibulali zinambuzane	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa			
	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa			
	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise			
	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela			
	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla			
Iibhotile zeplastiki	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa			
	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa			
	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise			
	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela			
	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla			
Ukutya okuchithwayo	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa			
	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa			
	3		Phindausebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise			
	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela			

	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla
Iinabukeni	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa
	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa
	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise
	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela
	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla
Okusongwa ngeplastiki	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa
	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa
	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise
	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela
	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla
Okunye	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa	1		Nciphisa
	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa	2		Iyoqalelwa
	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise	3		Phinda usebenzise
	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela	4		Vuselela
	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla	5		Lahla

Iveki 2 **Ukususela: _____ ukuya: _____**

Hlobo lwenkunkuma	**Mvulo**		**Lwesibini**		**Lwesithathu**		**Lwesine**		**Lwesihlanu**		**No**		**No**		**Cawa**	
Amaphepha ne Magazini	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1			Nciphisa
	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2			Iyoqalelwa
	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3			Phinda usebenzise
	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4			Vuselela
	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5			Lahla
Ikhalibhothi	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1			Nciphisa
	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2			Iyoqalelwa
	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3			Phinda usebenzise
	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4			Vuselela
	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5			Lahla
Igobhoza lesiselo	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1			Nciphisa
	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2			Iyoqalelwa
	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3			Phinda usebenzise
	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4			Vuselela
	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5			Lahla
Iibhotile	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1			Nciphisa
	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2			Iyoqalelwa

	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3		Phinda usebenzise
	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4		Vuselela
	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5		Lahla
Ukutya nesiselo esinkonkxi weyo	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1		Nciphisa
	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2		Iyoqalelwa
	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3		Phinda usebenzise
	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4		Vuselela
	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5		Lahla
Iziqholo zomzimba nesibulali zinambuzane	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1		Nciphisa
	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2		Iyoqalelwa
	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3		Phinda usebenzise
	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4		Vuselela
	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5		Lahla
Iibhotile zeplastiki	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1		Nciphisa
	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2		Iyoqalelwa
	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3		Phinda usebenzise
	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4		Vuselela
	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5		Lahla
	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1		Nciphisa
	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2		Iyoqalelwa

Ukutya okuchithwayo	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise
	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela
	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla
Iinabukeni	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa
	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa
	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise
	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela
	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla
Okusongwa ngeplastiki	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa
	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa
	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise
	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela
	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla
Okunye	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa	1	Nciphisa
	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa	2	Iyoqalelwa
	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise	3	Phinda usebenzise
	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela	4	Vuselela
	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla	5	Lahla

NDIYABULELA NGOKUGCWALISA LE NCWADANA

NCEDA:

a) Ufake le ncwadana wakugqiba kwimvulophu uyivale.

b) Uze uyibuyise le mvulophu ivaliwe _____uyinike utitshala wakho.

Appendix 12: IREC FULL APPROVAL

DUT
DURBAN
UNIVERSITY OF
TECHNOLOGY

Institutional Research Ethics Committee
Faculty of Health Sciences
Room MS 49, Mansfield School Site
Gate 8, Ritson Campus
Durban University of Technology

P O Box 1334, Durban, South Africa, 4001

Tel: 031 373 2900
Fax: 031 373 2407
Email: lavishad@dut.ac.za
http://www.dut.ac.za/research/institutional_research_ethics

www.dut.ac.za

12 July 2016

IREC Reference Number: **REC 36/16**

Mr I D Njiva
P O Box 5826
Port St. John's
5120

Dear Mr Njiva

The effectiveness of environmental education on waste management practices in Mtumbane and Maheng townships in Post St. John's, Eastern Cape

The Institutional Research Ethics Committee acknowledges receipt of your notification regarding the piloting of your data collection tools.

Kindly ensure that participants used for the pilot study are not part of the main study.

In addition, the IREC acknowledges receipt of your gatekeeper permission letters.

Please note that FULL APPROVAL is granted to your research proposal. You may proceed with data collection.

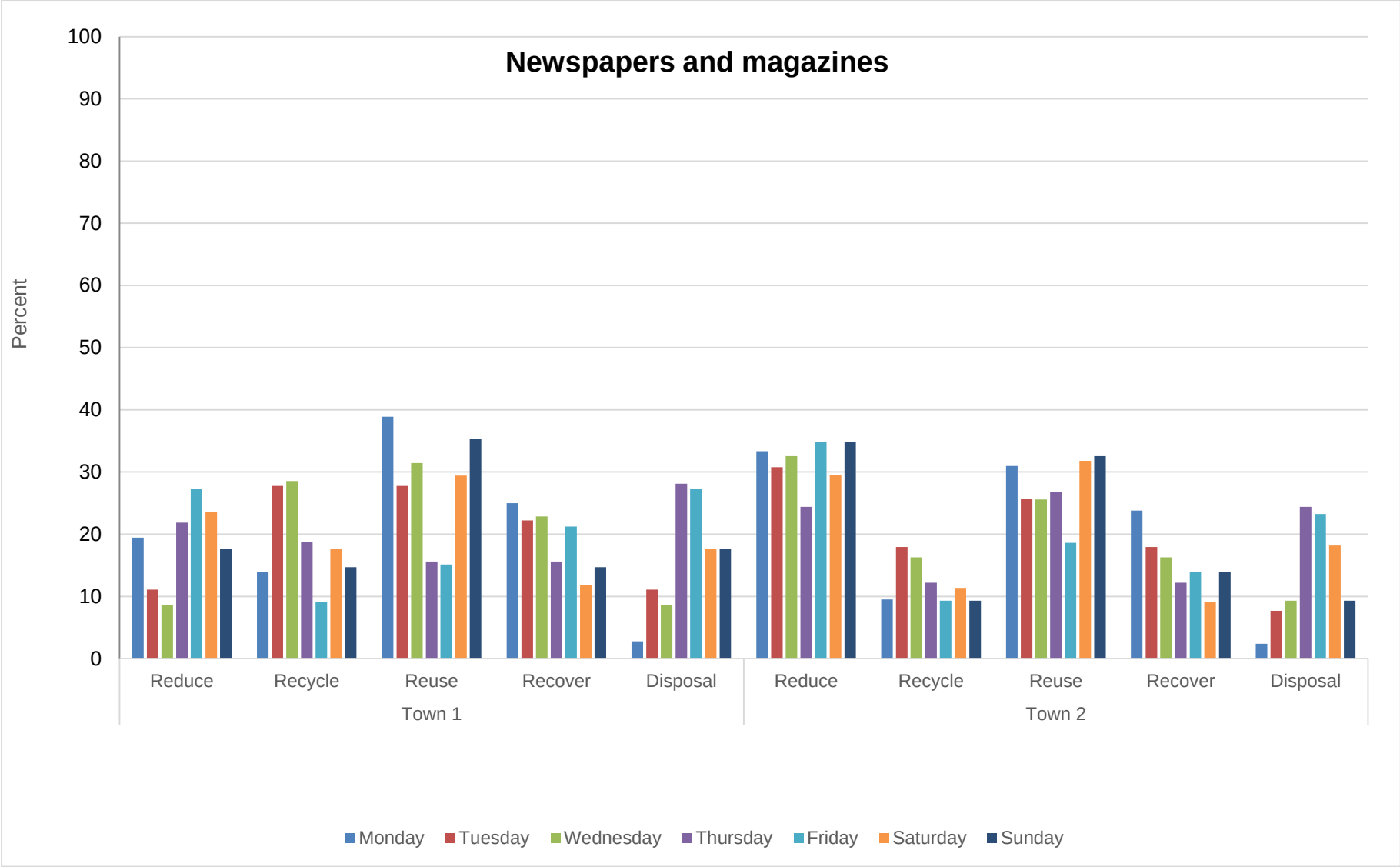
Yours Sincerely,

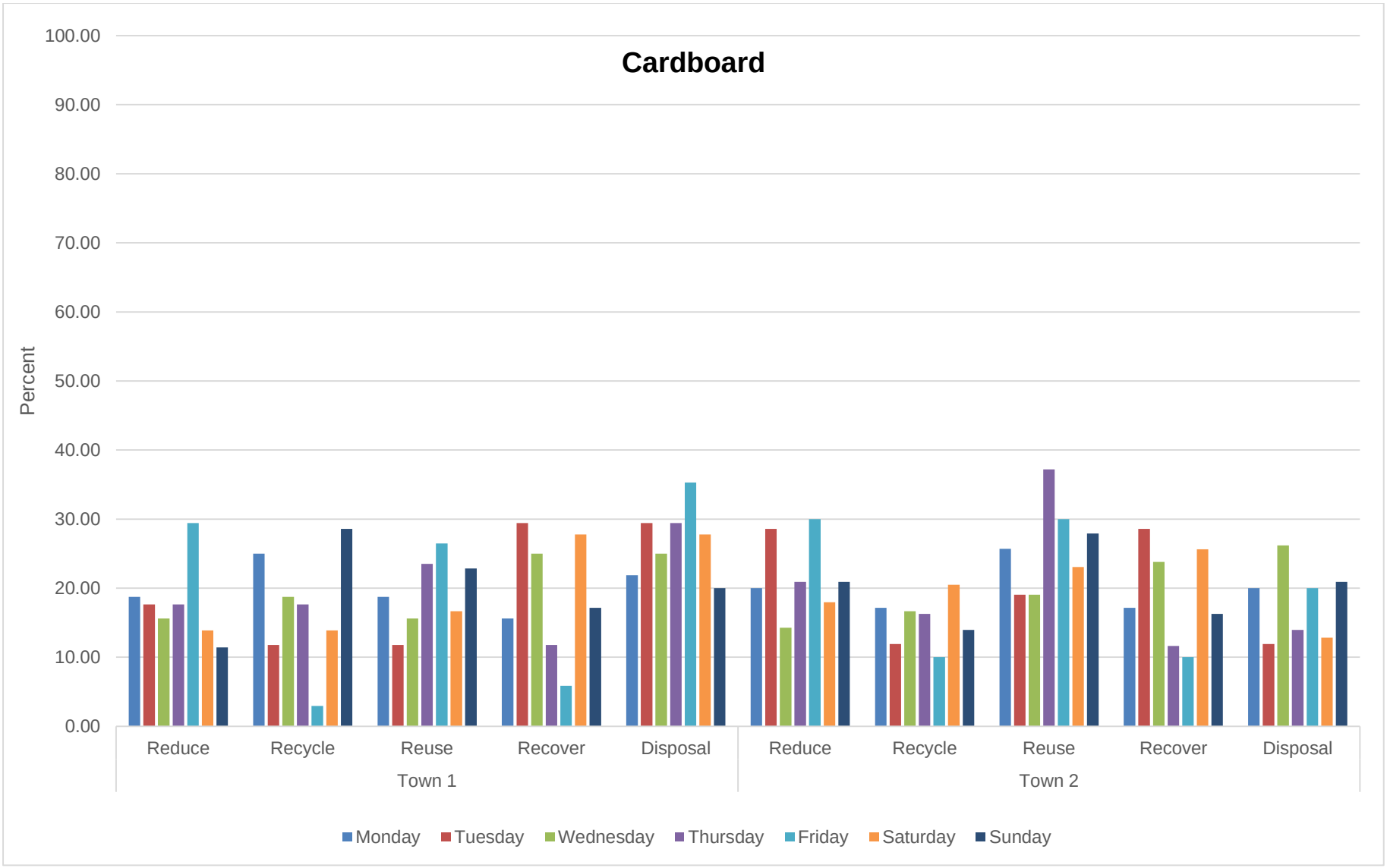
[redacted]

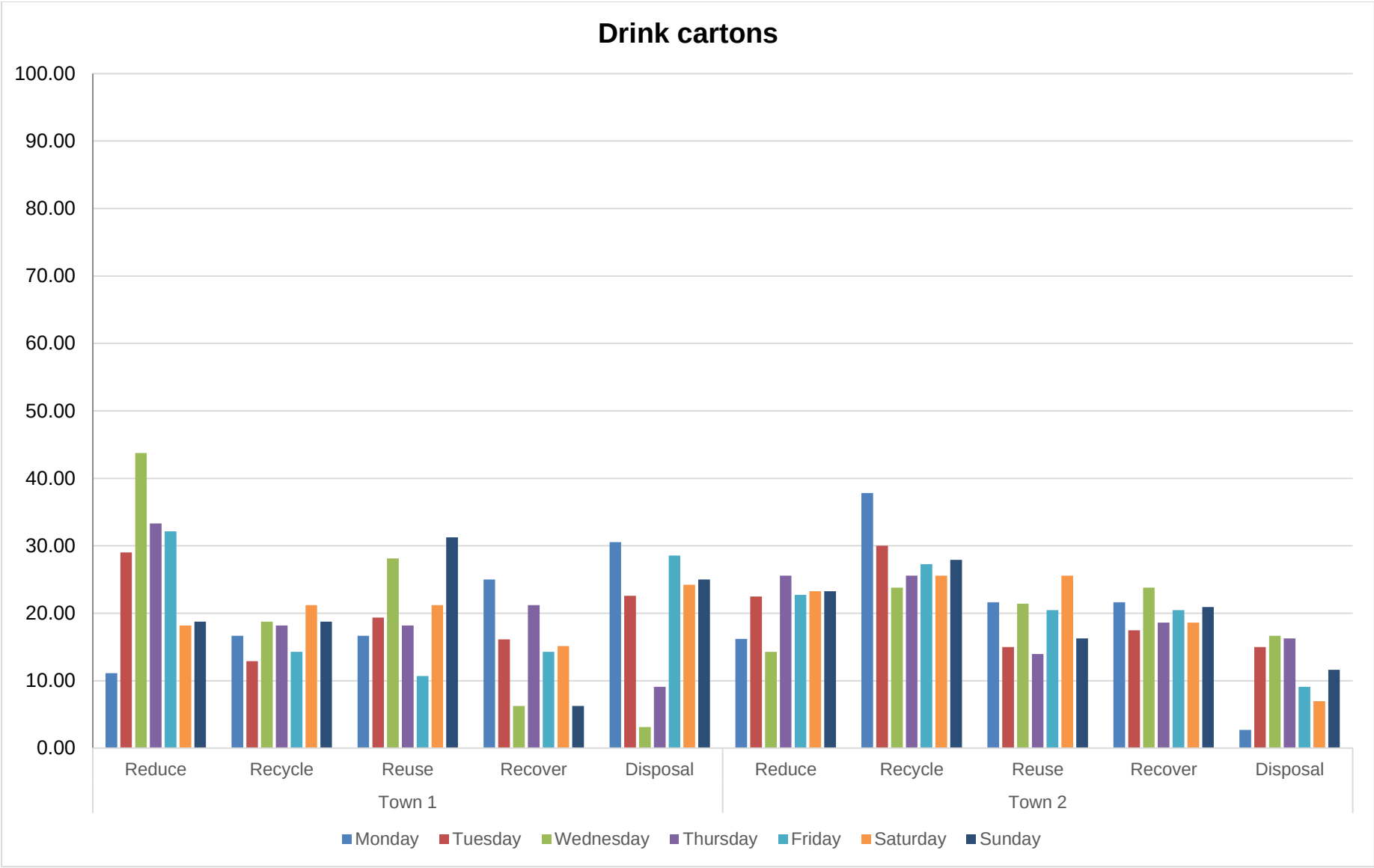
Professor J K Adam
Chairperson: IREC

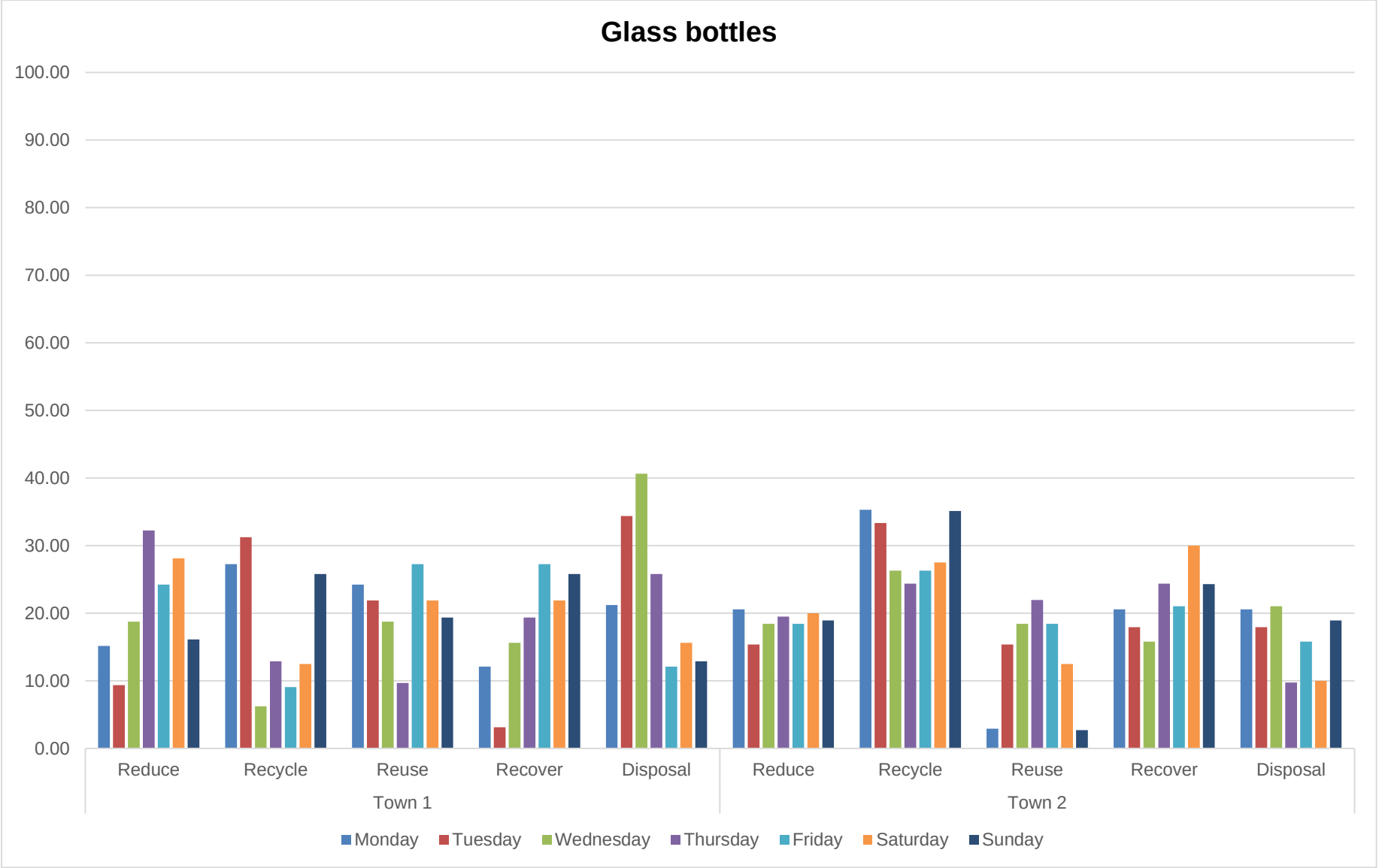
DUT DURBAN UNIVERSITY OF TECHNOLOGY
2016 -07- 12
INSTITUTIONAL RESEARCH ETHICS COMMITTEE
P O BOX 1334 DURBAN 4000 SOUTH AFRICA

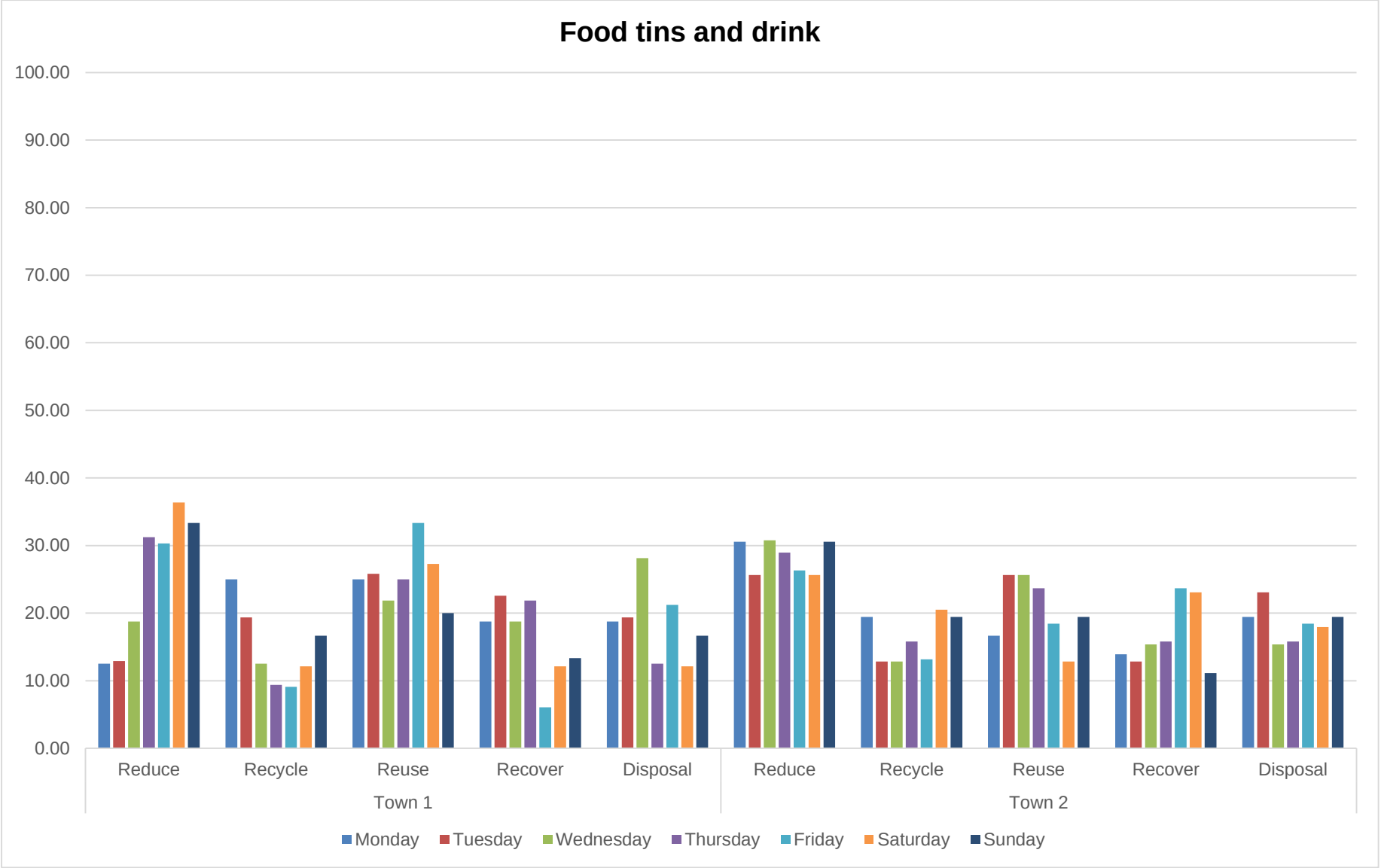
Appendix 13: DAILY DIARY RESULTS (additional results)

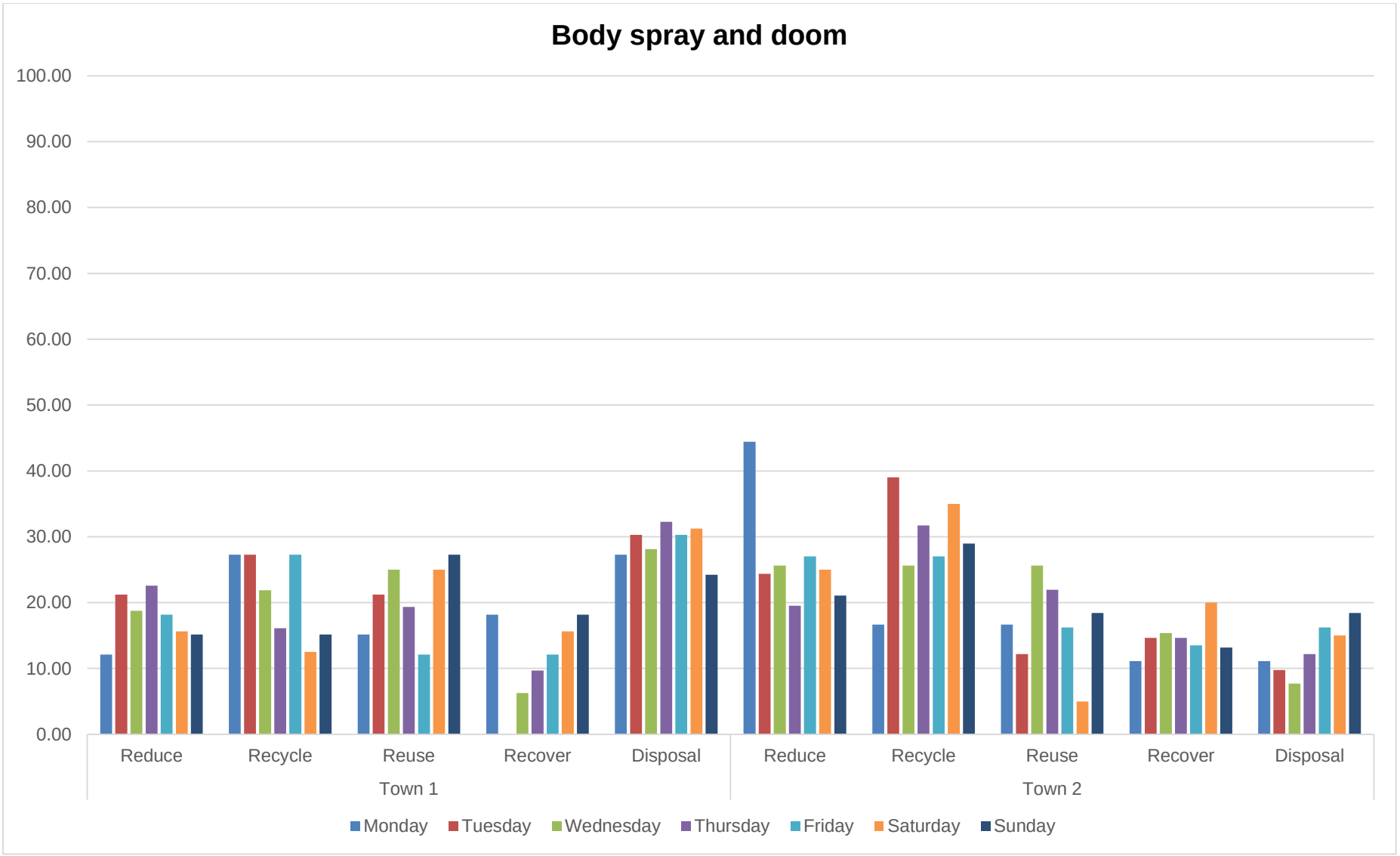


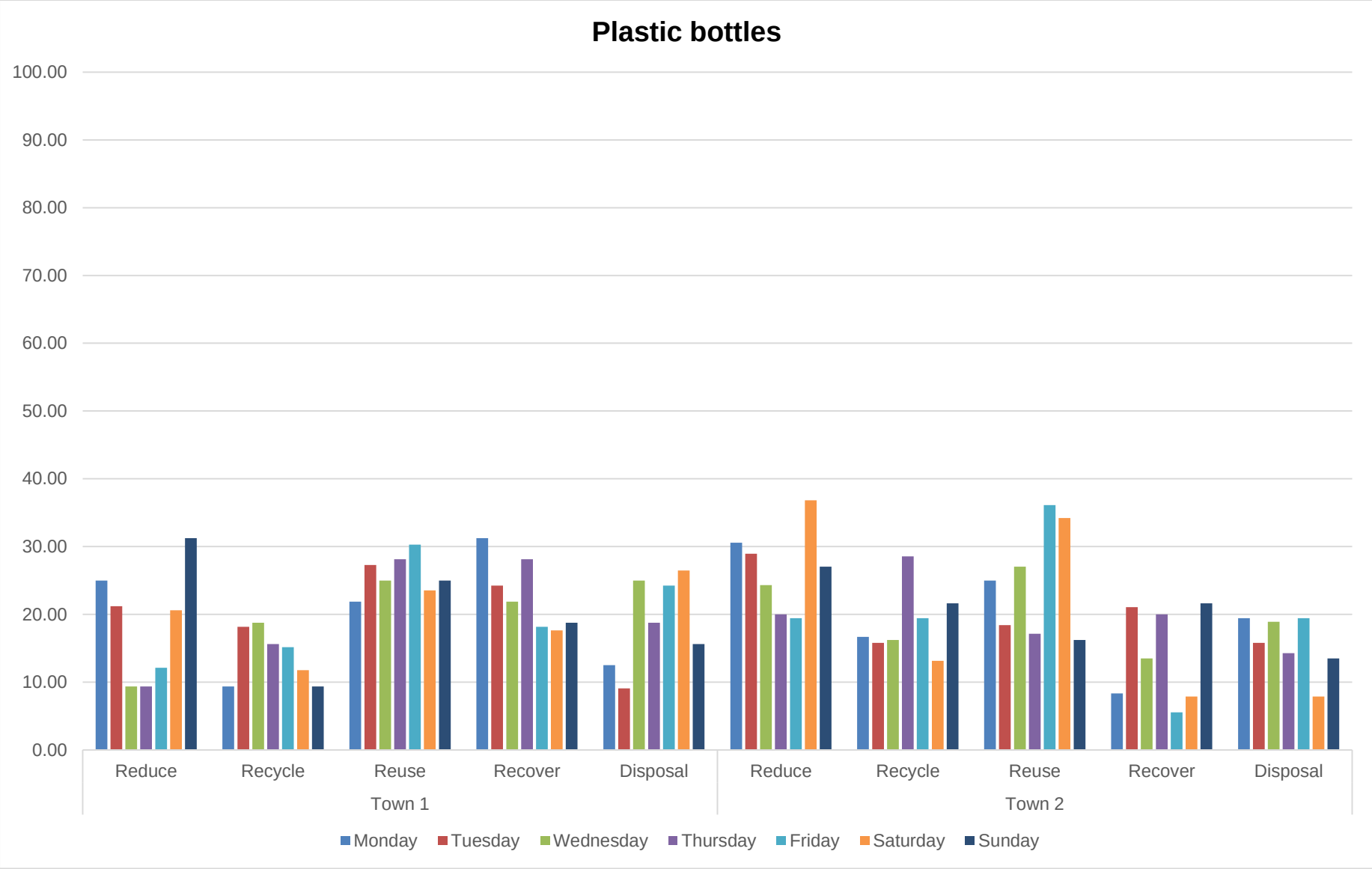

Cardboard
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Percent
Reduce
Recycle
Reuse
Recover
Disposal
Town 1
Reduce
Recycle
Reuse
Recover
Disposal
Town 2
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday

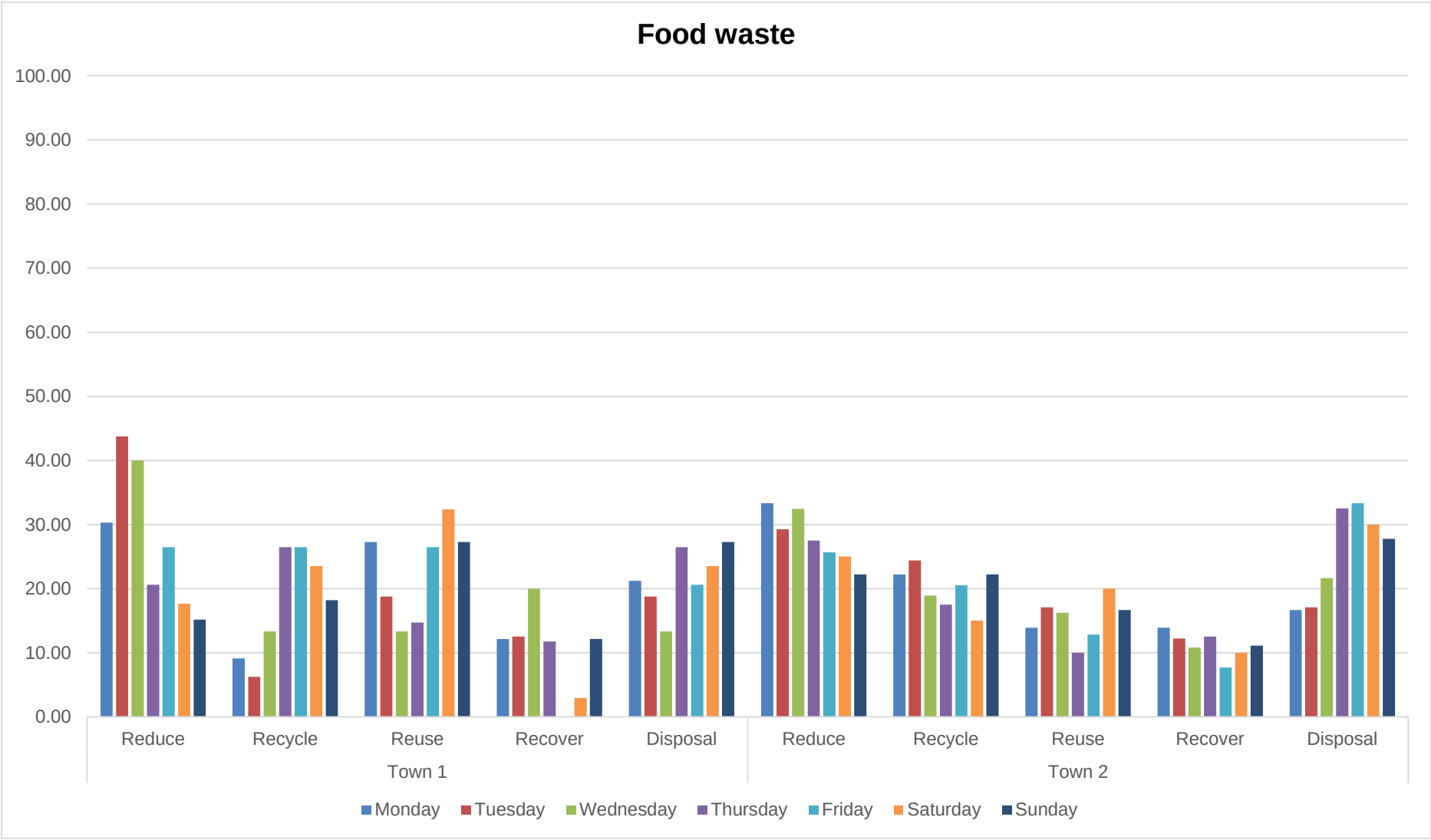

Drink cartons
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Reduce
Recycle
Reuse
Recover
Disposal
Town 1
Reduce
Recycle
Reuse
Recover
Disposal
Town 2
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday

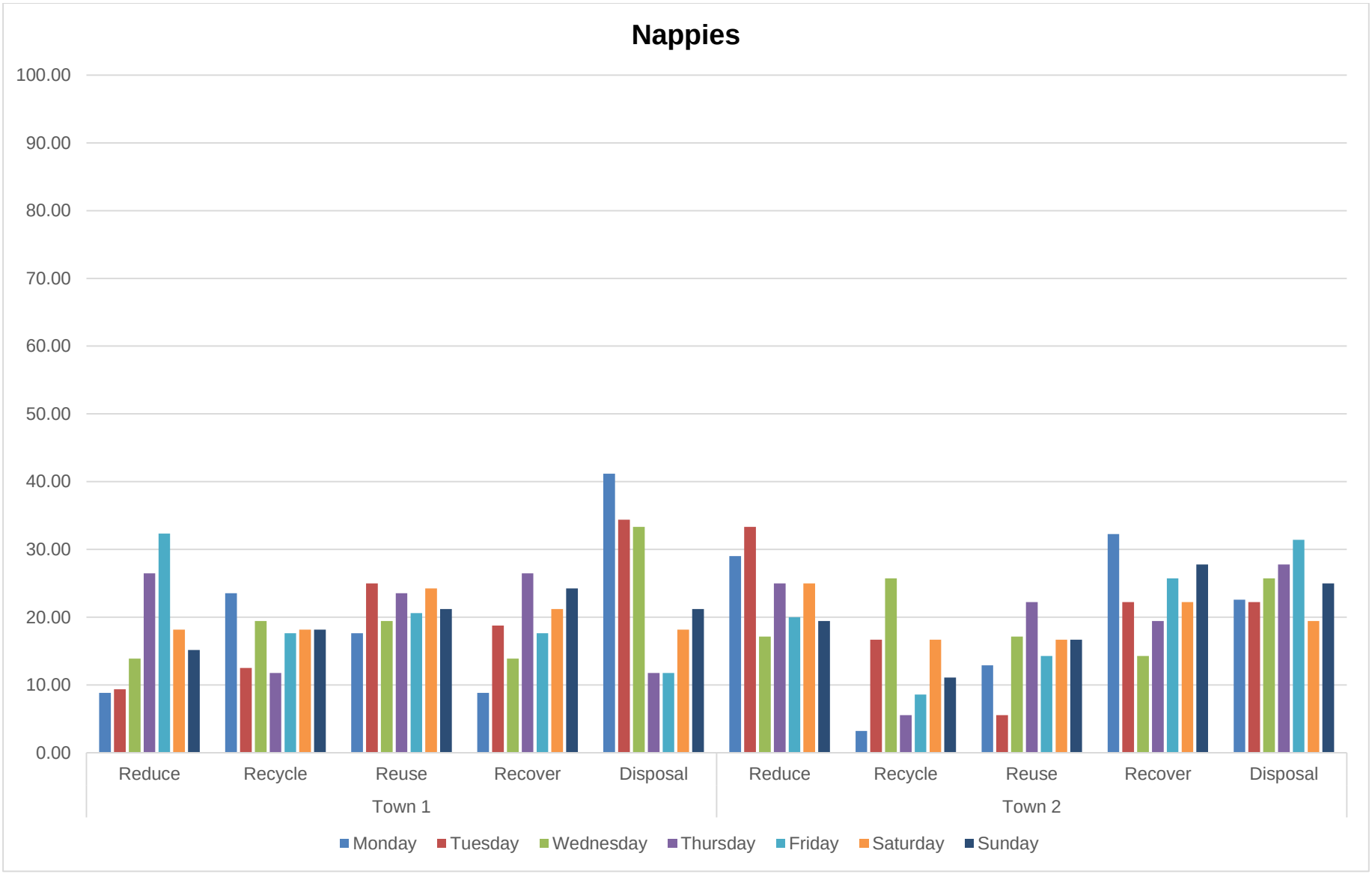

Glass bottles
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Reduce
Recycle
Reuse
Recover
Disposal
Reduce
Recycle
Reuse
Recover
Disposal
Town 1
Town 2
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday

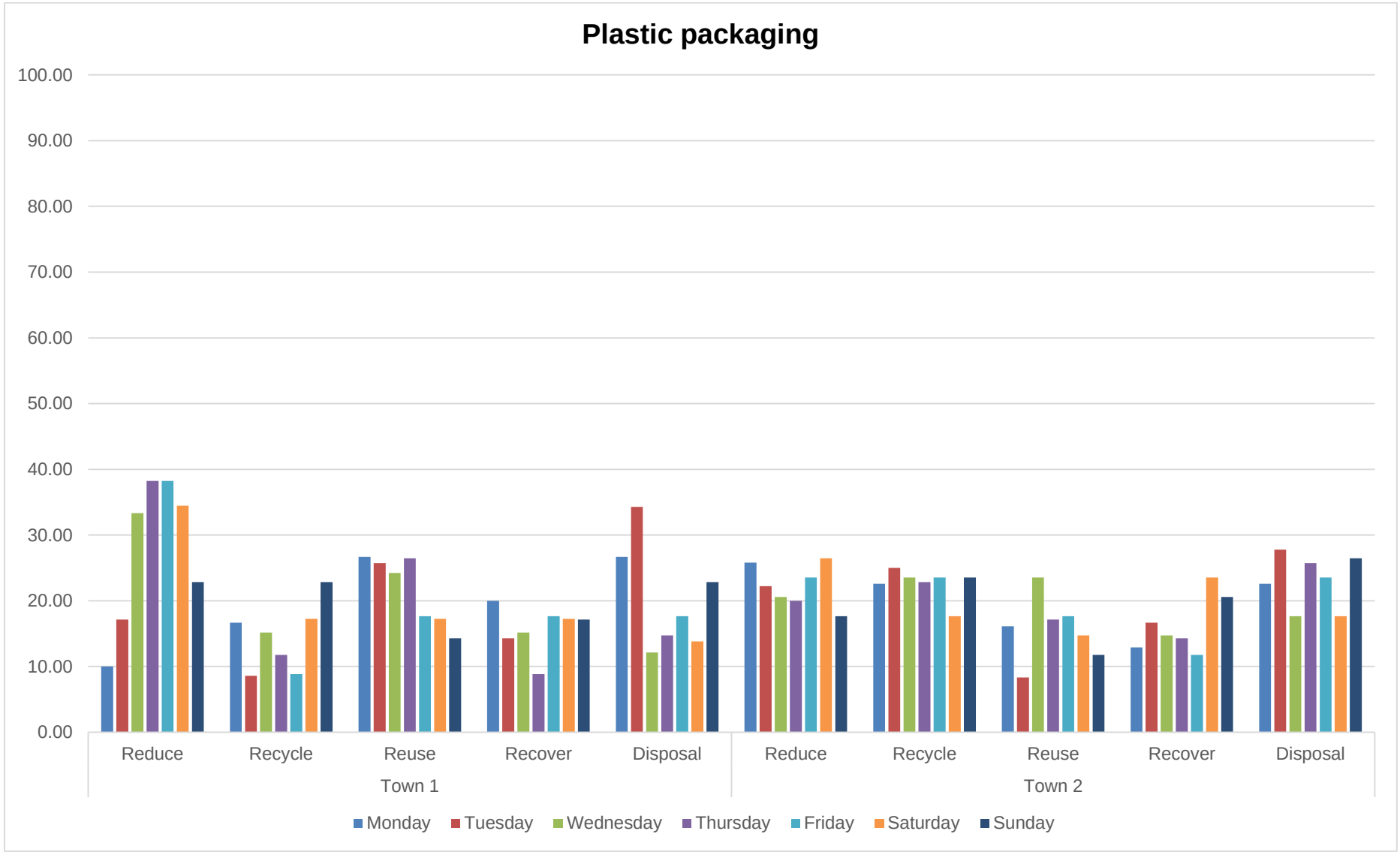

Food tins and drink
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Reduce
Recycle
Reuse
Recover
Disposal
Town 1
Reduce
Recycle
Reuse
Recover
Disposal
Town 2
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday


Body spray and doom
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Reduce
Recycle
Reuse
Recover
Disposal
Reduce
Recycle
Reuse
Recover
Disposal
Town 1
Town 2
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday


Plastic bottles
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Reduce
Recycle
Reuse
Recover
Disposal
Town 1
Reduce
Recycle
Reuse
Recover
Disposal
Town 2
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday


Food waste
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Reduce
Recycle
Reuse
Recover
Disposal
Reduce
Recycle
Reuse
Recover
Disposal
Town 1
Town 2
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday


Nappies
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Reduce
Recycle
Reuse
Recover
Disposal
Reduce
Recycle
Reuse
Recover
Disposal
Town 1
Town 2
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday


Plastic packaging
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Reduce
Recycle
Reuse
Recover
Disposal
Reduce
Recycle
Reuse
Recover
Disposal
Town 1
Town 2
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday