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Waste Characterisation Study Mossel Bay Municipality

Final Report 2016

Prepared by:

EXECUTIVE SUMMARY

A lack of information regarding waste generation types and volumes was identified as a gap in Mossel Bay Municipality's Integrated Waste Management Plan. Therefore, Eden District Municipality, together with Mossel Bay Municipality and the participants of the Youth Jobs in Waste Programme implemented by the National Department of Environmental Affairs conducted a waste characterisation study in October 2015.

The objective of the waste characterisation study was to provide a breakdown of the composition and quantities of household and commercial waste that is being collected from households or commercial outlets in order to ensure proper integrated waste management planning.

As recommended by the Department of Environmental Affairs and Development Planning (DEADP), the Municipal Waste Characterisation Procedures of the Environmental Protection Agency, Ireland, was used as a guideline in determining the sample size for Waste Characterisation Study.

Recommendations by the DEADP regarding the type of venue, equipment, sampling and sorting methods and data collection were used during the characterisation study.

It was decided that the waste will be categorised / sorted into fifteen (15) different waste types namely:

No.	Waste Type	Example
1	Soft Plastics	Plastic bags, plastic film.
2	Hard Plastics	Plastic bottles, containers, lids, hard plastic objects.
3	Cardboard	Office paper, newspaper, magazines, books, glossy paper.
4	Paper	Boxes, cardboard packaging.
5	Glass	Glass bottles, jars.
6	Metal	Ferrous and non-ferrous metals, cooldrink cans, tins, metal objects.
7	Food Waste	Any food, vegetable peels.
8	Garden Waste	Grass clippings, leaves, tree branches, flowers.
9	Textiles	Clothes, shoes, blankets, material.
10	Wood	Planks, manufactured wooden products.
11	Inert	Concrete, brick, sand, asphalt, stones.
12	Nappies	Disposable baby and adult nappies.
13	E-Waste	Any electrical or battery operated objects.
14	Hazardous Waste	Paints, resins, glues, fluorescent tubes, batteries, pesticides, asbestos.
15	Rest	All waste that cannot be sorted into abovementioned categories e.g. hair, dust.

When applying the total number of households (29 382) to the graph in Appendix C of the Municipal Waste Characterisation Procedures, EPA, Ireland, it was determined that a sample size of approximately 825 would be adequate, which was rounded off to a sample size of 850 in order to ensure a representative sample.

However, due to the lack of a sufficient sampling plan, only 768 samples were collected. The sample size of 768 was deemed to be sufficient in order to represent an indication of waste generation trends.

The number of samples per sub area was then calculated relative to the percentage of the total number of households.

Of the 768 bags that were sampled a total mass of 3842,22 kg (3,84 tons) of waste was recorded, with a compacted volume of 15,812 m³ as indicated in Table 3.42 below.

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	300,43	7,82	1,926
Hard Plastics	297,69	7,75	4,135
Paper	289,42	7,53	1,269
Cardboard	274,44	7,14	2,111
Glass	360,52	9,38	0,877
Metal	119,85	3,12	0,375
Food Waste	860,55	22,40	0,836
Garden	460,65	11,99	1,035
Textiles	163,44	4,25	0,560
Wood	25,05	0,65	0,161
Inert	21,22	0,55	0,020
Nappies	294,67	7,67	1,298
E-Waste	24,55	0,64	0,205
Hazardous	6,1	0,16	0,018
Rest	343,64	8,94	0,987
Total	**3842,22**	**100,00**	**15,812**

Table 3.42: Results for Mossel Bay Municipality (768 samples)

42% of the waste types that were sampled by mass were recyclable materials: Glass (9%), Soft Plastics (8%), Hard Plastics (8%), Paper (7%), Cardboard (7%) and Metal (3%). However, by volume, 68% of the waste types that were sampled were recyclable materials: Hard Plastics (26%), Cardboard (13%), Soft Plastics (12%), Paper (8%), Glass (6%) and Metal (3%).

The results obtained from the different sub areas within Mossel Bay Municipality illustrated different trends in waste generation. These trends will be significant in identifying and prioritising the type of waste minimisation initiatives to be implemented in the various sub-areas. E.g. Home composting initiatives should be implemented in the sub areas where Garden Waste was the prominent component of the waste sampled.

The prediction of uniformity and consistency of waste type occurrence is complex due to the heterogeneous nature and variability of waste. Therefore it is not likely to determine accurate projections of the likelihood of the occurrence of particular waste types in a waste stream.

It is assumed that the recyclable portion (soft plastic, hard plastic, paper, cardboard, glass and metal) comprises of 43% of the total waste landfilled at PetroSA landfill site on a monthly basis. This amounts to a total of approximately 986,02 tons and 6420,44 m³ of recyclable materials that could potentially be diverted from landfill and could result in a significant transport and disposal cost saving.

CONTENTS

1. INTRODUCTION

Waste stream analysis can be defined as any programme which involves a logical and systematic approach to obtain and analyzing data on one or more waste streams or sub-streams. The analysis also provides an estimate of solid waste quantity and composition, referred to as waste characterisation.

A lack of information regarding waste generation types and volumes was identified as a gap in Mossel Bay Municipality's Integrated Waste Management Plan. Therefore, a waste characterisation study was conducted in order to determine the types and quantities of waste that is being generated in Mossel Bay. The analysis is essential to ensure proper planning in terms of collection, handling, minimisation and disposal of the generated waste.

Eden District Municipality, together with Mossel Bay Municipality and the participants of the Youth Jobs in Waste Programme implemented by the National Department of Environmental Affairs conducted a waste characterisation study from 26 - 30 October 2015.

The objective of the waste characterisation study was to provide a breakdown of the composition and quantities of household and commercial waste that is being collected from households or commercial outlets in order to ensure proper integrated waste management planning.

This study was also conducted to determine the quantity of recyclable material that still remains in the waste stream transported to landfill. Any recyclable materials already recovered through the existing at source recycling programme implemented by Mossel Bay Municipality will not form part of this study.

The quantity of recyclable material recovered by the recycling service provider appointed by Mossel Bay Municipality is being reported on a monthly basis.

The characterisation study provided the following information:
- The average mass and volume of waste per waste type per household;
- The average mass and volume of waste per waste type per household per socio-economic region;
- The average mass and volume of waste per waste type per business;
- The percentage by mass of each major category in the waste stream;
- The percentage by volume of each major category in the waste stream

A sample of a total of 766 bags were collected and sorted into the 15 different major waste types. The number of samples per sub area was determined by the number of households relative to the total number of households in Mossel Bay Municipality.

2. METHODOLOGY

2.1 GENERAL APPROACH

As recommended by the Department of Environmental Affairs and Development Planning (DEADP), the Municipal Waste Characterisation Procedures of the Environmental Protection Agency, Ireland, was used as a guideline in determining the sample size for Waste Characterisation Study.

Recommendations by the DEADP regarding the type of venue, equipment, sampling and sorting methods and data collection were used during the characterisation study.

2.2 TRAINING

On 07 October 2015 a training session conducted by Eden District Municipality took place at the Schoeman Street Depot. A practical training session was conducted with the Youth Jobs in Waste participants where they were trained in the sorting method, waste types, weighing, volume determination and data collection. Training in the proper use of Personal Protective Equipment, potential hazards and procedures was also discussed at this training session.

The waste was categorised / sorted into fifteen (15) different waste types namely:

No.	Waste Type	Example
1	Soft Plastics	Plastic bags, plastic film.
2	Hard Plastics	Plastic bottles, containers, lids, hard plastic objects.
3	Cardboard	Office paper, newspaper, magazines, books, glossy paper.
4	Paper	Boxes, cardboard packaging.
5	Glass	Glass bottles, jars.
6	Metal	Cooldrink cans, tins, metal objects.
7	Food Waste	Any food, vegetable peels.
8	Garden Waste	Grass clippings, leaves, tree branches, flowers.
9	Textiles	Clothes, shoes, blankets, material.
10	Wood	Planks, manufactured wooden products.
11	Inert	Concrete, brick, sand, asphalt, stones.
12	Nappies	Disposable baby and adult nappies.
13	E-Waste	Any electrical or battery operated objects.
14	Hazardous Waste	Paints, resins, glues, fluorescent tubes, batteries, pesticides, asbestos.
15	Rest	All waste that cannot be sorted into abovementioned categories e.g. hair, dust.

Figure 2.1: Training in waste characterisation & sorting

2.3 SAMPLE SIZE & PLANNING

2.3.1 REPRESENTATIVE SAMPLE

The estimated total number of households of 2013 as obtained from Mossel Bay Municipality's Integrated Waste Management Plan was used to determine a representative sample by using the graph in Appendix C of the Municipal Waste Characterisation Procedures, EPA, Ireland.

When applying the total number of households (29 382) to the graph mentioned above, it was determined that a sample size of approximately 825 would be adequate, which was rounded off to a sample size of 850 in order to ensure a representative sample.

The identified households from which the samples were to be obtained were not informed regarding the study in order to prevent any bias that may result by a temporary change in habits.
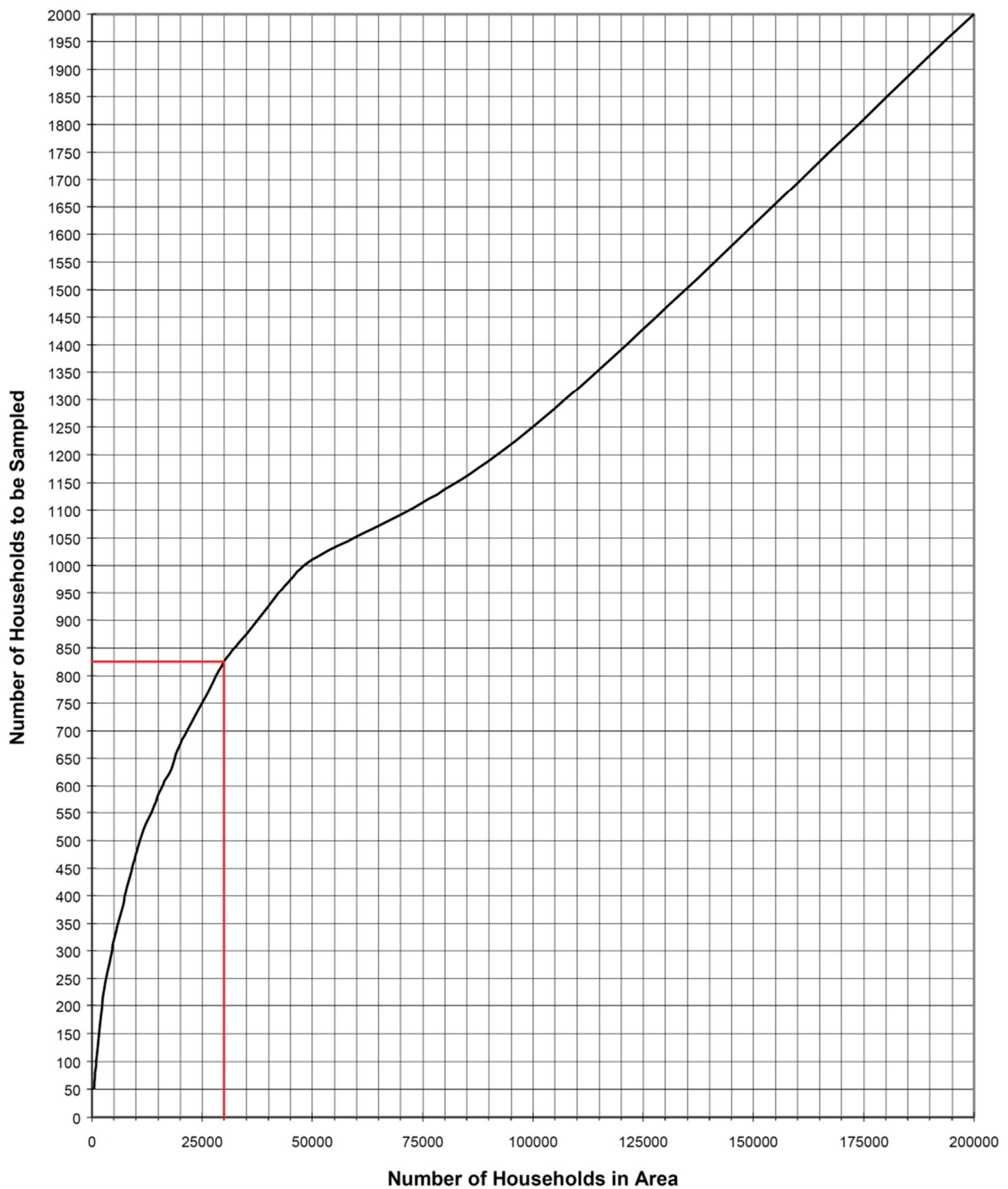
Figure 2.2: Graph determining sample size relative to no. of households

The number of samples per sub area was then calculated relative to the percentage of the total number of households (Table 2.3)

Sub Area	No. of Households (29 382)	Percentage of Sample (%)	Sample Size (850)
Asazani JCCC Camp	142	0.5	4
Bay View SP	317	1.1	9
Bergsig	248	0.8	7
Blue Ridge SP	4	0.01	1
Boggoms Bay SP	48	0.2	2
Boplaas	405	1.4	12
Botha Strand	91	0.3	3
Brandwacht SP	418	1.4	12
D'Almeida	1 550	5.3	45
Dana Bay SP	1 167	4.0	34
Da Nova	402	1.4	12
Die Bakke	211	0.7	6
Die Voorbaai	251	0.9	8
Fairview	1 023	3.5	30
Friemersheim SP	320	1.1	9
Glentana	258	0.9	8
Greenhaven	298	1.0	9
Groot Brakrivier SP1	179	0.6	5
Groot Brakrivier SP2	236	0.8	7
Hartenbos SP	1 525	5.2	44
Heiderand	1 782	6.1	52
Herbertsdale SP	176	0.6	5
Isinyoka SP	19	0.1	1
Jonkersberg State Forest SP	29	0.1	1
Klein Brakrivier SP	857	2.9	25
KwaNonqaba Ext	189	2.4	20
Kwanonqaba Ext.	5 698	19.4	165
Kwanonqaba SP	3 290	11.2	95
Linkside	167	0.6	5
Moquini Coastal Estate SP	10	0.03	1
Mossdustria SP	16	0.1	1
Mossel Bay Central	333	1.1	9
Mossel Bay Ext. 13	618	2.1	18
Mossel Bay Ext. 26	195	0.7	6
Mossel Bay Golf Estate	248	0.8	7
Mossel Bay NU	1 349	4.6	39
Mossel Bay SP1	414	1.4	12
Mossel Bay SP2	76	0.3	3
Nautilus Bay SP	7	0.02	1
New Sunnyside	280	1.0	9
Outeniqua Strand	167	0.6	5
Pinnacle Point	26	0.1	1
Reebok SP	505	1.7	14
Ruiterbos State Forest SP	117	0.4	3
Santos Bay	4	0.01	1

Southern Cross	107	0.4	3
Springerbaai Coastal Eco-Estate	4	0.01	1
Tergniet SP	556	1.9	16
The Island	173	0.6	5
Vlees Bay SP	120	0.4	3
Vyf Brakke Fonteinen SP	1 189	4.0	34
Wolwedans	1 568	5.3	45

Table 2.3: Sample size determination per sub area

A planning session was held on 14 September 2015 together with officials from Eden District Municipality and Mossel Bay Municipality. Maps of each sub area were provided, and specific households were identified from which to sample. These identified households were evenly distributed in order to ensure a representative sample of that specific sub area.

The local knowledge of the Mossel Bay Municipality officials were relied upon in order to identify businesses in each sub area which was included in the sample size of that specific sub area.

It was decided that should no bags be available for sampling from the specified household that a sample be taken from a household in the near proximity of the specified household.

2.3.2 LABELLING OF SAMPLES
In order to identify the sub area from which the sample was taken as well as to ensure the capturing of other relevant information, it was essential that the samples were properly labelled when collected. The following details were recorded on the labels when collection took place:
- Date on which sample was taken
- The address from which the sample was taken
- Household or Business
- Total number of bags from which the sample was taken e.g. 1 of 3

2.3.3 SAMPLING PLAN
Mossel Bay Municipality was responsible for the sampling of bags. A sampling team collected and labelled the samples from the identified households prior to the waste collection on that specific day of the week. The samples were then stored in the secure storage area prior to sorting. Samples were taken the day before the intended sorting in order to ensure that the Youth Jobs in Waste participants could commence with the sorting at the start of the working day.

2.4 VENUE & EQUIPMENT

2.4.1 VENUE
Mossel Bay Municipality was responsible for acquiring a venue with the following requirements:
- Under cover
- Ablution facilities
- Running water
- Electricity
- Proper ventilation
- Secure / no unauthorized access

The venue which was acquired was the Law Enforcement Storage Facility located in Schoeman Street.

Figure 2.4: Layout of the venue at the Law Enforcement Storage Facility

2.4.2 EQUIPMENT

The following equipment was required in order to conduct the Characterisation Study, which was purchased and provided by Eden District Municipality:

- 4 x 150kg electronic platform scales
- 80 x 46cm plastic basins
- 6 x yard brooms
- 20 x vapour & organic respirator masks incl. replacement filters
- Plastic aprons
- Safety glasses
- Red PVC gloves
- Surface disinfectant
- Hand sanitizer
- Cleaning Rags
- Disposable towels with stands
- Data sheets
- Stationery
- Labels
- Permanent markers and pens

Mossel Bay Municipality was responsible for the provision of the sorting tables, recycling and refuse bags as well as a hosepipe for the cleaning of the sorting basins during and after each working day.

2.5 CHARACTERISATION, WEIGHING & DATA COLLECTION

The samples were stored per sub area in order to ensure that the data collection was done per sub area which eases the analysis of the data and ensures that the analysis is done per sub area.

Figure 2.5: Samples stored per sub area

2.5.1 STEP 1:
The unopened black bag (sample) was weighed and the mass and the particulars of the label recorded on the data sheets.

2.5.2 STEP 2:
The contents of the sample was then categorised into the fifteen different waste types using the 46cm plastic basins.

Figure 2.6: Waste being sorted into different waste types

2.5.3 STEP 3:
Each categorised waste type was then weighed individually. The Scales were tarred before weighing and therefore only the contents of the basin were recorded. The volumes of the waste types in the basins were estimated as recommended by the DEADP. The mass and volumes of each waste type from that specific sample was recorded. The individual masses of the waste types should add up to the total mass of the unopened bag.

Figure 2.7: Basin with sorted waste type being weighed (background) and the data recorded

2.5.4 STEP 4:

All the recyclable waste types / materials were placed into recycling bags (blue) and the non-recyclable waste was placed into black bags. It was decided at the planning session to recover all the recyclable materials during the study. The local recycler was contacted at the end of each working day to collect the recovered recyclable materials.

Figure 2.8: Recovered recyclable material in blue bags

2.5.5 DATA CAPTURING

Eden District Municipality was responsible for the data capturing of the raw data to an electronic format in order to simplify the data analysis.

2.6 VOLUME DETERMINATION

It was recommended by DEADP to determine the volume of waste by estimating the volume percentage occupied by the sorted waste types per basin. However, each waste type occupies a different volume when compacted which is determined by the density of each waste type. The volume was therefore determined by obtaining the general compacted densities of each waste type and converting the mass to volume in cubic metres (m³).

It is imperative to determine the volume of the waste as this determines the lifespan of a landfill site as well as transport costs as the waste is compacted and then transported to the landfill site. The general compacted densities were sourced from the Environmental Protection Authority, Victoria, Australia.

The general compacted densities of the different waste types are indicated in Table 2.10 below.

Waste Type	Density (Compacted)
Soft Plastics	156 kg/m³
Hard Plastics	72 kg/m³
Paper	228 kg/m³
Cardboard	130 kg/m³
Glass	411 kg/m³
Metal	320 kg/m³
Food Waste	1029 kg/m³
Garden	445 kg/m³
Textiles	292 kg/m³
Wood	156 kg/m³
Inert	1060 kg/m³
Nappies	227 kg/m³
E-Waste	120 kg/m³
Hazardous	348 kg/m³
Rest	348 kg/m³

Table 2.9 General densities of the various compacted waste types

It should be noted that the calculated volumes are representative of the specific waste types should they be compacted separately.

3. RESULTS

3.1 RESULTS PER SUB AREA

3.1.1 BOGGOMSBAAI (10 SAMPLES)

Waste Type	Mass (kg)	Percentage of total Mass (%)	Calculated Volume (m³)
Soft Plastics	2.90	7.27	0.019
Hard Plastics	2.70	6.77	0.038
Paper	0.80	2.01	0.004
Cardboard	2.10	5.26	0.016
Glass	3.75	9.40	0.009
Metal	1.00	2.51	0.003
Food Waste	18.05	45.24	0.018
Garden	6.40	16.04	0.014
Textiles	0.00	0.00	0.000
Wood	0.10	0.25	0.001
Inert	0.00	0.00	0.000
Nappies	0.00	0.00	0.000
E-Waste	0.00	0.00	0.000
Hazardous	0.20	0.50	0.001
Rest	1.90	4.76	0.005
Total	**39.90**	**100.00**	**0.127**

Table 3.1: Results of Boggomsbaai (10 samples)

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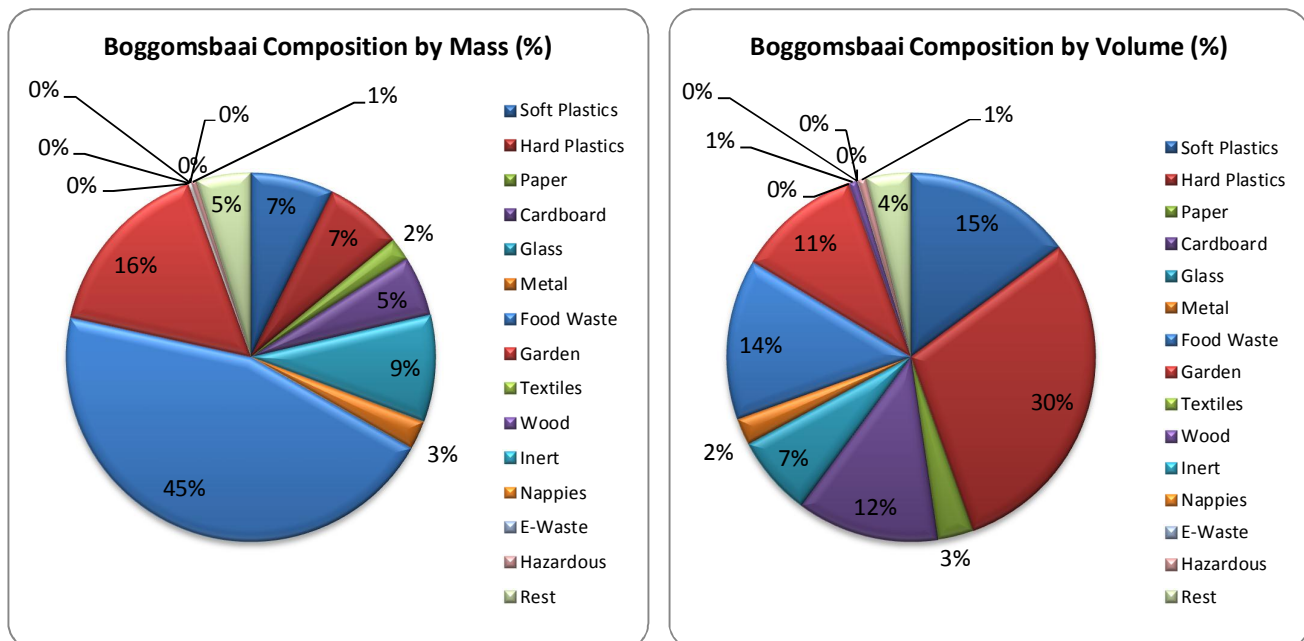
3.1.2 HEIDERAND (53 SAMPLES)

Waste Type	Mass (kg)	Percentage of total Mass (%)	Calculated Volume (m³)
Soft Plastics	17.32	7.67	0.111
Hard Plastics	17.22	7.63	0.239
Paper	21.10	9.34	0.093
Cardboard	22.30	9.88	0.172
Glass	22.70	10.05	0.055
Metal	6.85	3.03	0.021
Food Waste	59.55	26.37	0.058
Garden	18.70	8.28	0.042
Textiles	2.30	1.02	0.008
Wood	3.65	1.62	0.023
Inert	0.00	0.00	0.000
Nappies	7.45	3.30	0.033
E-Waste	0.00	0.00	0.000
Hazardous	0.65	0.29	0.002
Rest	26.00	11.52	0.075
Total	**225.79**	**100.00**	**0.931**

Table 3.2: Results of Heiderand (53 samples)

Heiderand Composition by Mass (%)

Heiderand Composition by Volume (%)

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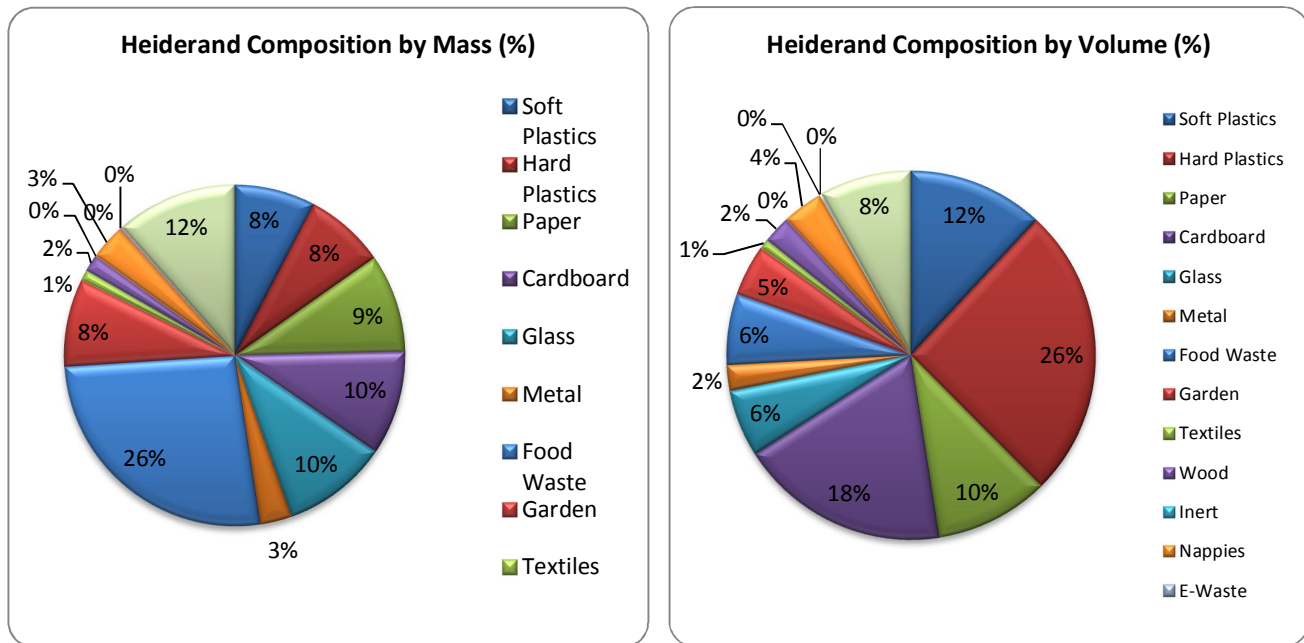
3.1.3 WOLWEDANS (39 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	10.85	7.75	0.070
Hard Plastics	12.15	8.68	0.169
Paper	9.00	6.43	0.039
Cardboard	10.90	7.79	0.084
Glass	17.60	12.57	0.043
Metal	3.80	2.71	0.012
Food Waste	33.50	23.93	0.033
Garden	0.95	0.68	0.002
Textiles	12.45	8.89	0.043
Wood	0.20	0.14	0.001
Inert	0.00	0.00	0.000
Nappies	0.00	0.00	0.000
E-Waste	0.60	0.43	0.005
Hazardous	0.10	0.07	0.000
Rest	27.91	19.93	0.080
Total	**140.01**	**100.00**	**0.580**

Table 3.3: Results of Wolwedans (39 samples)
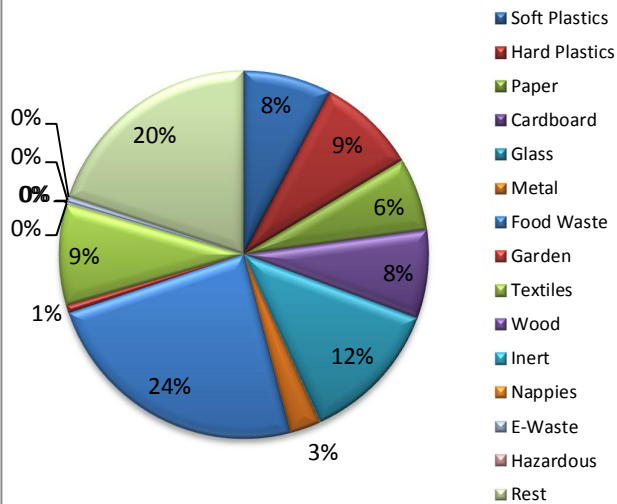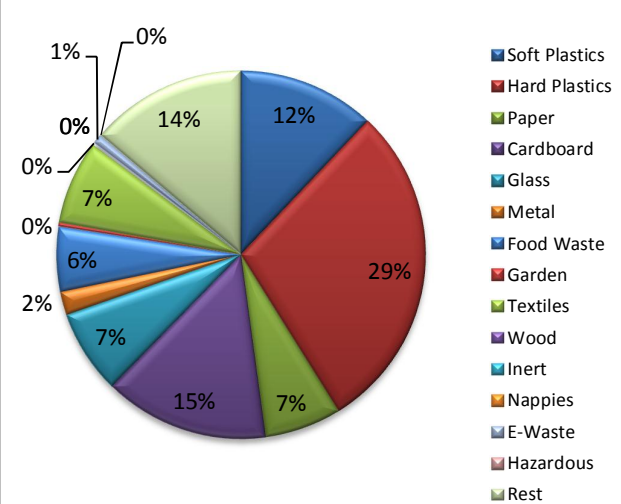
3.1.4 TERGNIET (15 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	3.90	4.78	0.025
Hard Plastics	3.00	3.68	0.042
Paper	3.90	4.78	0.017
Cardboard	2.60	3.19	0.020
Glass	9.95	12.20	0.024
Metal	2.20	2.70	0.007
Food Waste	22.35	27.41	0.022
Garden	12.00	14.71	0.027
Textiles	1.35	1.66	0.005
Wood	0.30	0.37	0.002
Inert	1.00	1.23	0.001
Nappies	0.00	0.00	0.000
E-Waste	0.00	0.00	0.000
Hazardous	2.65	3.25	0.008
Rest	16.35	20.05	0.047
Total	**81.55**	**100.00**	**0.246**

Table 3.4: Results of Tergniet (15 samples)
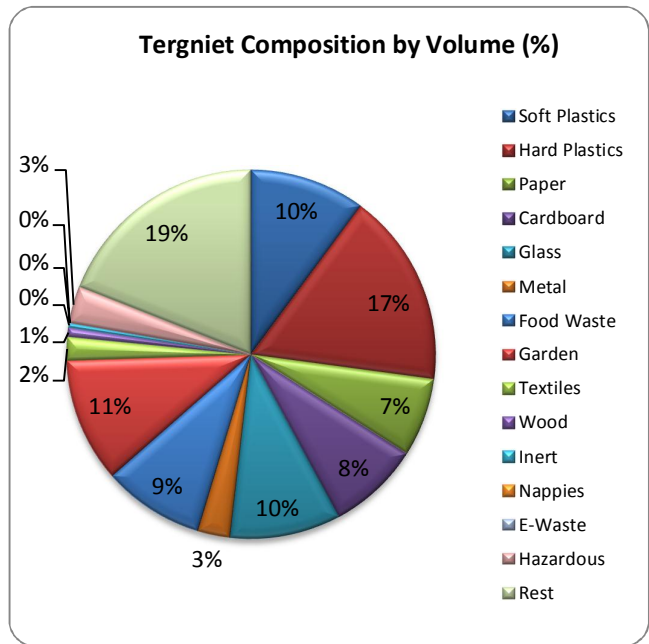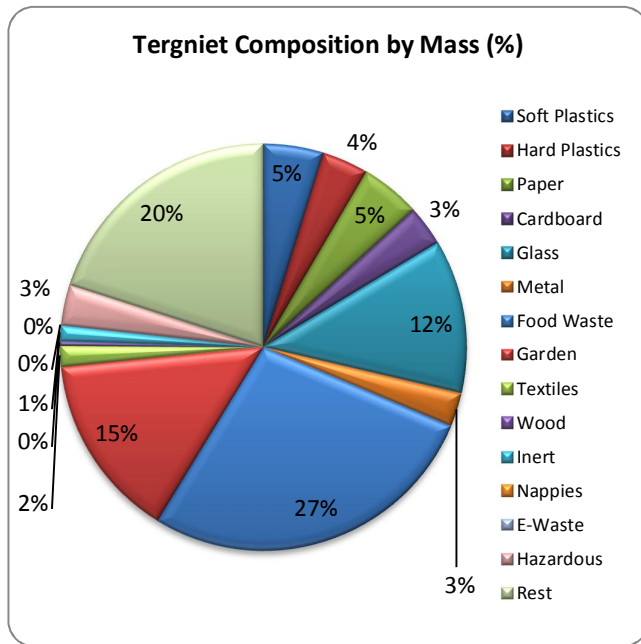
3.1.5 VOORBAAI (19 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	4.55	6.47	0.029
Hard Plastics	7.65	10.89	0.106
Paper	12.50	17.79	0.055
Cardboard	7.00	9.96	0.054
Glass	1.55	2.21	0.004
Metal	3.50	4.98	0.011
Food Waste	7.45	10.60	0.007
Garden	17.60	25.04	0.040
Textiles	3.00	4.27	0.010
Wood	1.48	2.11	0.009
Inert	0.00	0.00	0.000
Nappies	1.20	1.71	0.005
E-Waste	0.00	0.00	0.000
Hazardous	0.00	0.00	0.000
Rest	2.80	3.98	0.008
Total	**70.28**	**100.00**	**0.339**

Table 3.5: Results of Voorbaai (19 samples)

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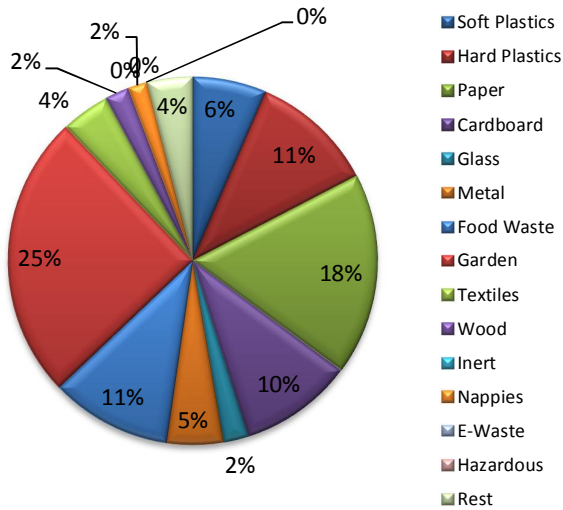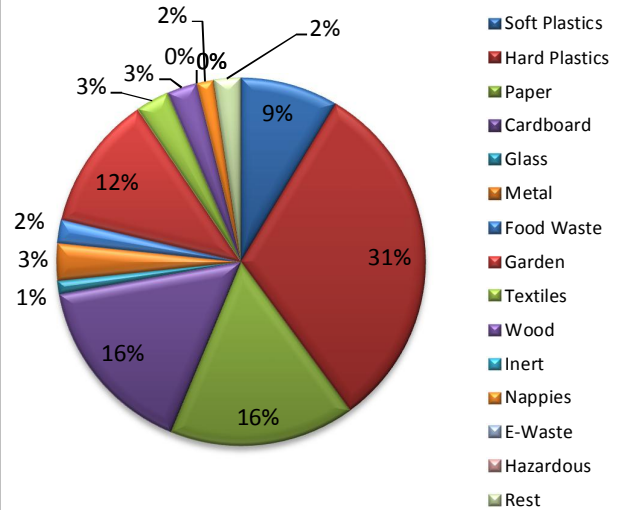
3.1.6 ASLA (10 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	2.70	5.97	0.017
Hard Plastics	3.50	7.73	0.049
Paper	1.40	3.09	0.006
Cardboard	1.60	3.54	0.012
Glass	1.95	4.31	0.005
Metal	1.30	2.87	0.004
Food Waste	12.10	26.74	0.012
Garden	5.65	12.49	0.013
Textiles	2.85	6.30	0.010
Wood	0.00	0.00	0.000
Inert	0.00	0.00	0.000
Nappies	8.80	19.45	0.039
E-Waste	0.00	0.00	0.000
Hazardous	0.00	0.00	0.000
Rest	3.40	7.51	0.010
Total	**45.25**	**100.00**	**0.176**

Table 3.6: Results of Asla (10 samples)
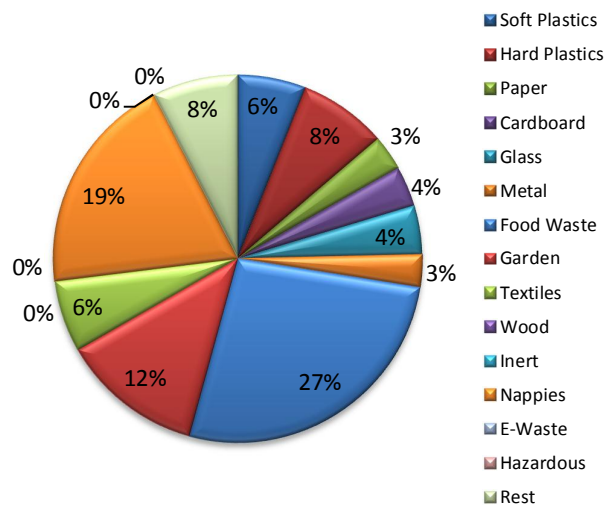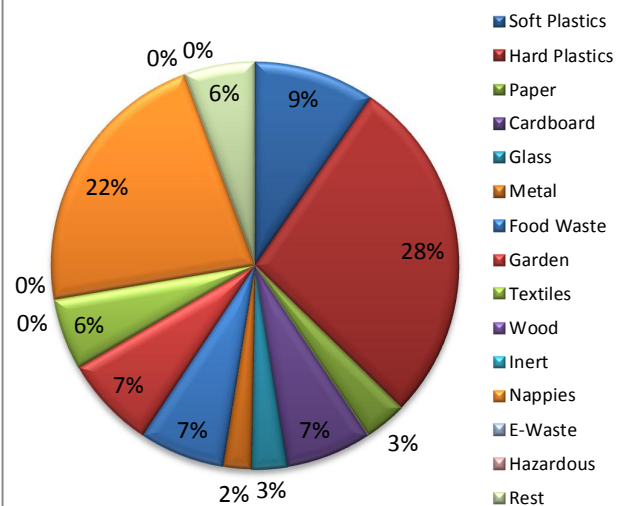
3.1.7 GROOTBRAK (10 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	2.35	5.14	0.015
Hard Plastics	5.00	10.93	0.069
Paper	3.80	8.31	0.017
Cardboard	4.65	10.16	0.036
Glass	7.95	17.38	0.019
Metal	1.55	3.39	0.005
Food Waste	11.15	24.37	0.011
Garden	1.00	2.19	0.002
Textiles	1.75	3.83	0.006
Wood	0.15	0.33	0.001
Inert	0.00	0.00	0.000
Nappies	0.00	0.00	0.000
E-Waste	0.05	0.11	0.000
Hazardous	1.10	2.40	0.003
Rest	5.25	11.48	0.015
Total	**45.75**	**100.00**	**0.200**

Table 3.7: Results of Grootbrak (10 samples)
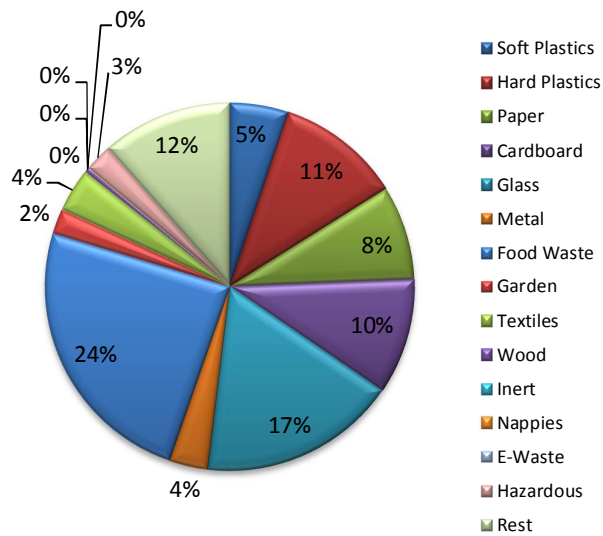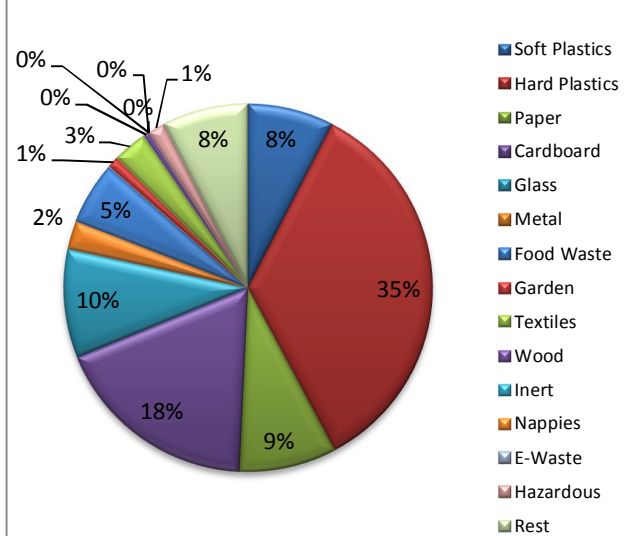
3.1.8 BAYVIEW (8 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	1.10	3.23	0.007
Hard Plastics	1.75	5.14	0.024
Paper	2.10	6.17	0.009
Cardboard	2.95	8.66	0.023
Glass	4.15	12.19	0.010
Metal	0.40	1.17	0.001
Food Waste	8.45	24.82	0.008
Garden	5.45	16.01	0.012
Textiles	0.05	0.15	0.000
Wood	0.00	0.00	0.000
Inert	0.00	0.00	0.000
Nappies	4.50	13.22	0.020
E-Waste	0.00	0.00	0.000
Hazardous	0.00	0.00	0.000
Rest	3.15	9.25	0.009
Total	**34.05**	**100.00**	**0.124**

Table 3.8: Results of Bayview (8 samples)

Bayview Composition by Mass (%)
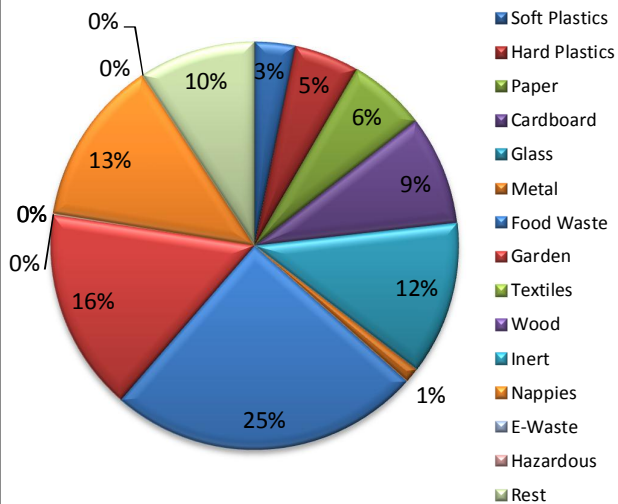
Bayview Composition by Volume (%)
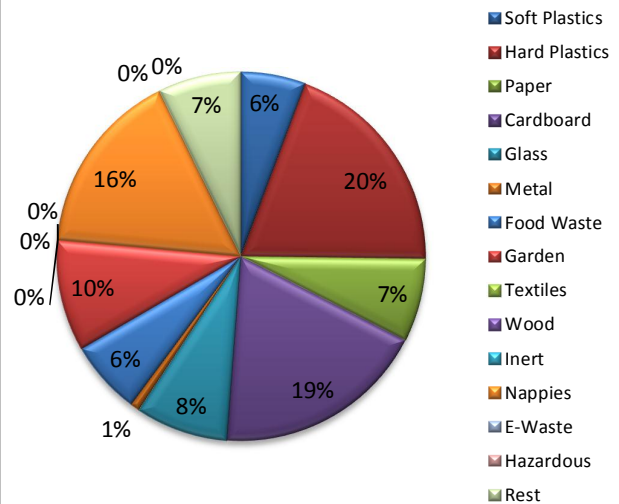
3.1.9 DA NOVA (11 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	3.15	8.08	0.020
Hard Plastics	2.65	6.79	0.037
Paper	4.05	10.38	0.018
Cardboard	3.04	7.79	0.023
Glass	6.35	16.28	0.015
Metal	1.91	4.90	0.006
Food Waste	5.40	13.85	0.005
Garden	1.45	3.72	0.003
Textiles	0.15	0.38	0.001
Wood	0.05	0.13	0.000
Inert	0.00	0.00	0.000
Nappies	4.05	10.38	0.018
E-Waste	0.00	0.00	0.000
Hazardous	0.45	1.15	0.001
Rest	6.30	16.15	0.018
Total	**39.00**	**100.00**	**0.166**

Table 3.9: Results of Da Nova (11 samples)

Da Nova Composition by Mass (%)

Da Nova Composition by Volume (%)

19
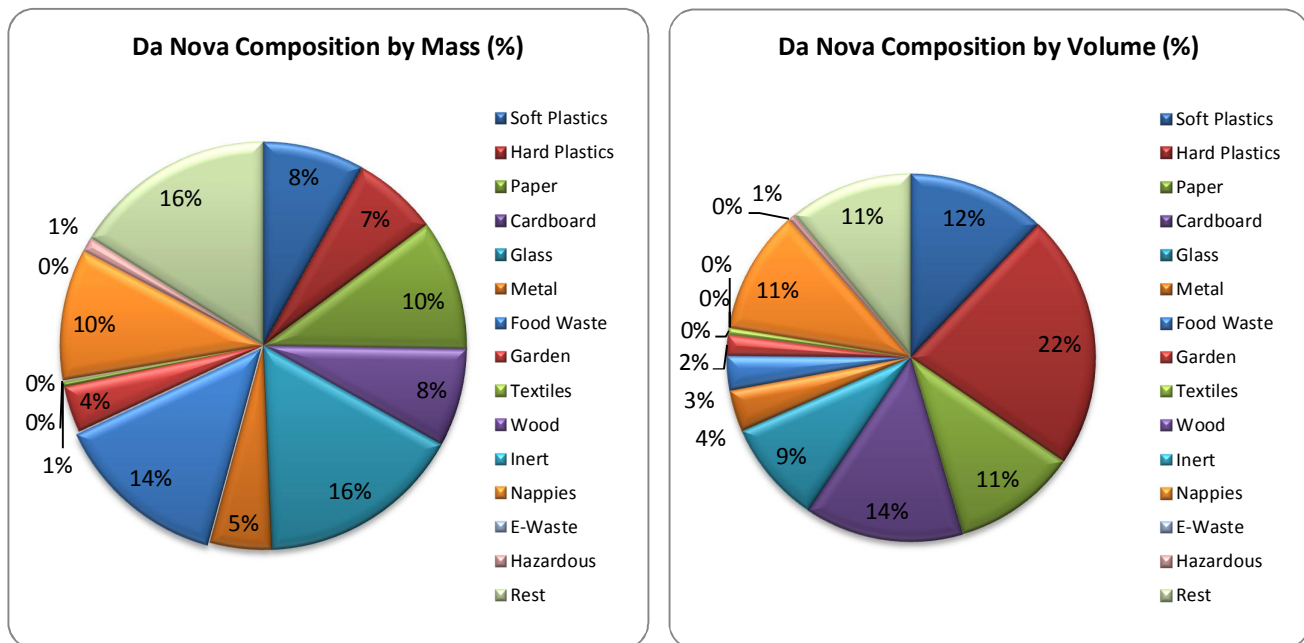
3.1.10 MOSSDUSTRIA (5 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	1.00	3.60	0.006
Hard Plastics	1.00	3.60	0.014
Paper	1.85	6.67	0.008
Cardboard	0.90	3.24	0.007
Glass	0.05	0.18	0.000
Metal	0.45	1.62	0.001
Food Waste	10.00	36.04	0.010
Garden	0.00	0.00	0.000
Textiles	1.10	3.96	0.004
Wood	0.00	0.00	0.000
Inert	0.00	0.00	0.000
Nappies	9.60	34.59	0.042
E-Waste	0.00	0.00	0.000
Hazardous	0.00	0.00	0.000
Rest	1.80	6.49	0.005
Total	**27.75**	**100.00**	**0.098**

Table 3.10: Results of Mossdustria (5 samples)

Mossdustria Composition by Mass (%)
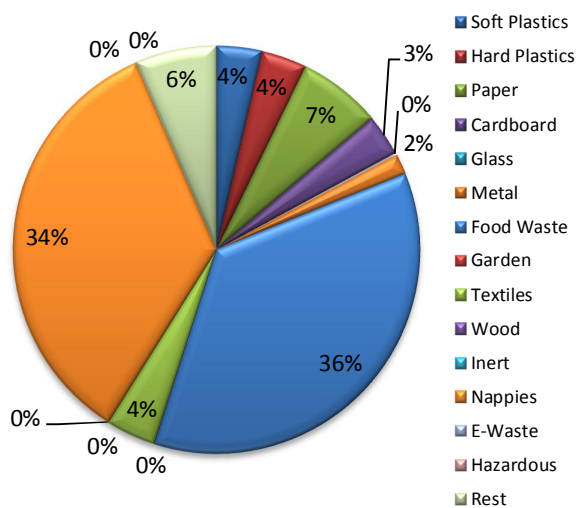
Mossdustria Composition by Volume (%)
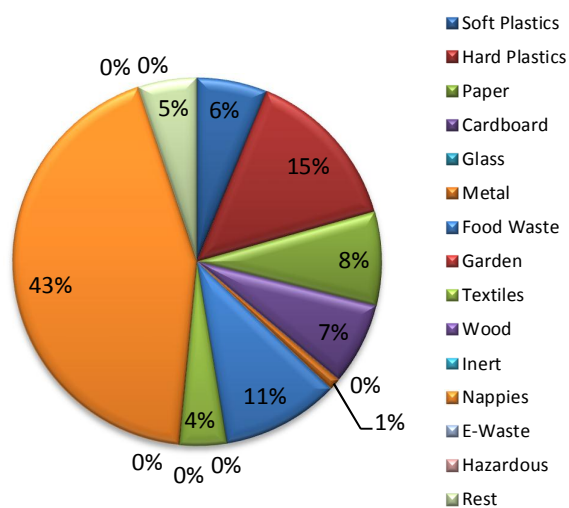
3.1.11 DANABAAI (31 samples)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	6.60	4.38	0.042
Hard Plastics	9.44	6.27	0.131
Paper	6.15	4.08	0.027
Cardboard	7.90	5.24	0.061
Glass	5.78	3.84	0.014
Metal	4.80	3.19	0.015
Food Waste	20.70	13.74	0.020
Garden	40.35	26.79	0.091
Textiles	32.05	21.28	0.110
Wood	6.77	4.49	0.043
Inert	0.00	0.00	0.000
Nappies	3.55	2.36	0.016
E-Waste	0.00	0.00	0.000
Hazardous	0.00	0.00	0.000
Rest	6.55	4.35	0.019
Total	**150.64**	**100.00**	**0.589**

Table 3.11: Results of Danabaai (31 samples)

Danabaai Composition by Mass (%)
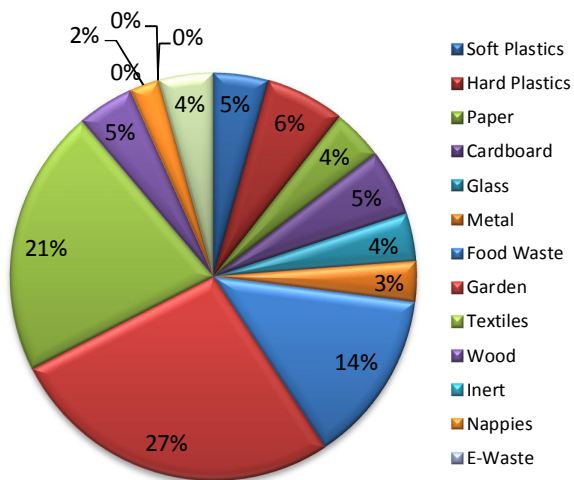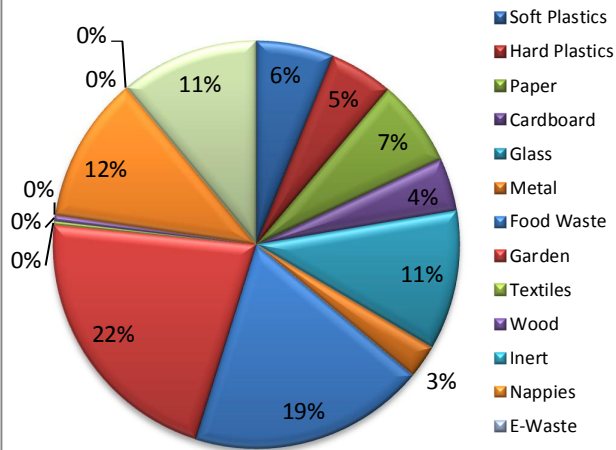

Danabaai Composition by Volume (%)
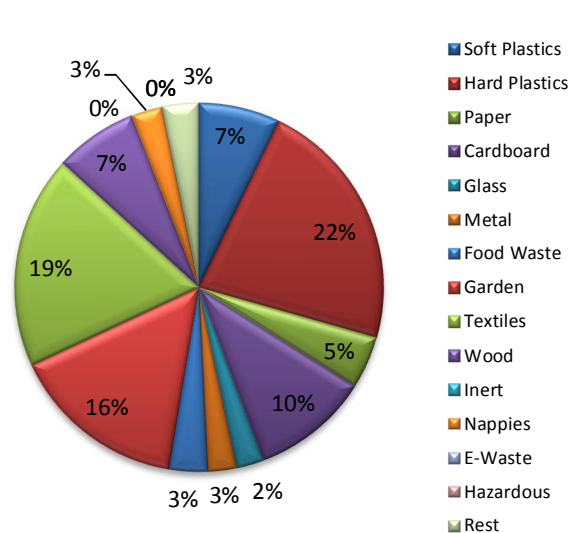
3.1.12 HARTENBOS (43 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	12.70	6.16	0.081
Hard Plastics	10.45	5.07	0.145
Paper	14.25	6.91	0.063
Cardboard	8.65	4.19	0.067
Glass	22.85	11.08	0.056
Metal	5.45	2.64	0.017
Food Waste	38.75	18.79	0.038
Garden	44.75	21.70	0.101
Textiles	0.60	0.29	0.002
Wood	1.00	0.48	0.006
Inert	0.00	0.00	0.000
Nappies	24.00	11.64	0.106
E-Waste	0.05	0.02	0.000
Hazardous	0.00	0.00	0.000
Rest	22.75	11.03	0.065
Total	**206.25**	**100.00**	**0.746**

Table 3.12: Results for Hartenbos (43 samples)
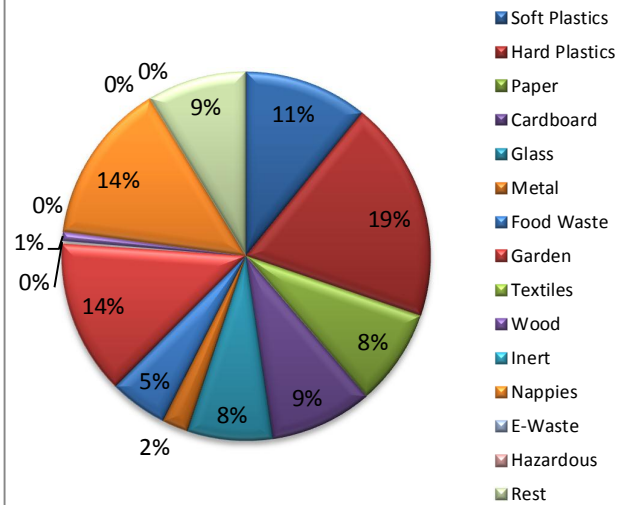
3.1.13 EXTENSION 13 (11 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	8,30	9,95	0,053
Hard Plastics	10,65	12,76	0,148
Paper	8,90	10,67	0,039
Cardboard	9,65	11,56	0,074
Glass	7,15	8,57	0,017
Metal	6,80	8,15	0,021
Food Waste	24,30	29,12	0,024
Garden	0,00	0,00	0,000
Textiles	5,85	7,01	0,020
Wood	0,10	0,12	0,001
Inert	0,00	0,00	0,000
Nappies	0,00	0,00	0,000
E-Waste	0,00	0,00	0,000
Hazardous	0,00	0,00	0,000
Rest	1,75	2,10	0,005
Total	**83,45**	**100,00**	**0,402**

Table 3.13: Results for Extension 13 (11 samples)

Extension 13 Composition by Mass (%)

Extention 13 Composition by Volume (%)

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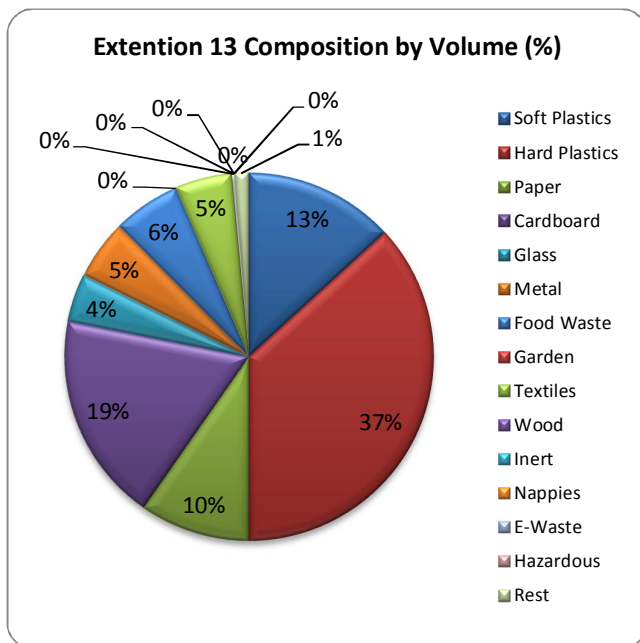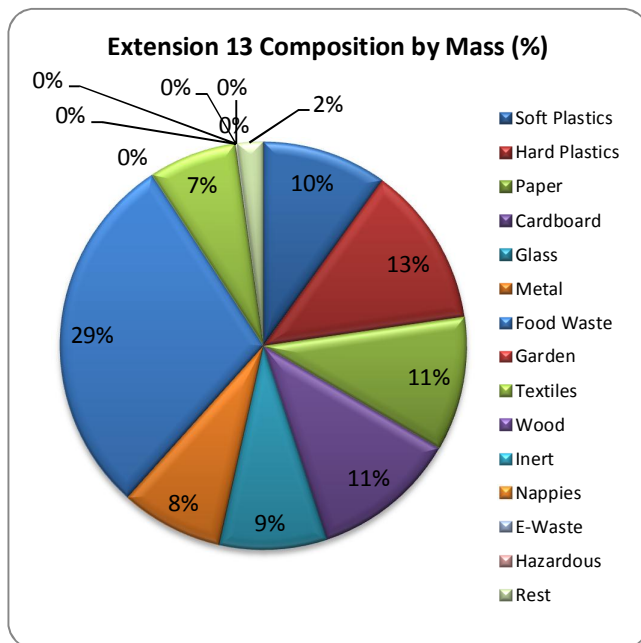
3.1.14 HERBERTSDALE (7 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	4,80	12,79	0,031
Hard Plastics	3,79	10,10	0,053
Paper	4,46	11,89	0,020
Cardboard	3,62	9,65	0,028
Glass	5,24	13,97	0,013
Metal	2,98	7,94	0,009
Food Waste	5,27	14,05	0,005
Garden	0,00	0,00	0,000
Textiles	1,56	4,16	0,005
Wood	0,00	0,00	0,000
Inert	1,22	3,25	0,001
Nappies	2,87	7,65	0,013
E-Waste	0,00	0,00	0,000
Hazardous	0,00	0,00	0,000
Rest	1,71	4,56	0,005
Total	**37,52**	**100,00**	**0,182**

Table 3.14: Results for Herbertsdale (7 samples)


Herbertsdale Composition by Mass (%)
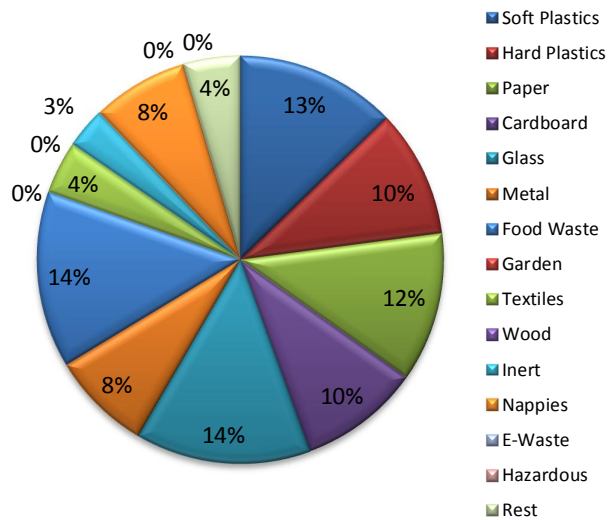
Herbertsdale Composition by Volume (%)
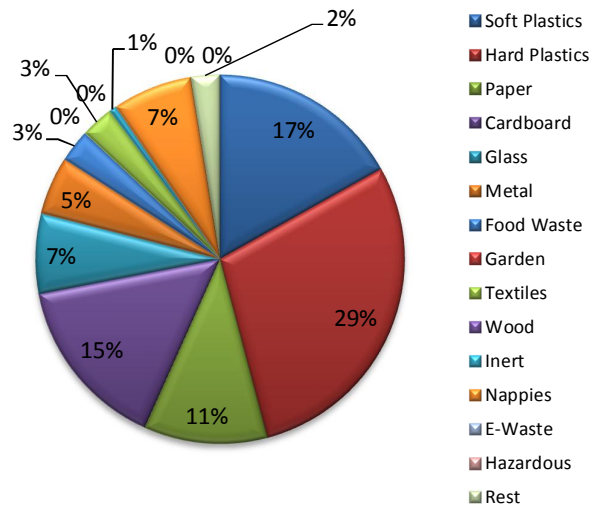
3.1.15 GOLF ESTATE (8 SAMPLES)

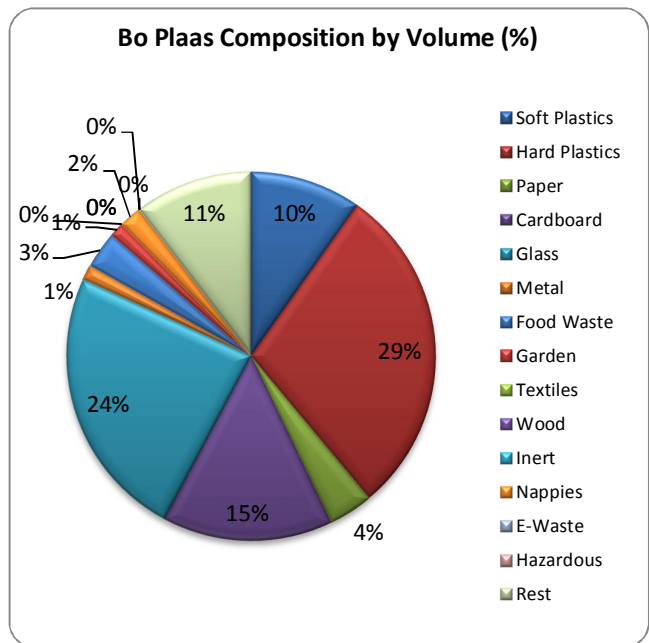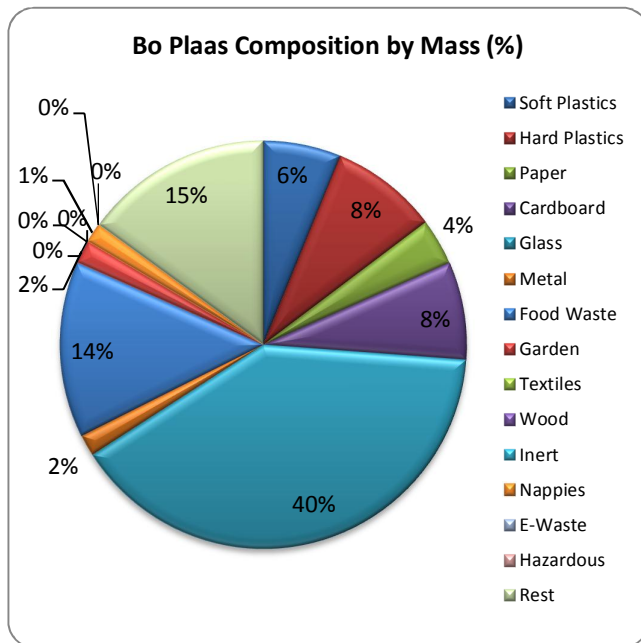| Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	1.30	4.49	0.008
Hard Plastics	2.35	8.11	0.033
Paper	0.85	2.93	0.004
Cardboard	2.60	8.97	0.020
Glass	5.60	19.32	0.014
Metal	0.50	1.73	0.002
Food Waste	9.33	32.19	0.009
Garden	3.60	12.42	0.008
Textiles	0.25	0.86	0.001
Wood	0.00	0.00	0.000
Inert	0.00	0.00	0.000
Nappies	0.30	1.04	0.001
E-Waste	0.00	0.00	0.000
Hazardous	0.00	0.00	0.000
Rest	2.30	7.94	0.007
Total	**28.98**	**100.00**	**0.106**

Table 3.15: Results for Golf Estate (8 samples)
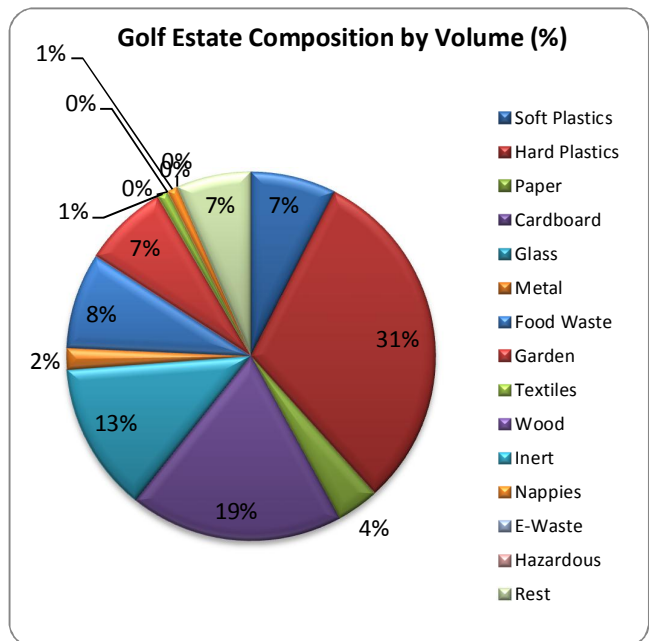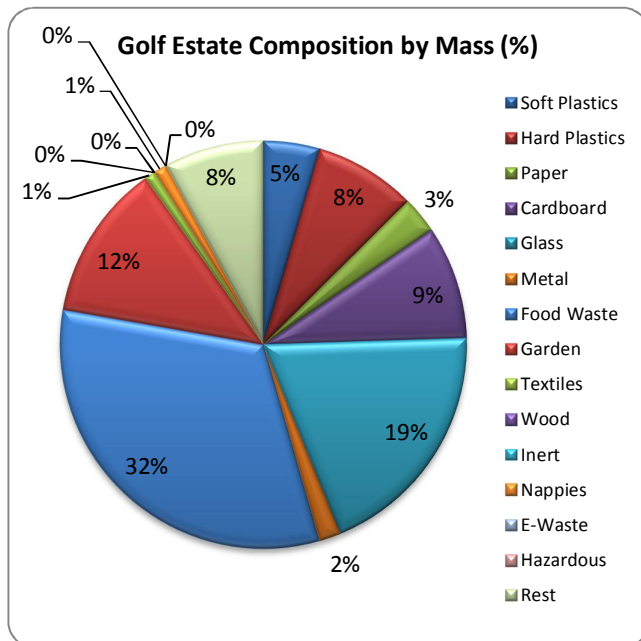
3.1.16 BO PLAAS (9 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	2.35	6.18	0.015
Hard Plastics	3.25	8.55	0.045
Paper	1.40	3.68	0.006
Cardboard	2.95	7.76	0.023
Glass	15.10	39.74	0.037
Metal	0.65	1.71	0.002
Food Waste	5.30	13.95	0.005
Garden	0.70	1.84	0.002
Textiles	0.00	0.00	0.000
Wood	0.00	0.00	0.000
Inert	0.00	0.00	0.000
Nappies	0.60	1.58	0.003
E-Waste	0.00	0.00	0.000
Hazardous	0.00	0.00	0.000
Rest	5.70	15.00	0.016
Total	**38.00**	**100.00**	**0.154**

Table 3.16: Results for Bo Plaas (9 samples)

Bo Plaas Composition by Mass (%)

Bo Plaas Composition by Volume (%)

3.1.17 RUITERBOS FOREST ESTATE (3 SAMPLES)

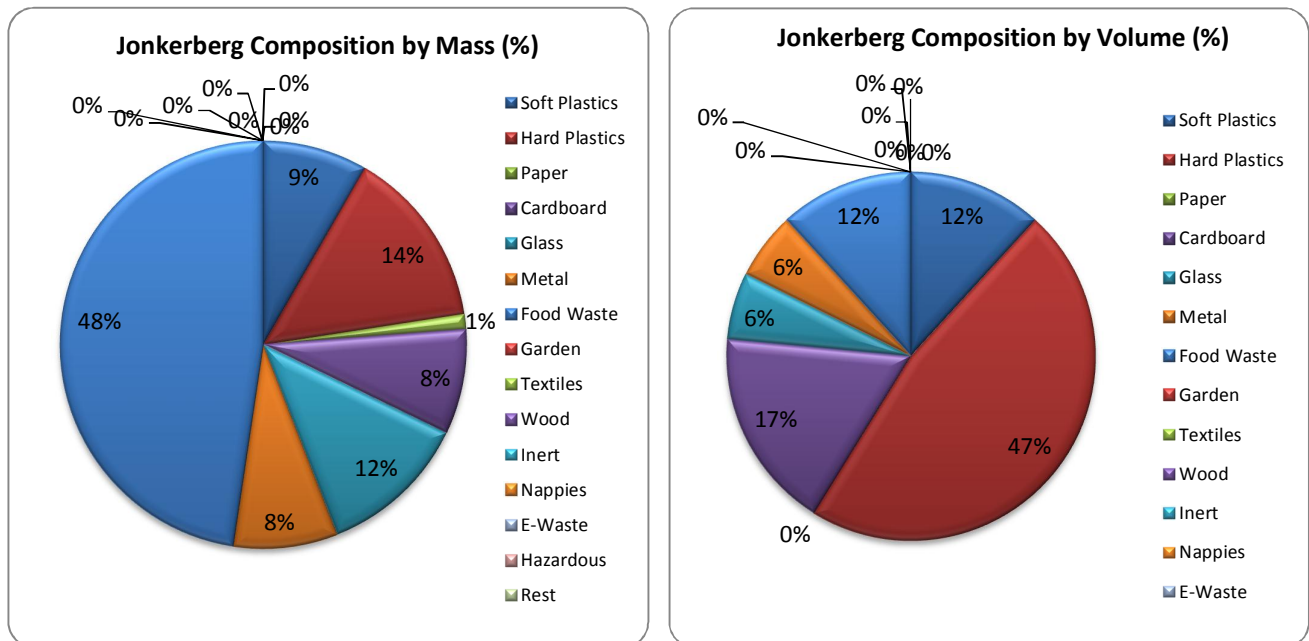| Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	1.10	9.02	0.007
Hard Plastics	1.10	9.02	0.015
Paper	0.90	7.38	0.004
Cardboard	1.20	9.84	0.009
Glass	3.70	30.33	0.009
Metal	0.25	2.05	0.001
Food Waste	3.25	26.64	0.003
Garden	0.00	0.00	0.000
Textiles	0.00	0.00	0.000
Wood	0.00	0.00	0.000
Inert	0.00	0.00	0.000
Nappies	0.45	3.69	0.002
E-Waste	0.00	0.00	0.000
Hazardous	0.00	0.00	0.000
Rest	0.25	2.05	0.001
Total	**12.20**	**100.00**	**0.051**

Table 3.17: Results for Ruiterbos Forest Estate (3 samples)
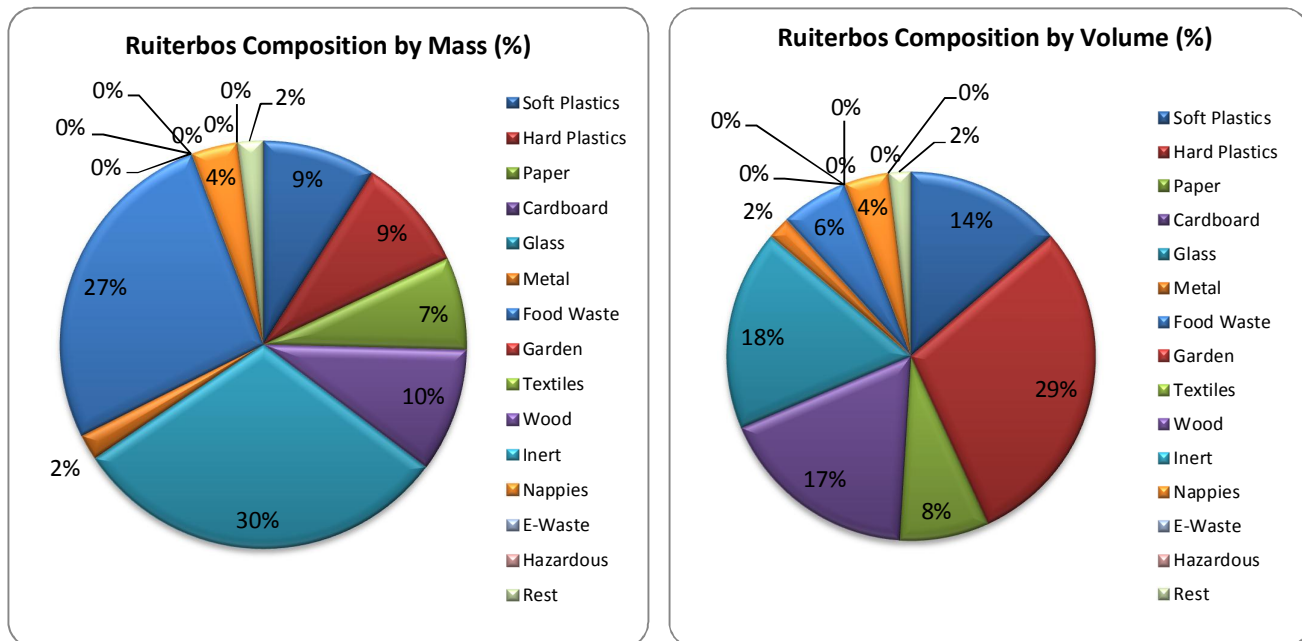
3.1.18 JONKERBERG FOREST ESTATE (1 SAMPLE)

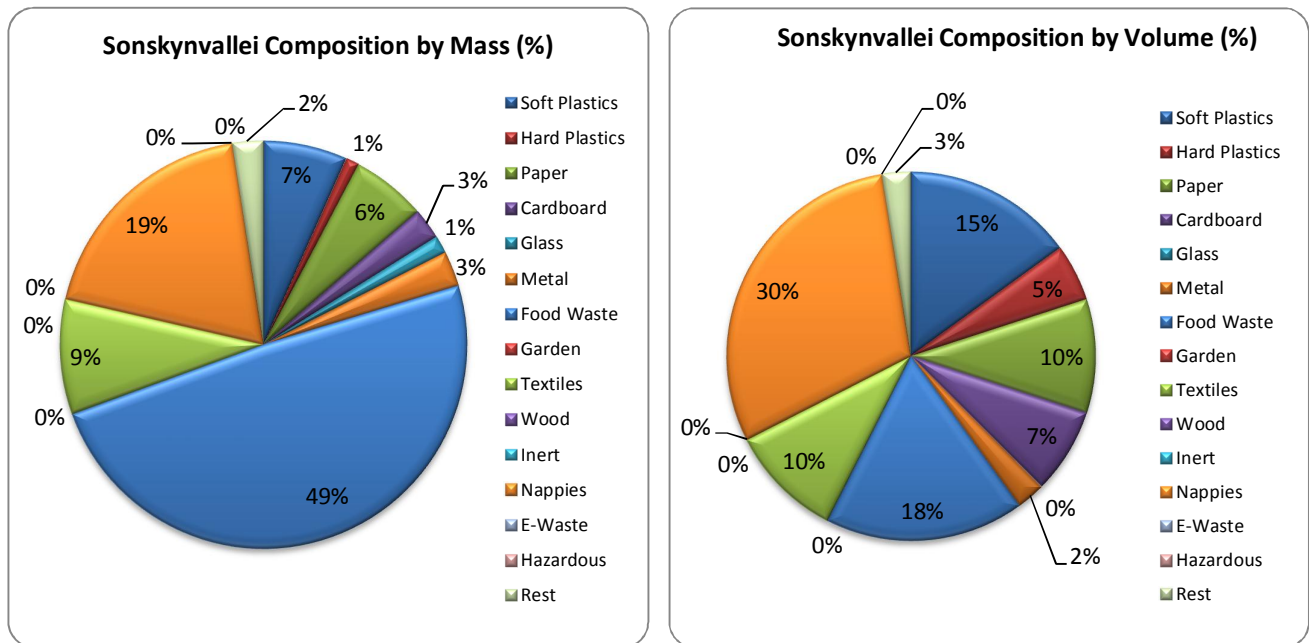| Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	0.35	8.33	0.002
Hard Plastics	0.60	14.29	0.008
Paper	0.05	1.19	0.000
Cardboard	0.35	8.33	0.003
Glass	0.50	11.90	0.001
Metal	0.35	8.33	0.001
Food Waste	2.00	47.62	0.002
Garden	0.00	0.00	0.000
Textiles	0.00	0.00	0.000
Wood	0.00	0.00	0.000
Inert	0.00	0.00	0.000
Nappies	0.00	0.00	0.000
E-Waste	0.00	0.00	0.000
Hazardous	0.00	0.00	0.000
Rest	0.00	0.00	0.000
Total	**4.20**	**100.00**	**0.018**

Table 3.18: Results for Jonkerberg Forest Estate (1 sample)

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3.1.19 SONSKYNVALLEI (3 SAMPLES)

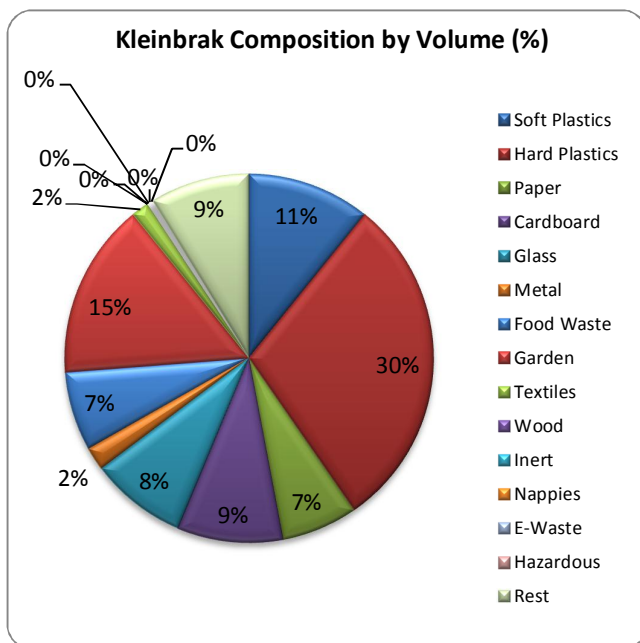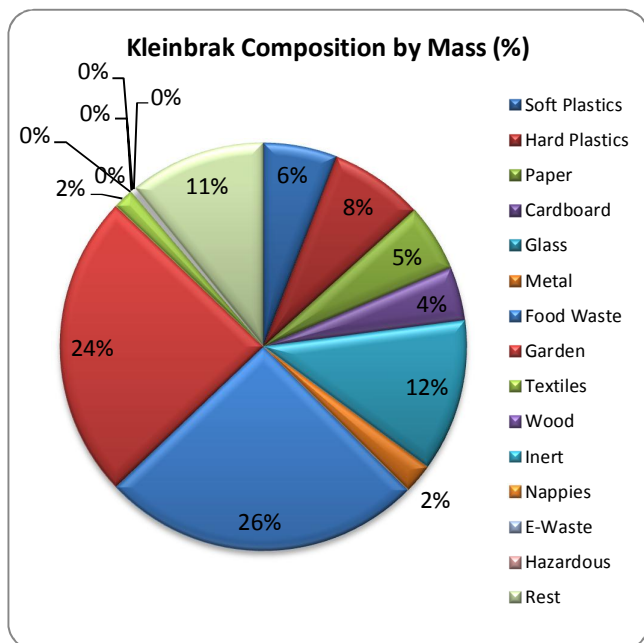| Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	0.95	6.67	0.006
Hard Plastics	0.15	1.05	0.002
Paper	0.85	5.96	0.004
Cardboard	0.35	2.46	0.003
Glass	0.20	1.40	0.000
Metal	0.40	2.81	0.001
Food Waste	7.00	49.12	0.007
Garden	0.00	0.00	0.000
Textiles	1.30	9.12	0.004
Wood	0.00	0.00	0.000
Inert	0.00	0.00	0.000
Nappies	2.70	18.95	0.012
E-Waste	0.00	0.00	0.000
Hazardous	0.00	0.00	0.000
Rest	0.35	2.46	0.001
Total	**14.25**	**100.00**	**0.040**

Table 3.19: Results for Sonskynvallei (3 samples)

3.1.20 KLEINBRAK (26 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	6.50	5.87	0.042
Hard Plastics	8.25	7.45	0.115
Paper	5.95	5.37	0.026
Cardboard	4.70	4.25	0.036
Glass	13.40	12.10	0.033
Metal	2.60	2.35	0.008
Food Waste	28.25	25.52	0.027
Garden	26.75	24.16	0.060
Textiles	1.80	1.63	0.006
Wood	0.00	0.00	0.000
Inert	0.00	0.00	0.000
Nappies	0.30	0.27	0.001
E-Waste	0.00	0.00	0.000
Hazardous	0.20	0.18	0.001
Rest	12.00	10.84	0.034
Total	**110.70**	**100.00**	**0.389**

Table 3.20: Results for Kleinbrak (26 samples)

Kleinbrak Composition by Mass (%)

Kleinbrak Composition by Volume (%)

3.1.21 VYF BRAKKE (32 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	6.90	5.04	0.044
Hard Plastics	12.55	9.17	0.174
Paper	5.60	4.09	0.025
Cardboard	7.60	5.56	0.058
Glass	9.00	6.58	0.022
Metal	3.60	2.63	0.011
Food Waste	51.35	37.54	0.050
Garden	10.40	7.60	0.023
Textiles	3.65	2.67	0.013
Wood	2.75	2.01	0.018
Inert	1.15	0.84	0.001
Nappies	13.70	10.01	0.060
E-Waste	0.05	0.04	0.000
Hazardous	0.10	0.07	0.000
Rest	8.40	6.14	0.024
Total	**136.80**	**100.00**	**0.524**

Table 3.21: Results for Vyf Brakke (32 samples)

31
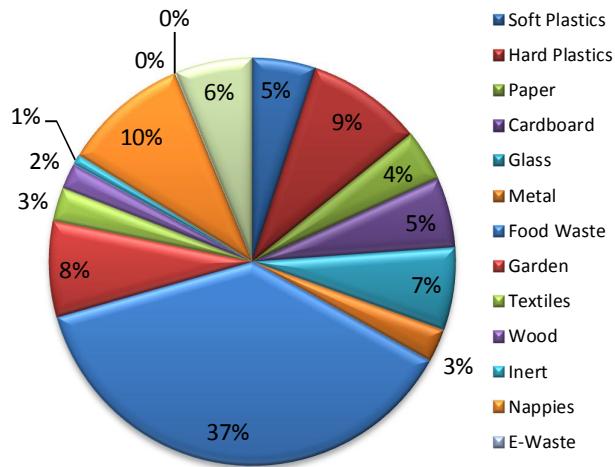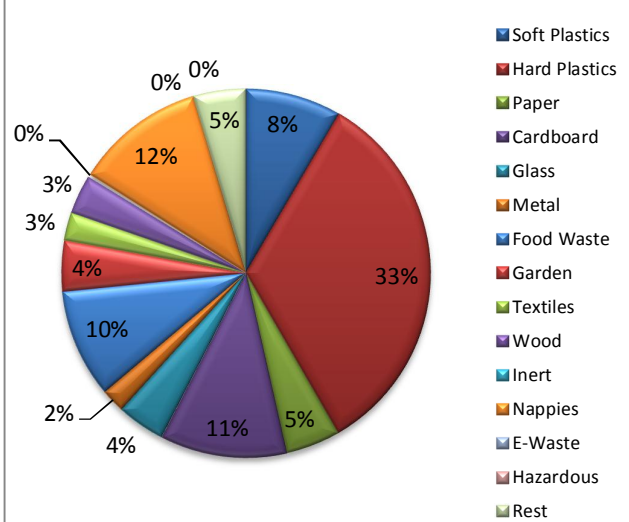
3.1.22 JCC KAMP (4 SAMPLES)

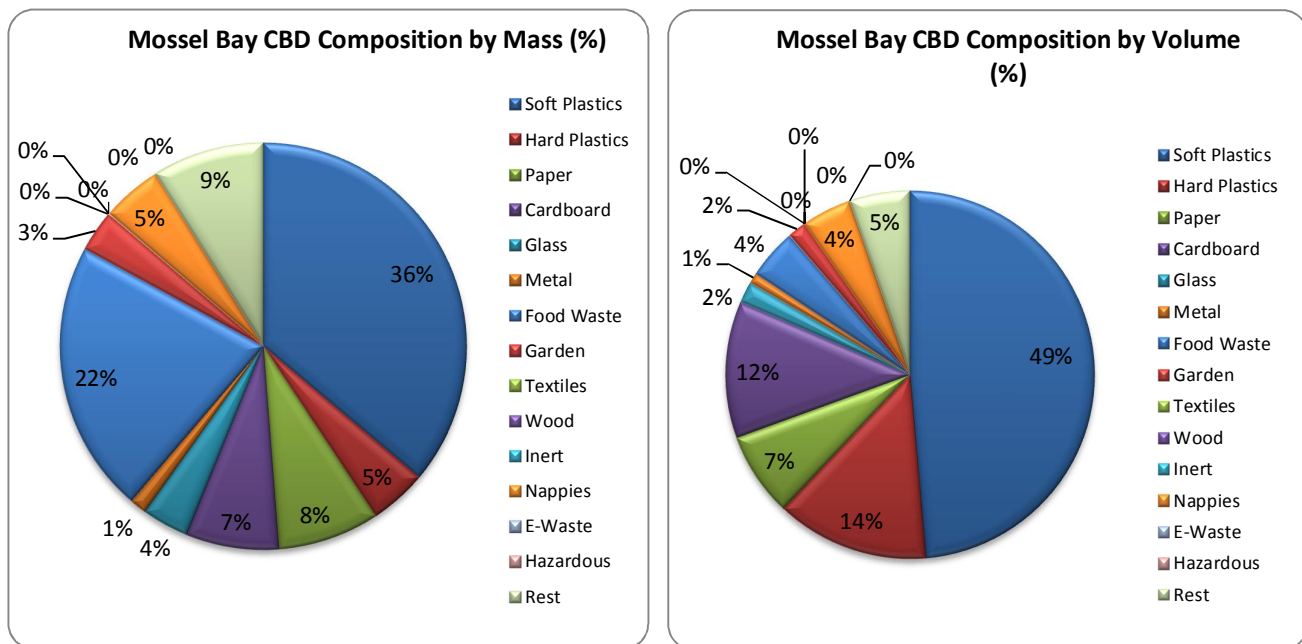| Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	0,40	3,48	0,003
Hard Plastics	1,05	9,13	0,015
Paper	1,55	13,48	0,007
Cardboard	0,70	6,09	0,005
Glass	1,00	8,70	0,002
Metal	0,05	0,43	0,000
Food Waste	0,45	3,91	0,000
Garden	6,25	54,35	0,014
Textiles	0,05	0,43	0,000
Wood	0,00	0,00	0,000
Inert	0,00	0,00	0,000
Nappies	0,00	0,00	0,000
E-Waste	0,00	0,00	0,000
Hazardous	0,00	0,00	0,000
Rest	0,00	0,00	0,000
Total	**11,50**	**100,00**	**0,047**

Table 3.22: Results for JCC Kamp (4 samples)
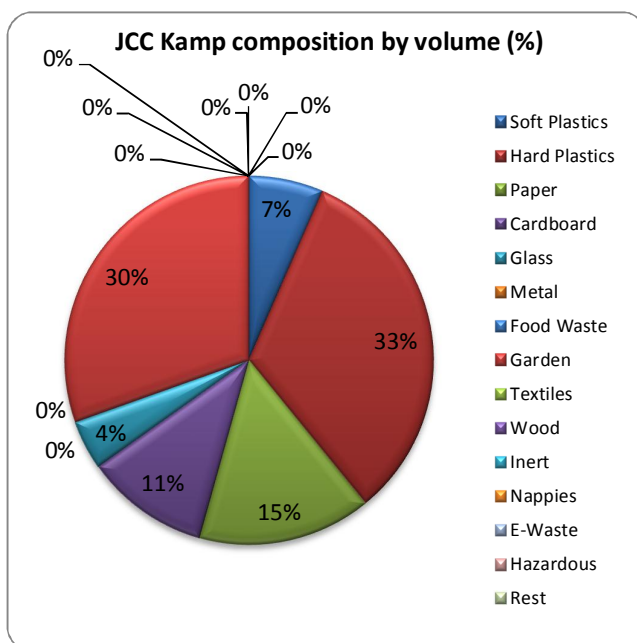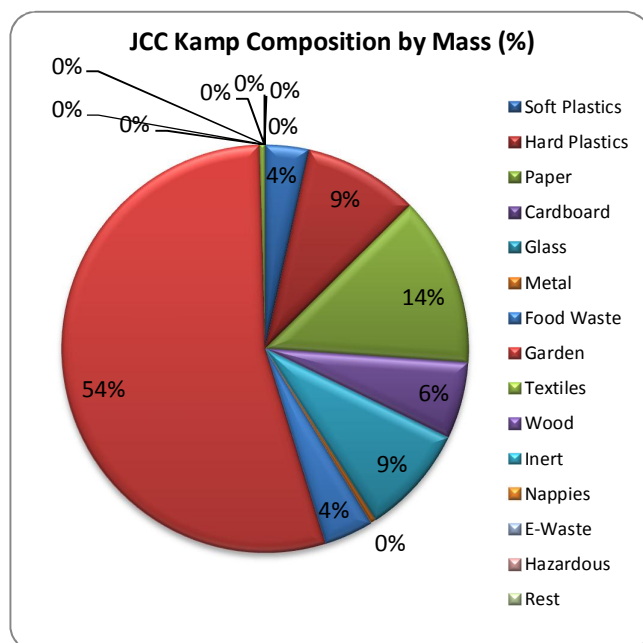
3.1.23 MOSSEL BAY CBD (44 SAMPLES)

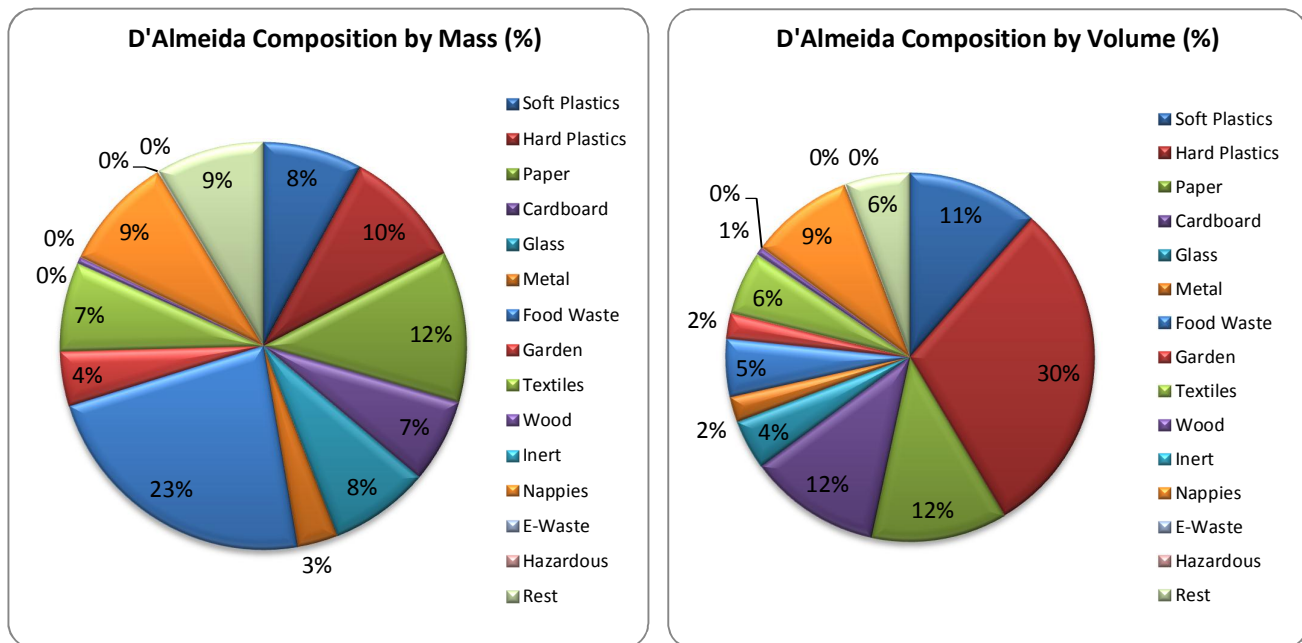| Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	32.80	36.12	0.210
Hard Plastics	4.15	4.57	0.058
Paper	7.35	8.09	0.032
Cardboard	6.71	7.39	0.052
Glass	3.40	3.74	0.008
Metal	1.20	1.32	0.004
Food Waste	19.70	21.69	0.019
Garden	3.00	3.30	0.007
Textiles	0.05	0.06	0.000
Wood	0.00	0.00	0.000
Inert	0.00	0.00	0.000
Nappies	4.35	4.79	0.019
E-Waste	0.00	0.00	0.000
Hazardous	0.00	0.00	0.000
Rest	8.10	8.92	0.023
Total	**90.81**	**100.00**	**0.432**

Table 3.23: Results for Mossel Bay CBD (44 samples)

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3.1.24 D'ALMEIDA (35 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	15.20	7.92	0.097
Hard Plastics	18.30	9.53	0.254
Paper	23.05	12.01	0.101
Cardboard	12.80	6.67	0.098
Glass	15.25	7.94	0.037
Metal	6.20	3.23	0.019
Food Waste	44.05	22.95	0.043
Garden	8.30	4.32	0.019
Textiles	13.65	7.11	0.047
Wood	1.00	0.52	0.006
Inert	0.00	0.00	0.000
Nappies	17.45	9.09	0.077
E-Waste	0.15	0.08	0.001
Hazardous	0.00	0.00	0.000
Rest	16.55	8.62	0.048
Total	**191.95**	**100.00**	**0.848**

Table 3.24: Results for D'Almeida (35 samples)

3.1.25 FAIRVIEW (29 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	7.20	6.02	0.046
Hard Plastics	8.65	7.24	0.120
Paper	3.80	3.18	0.017
Cardboard	8.20	6.86	0.063
Glass	17.65	14.76	0.043
Metal	2.65	2.22	0.008
Food Waste	40.10	33.54	0.039
Garden	20.25	16.94	0.046
Textiles	0.20	0.17	0.001
Wood	0.00	0.00	0.000
Inert	0.00	0.00	0.000
Nappies	5.10	4.27	0.022
E-Waste	0.00	0.00	0.000
Hazardous	0.00	0.00	0.000
Rest	5.75	4.81	0.017
Total	**119.55**	**100.00**	**0.421**

Table 3.25: Results for Fairview (29 samples)
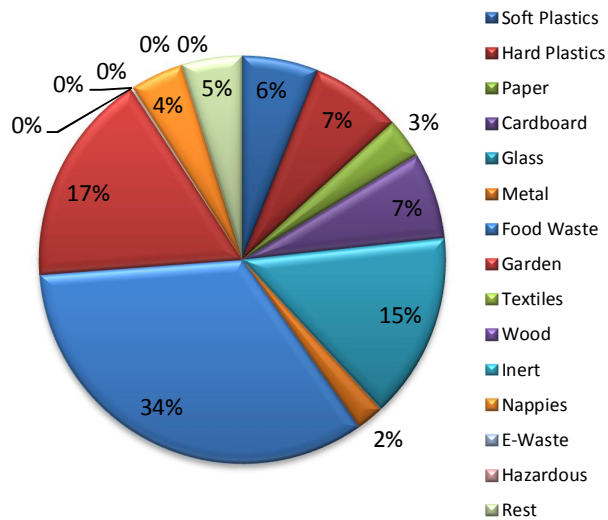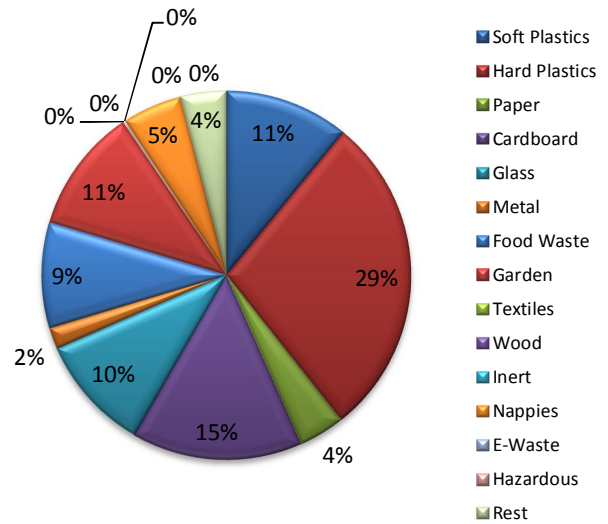
3.1.26 KWANONQABA (205 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	84.26	7.06	0.540
Hard Plastics	86.06	7.21	1.195
Paper	85.56	7.17	0.375
Cardboard	87.72	7.35	0.675
Glass	98.00	8.21	0.238
Metal	32.01	2.68	0.100
Food Waste	216.95	18.17	0.211
Garden	187.95	15.74	0.422
Textiles	62.38	5.22	0.214
Wood	6.25	0.52	0.040
Inert	15.30	1.28	0.014
Nappies	114.85	9.62	0.506
E-Waste	23.35	1.96	0.195
Hazardous	0.60	0.05	0.002
Rest	92.72	7.77	0.266
Total	**1193.96**	**100.00**	**4.994**

Table 3.26: Results for Kwanonqaba (205 samples)

36
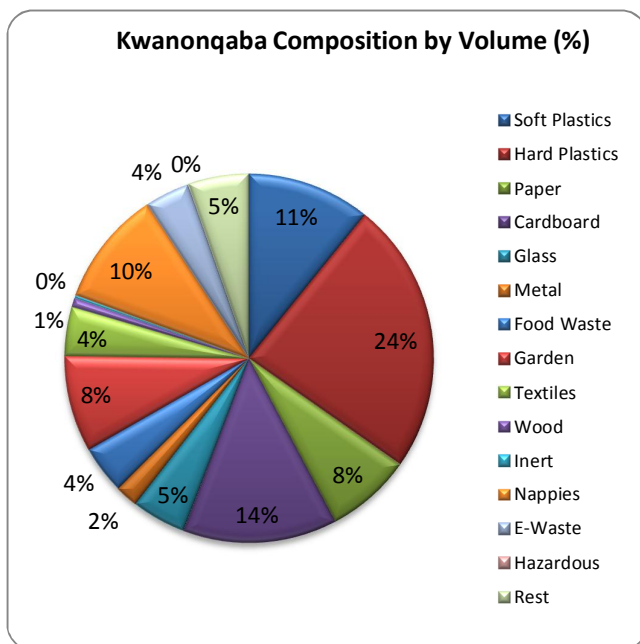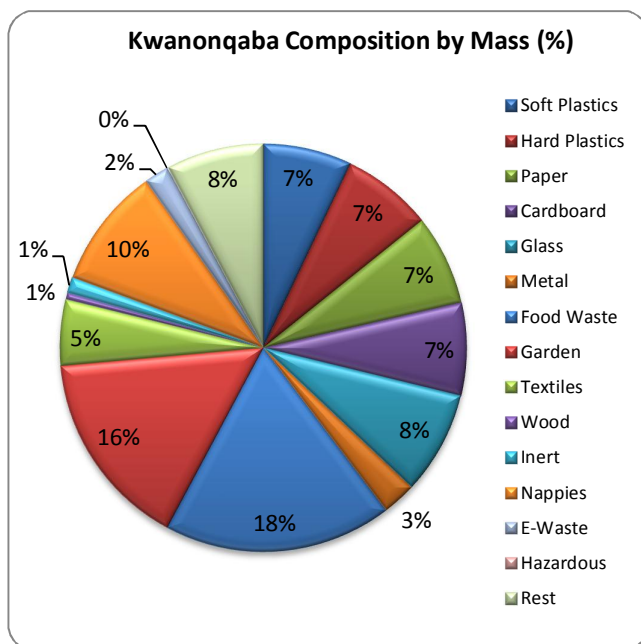
3.1.27 DE BAKKE (8 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	1.70	5.81	0.011
Hard Plastics	1.45	4.96	0.020
Paper	2.80	9.57	0.012
Cardboard	1.60	5.47	0.012
Glass	3.20	10.94	0.008
Metal	0.75	2.56	0.002
Food Waste	14.05	48.03	0.014
Garden	0.00	0.00	0.000
Textiles	0.65	2.22	0.002
Wood	0.00	0.00	0.000
Inert	0.00	0.00	0.000
Nappies	2.05	7.01	0.009
E-Waste	0.00	0.00	0.000
Hazardous	0.00	0.00	0.000
Rest	1.00	3.42	0.003
Total	**29.25**	**100.00**	**0.094**

Table 3.27: Results for De Bakke (8 samples)

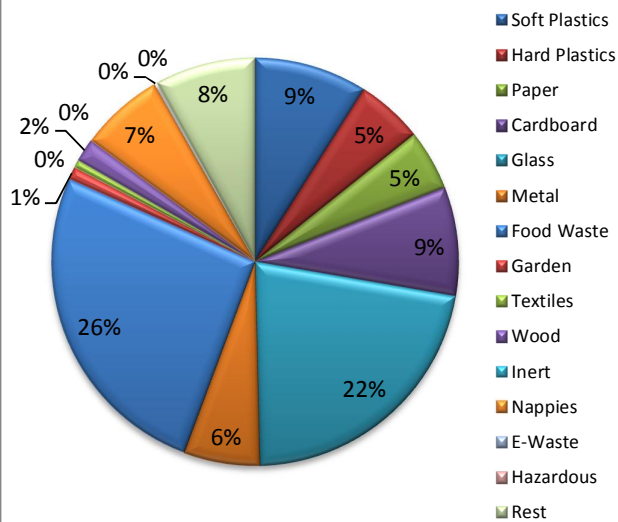De Bakke Composition by Mass (%)
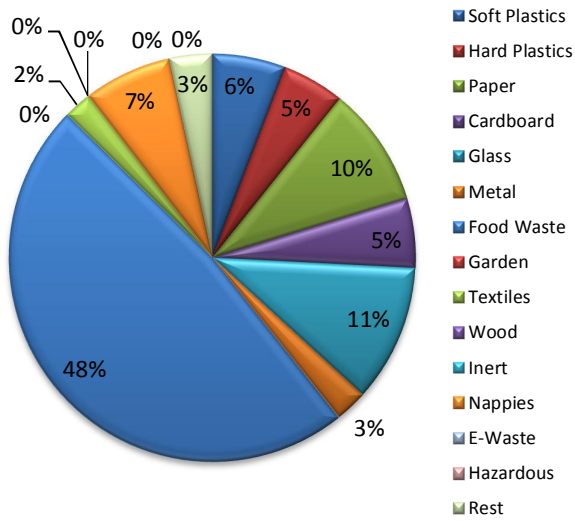
De Bakke Composition by Volume (%)
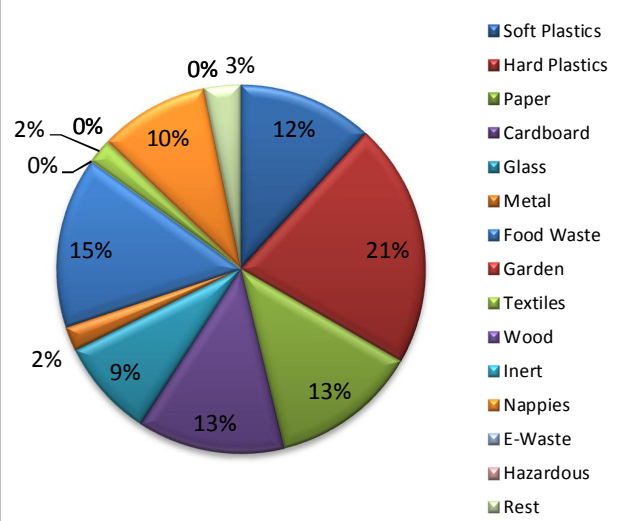
3.1.28 REEBOK (12 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	3.65	8.99	0.023
Hard Plastics	2.15	5.30	0.030
Paper	1.95	4.80	0.009
Cardboard	3.50	8.62	0.027
Glass	8.90	21.92	0.022
Metal	2.45	6.03	0.008
Food Waste	10.55	25.99	0.010
Garden	0.40	0.99	0.001
Textiles	0.25	0.62	0.001
Wood	0.75	1.85	0.005
Inert	0.00	0.00	0.000
Nappies	2.70	6.65	0.012
E-Waste	0.10	0.25	0.001
Hazardous	0.00	0.00	0.000
Rest	3.25	8.00	0.009
Total	**40.60**	**100.00**	**0.000**

Table 3.28:   Results for Reebok (25 samples)

Reebok Composition by Mass (%)

Reebok Composition by Volume (%)

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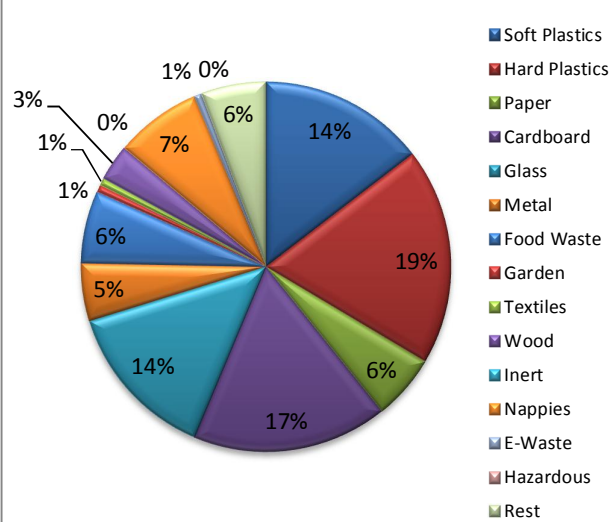
3.1.29 GLENTANA (8 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	2.20	6.11	0.014
Hard Plastics	3.90	10.83	0.054
Paper	2.95	8.19	0.013
Cardboard	1.05	2.92	0.008
Glass	2.85	7.92	0.007
Metal	0.85	2.36	0.003
Food Waste	8.10	22.50	0.008
Garden	6.65	18.47	0.015
Textiles	0.00	0.00	0.000
Wood	0.15	0.42	0.001
Inert	0.00	0.00	0.000
Nappies	3.65	10.14	0.016
E-Waste	0.00	0.00	0.000
Hazardous	0.00	0.00	0.000
Rest	3.65	10.14	0.010
Total	**36.00**	**100.00**	**0.149**

Table 3.29: Results for Glentana (8 samples)

Glentana Composition by Mass (%)

Glentana Composition by Volume (%)
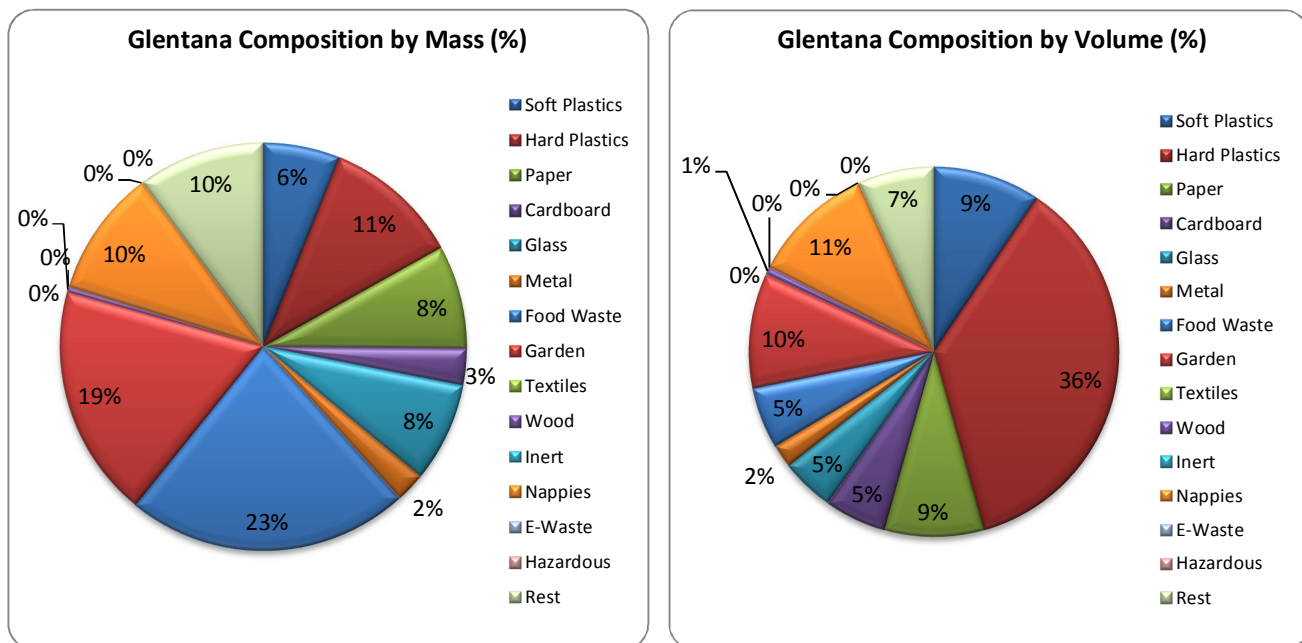
3.1.30 SUIDEKRUIS (3 SAMPLES)

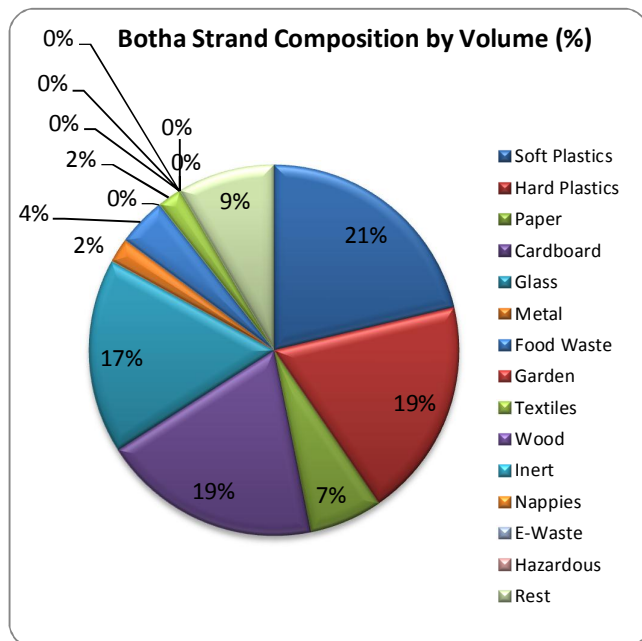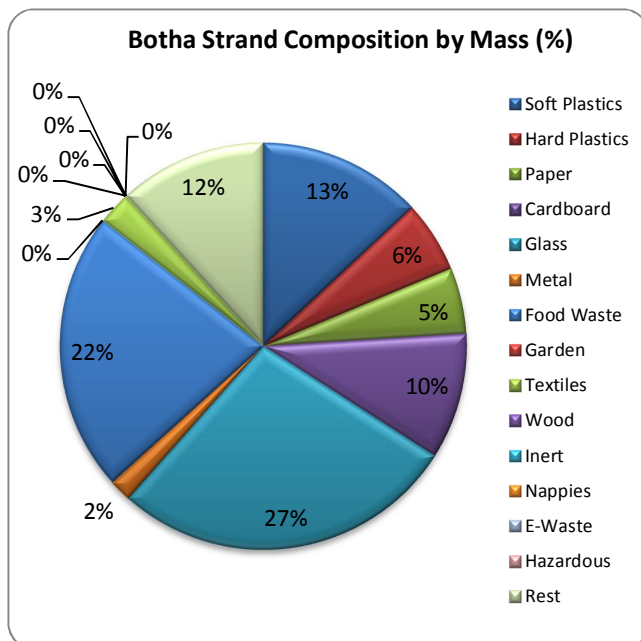| Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	1.15	6.91	0.007
Hard Plastics	1.00	6.01	0.014
Paper	0.40	2.40	0.002
Cardboard	0.80	4.80	0.006
Glass	2.70	16.22	0.007
Metal	0.25	1.50	0.001
Food Waste	2.20	13.21	0.002
Garden	7.70	46.25	0.017
Textiles	0.00	0.00	0.000
Wood	0.00	0.00	0.000
Inert	0.00	0.00	0.000
Nappies	0.00	0.00	0.000
E-Waste	0.00	0.00	0.000
Hazardous	0.00	0.00	0.000
Rest	0.45	2.70	0.001
Total	**16.65**	**100.00**	**0.057**

Table 3.30: Results for Suidekruis (3 samples)
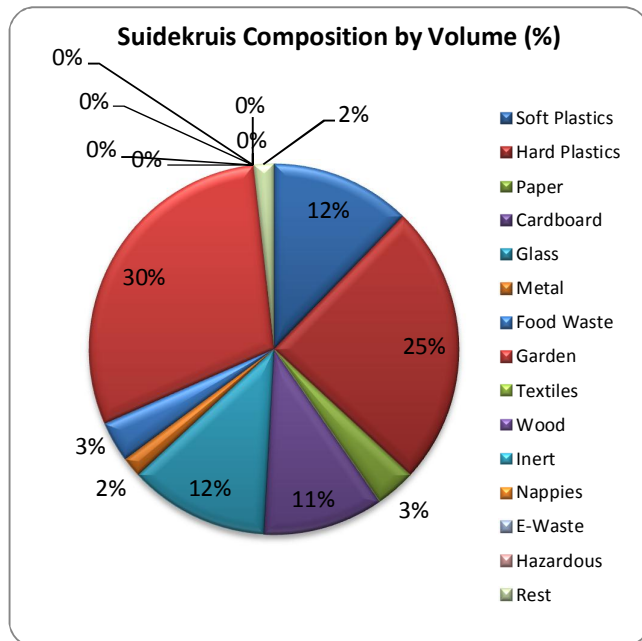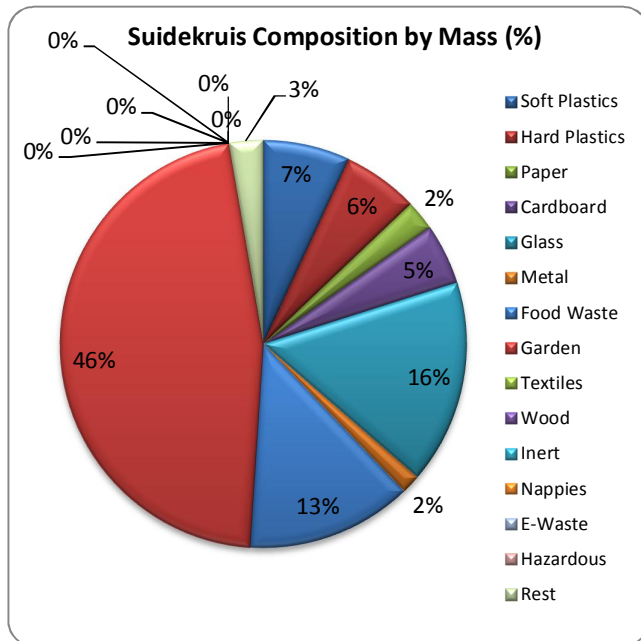
3.1.31 BOTHA STRAND (3 SAMPLES)

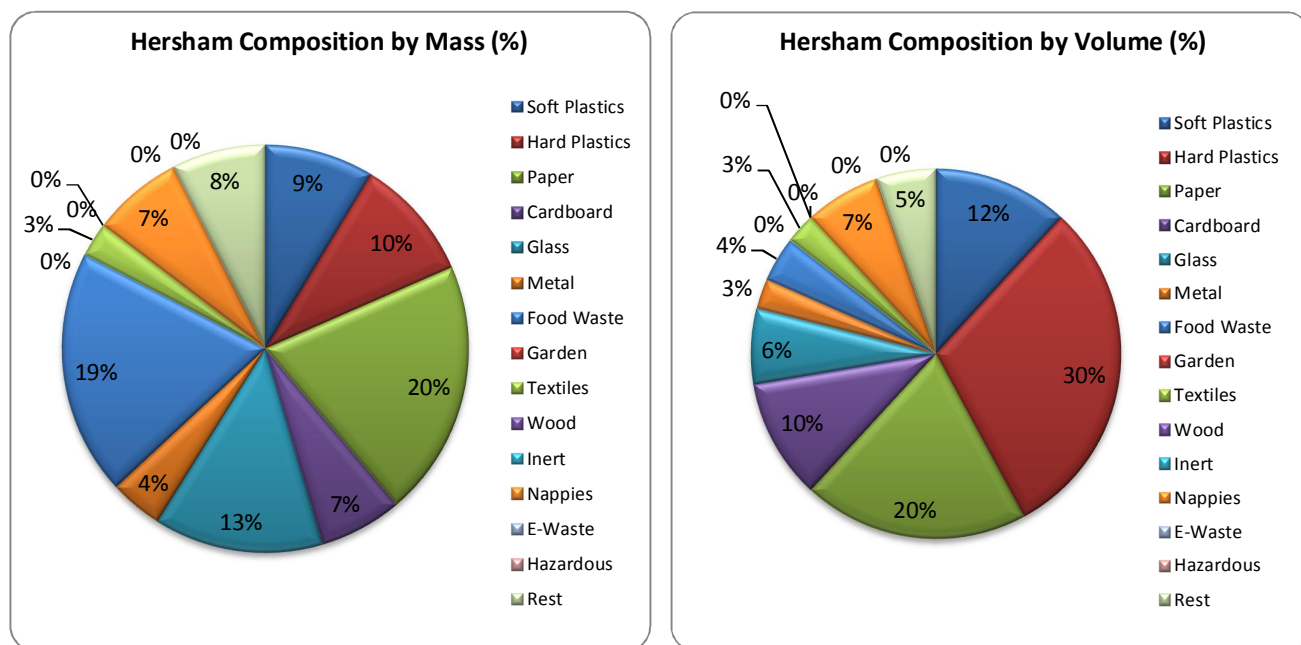| Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	1.50	13.10	0.010
Hard Plastics	0.65	5.68	0.009
Paper	0.60	5.24	0.003
Cardboard	1.15	10.04	0.009
Glass	3.15	27.51	0.008
Metal	0.20	1.75	0.001
Food Waste	2.55	22.27	0.002
Garden	0.00	0.00	0.000
Textiles	0.30	2.62	0.001
Wood	0.00	0.00	0.000
Inert	0.00	0.00	0.000
Nappies	0.00	0.00	0.000
E-Waste	0.00	0.00	0.000
Hazardous	0.00	0.00	0.000
Rest	1.35	11.79	0.004
Total	**11.45**	**100.00**	**0.046**

Table 3.31: Results for Botha Strand (3 samples)

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3.1.32 HERSHAM (4 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	1.45	8.69	0.009
Hard Plastics	1.63	9.77	0.023
Paper	3.40	20.38	0.015
Cardboard	1.10	6.59	0.008
Glass	2.25	13.49	0.005
Metal	0.70	4.20	0.002
Food Waste	3.25	19.48	0.003
Garden	0.00	0.00	0.000
Textiles	0.45	2.70	0.002
Wood	0.00	0.00	0.000
Inert	0.00	0.00	0.000
Nappies	1.20	7.19	0.005
E-Waste	0.00	0.00	0.000
Hazardous	0.00	0.00	0.000
Rest	1.25	7.49	0.004
Total	**16.68**	**100.00**	**0.077**

Table 3.32: Results for Hersham (4 samples)

Hersham Composition by Mass (%)

Hersham Composition by Volume (%)

3.1.33 VALLEY (12 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	3.90	5.76	0.025
Hard Plastics	4.10	6.05	0.057
Paper	6.70	9.89	0.029
Cardboard	5.00	7.38	0.038
Glass	3.70	5.46	0.009
Metal	1.25	1.85	0.004
Food Waste	24.05	35.50	0.023
Garden	3.55	5.24	0.008
Textiles	1.95	2.88	0.007
Wood	0.35	0.52	0.002
Inert	2.55	3.76	0.002
Nappies	5.85	8.63	0.026
E-Waste	0.00	0.00	0.000
Hazardous	0.05	0.07	0.000
Rest	4.75	7.01	0.014
Total	**67.75**	**100.00**	**0.245**

Table 3.33: Results for Valley (12 samples)

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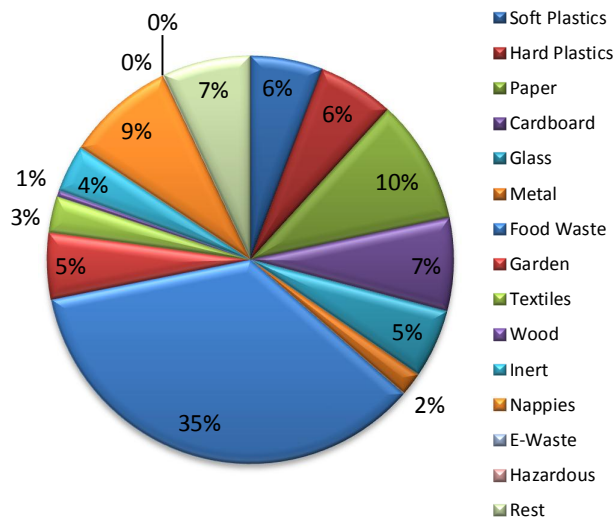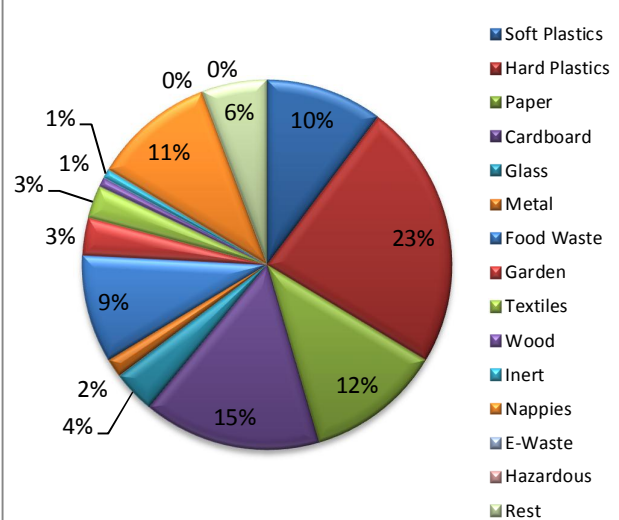
3.1.34 BRANDWACHT (12 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	5.05	13.69	0.032
Hard Plastics	5.35	14.50	0.074
Paper	4.25	11.52	0.019
Cardboard	1.95	5.28	0.015
Glass	7.50	20.33	0.018
Metal	1.05	2.85	0.003
Food Waste	7.05	19.11	0.007
Garden	0.55	1.49	0.001
Textiles	1.05	2.85	0.004
Wood	0.00	0.00	0.000
Inert	0.00	0.00	0.000
Nappies	0.00	0.00	0.000
E-Waste	0.15	0.41	0.001
Hazardous	0.00	0.00	0.000
Rest	2.95	7.99	0.008
Total	**36.90**	**100.00**	**0.183**

Table 3.34: Results for Brandwacht (12 samples)

Brandwacht Composition by Mass (%)

Brandwacht Composition by Volume (%)
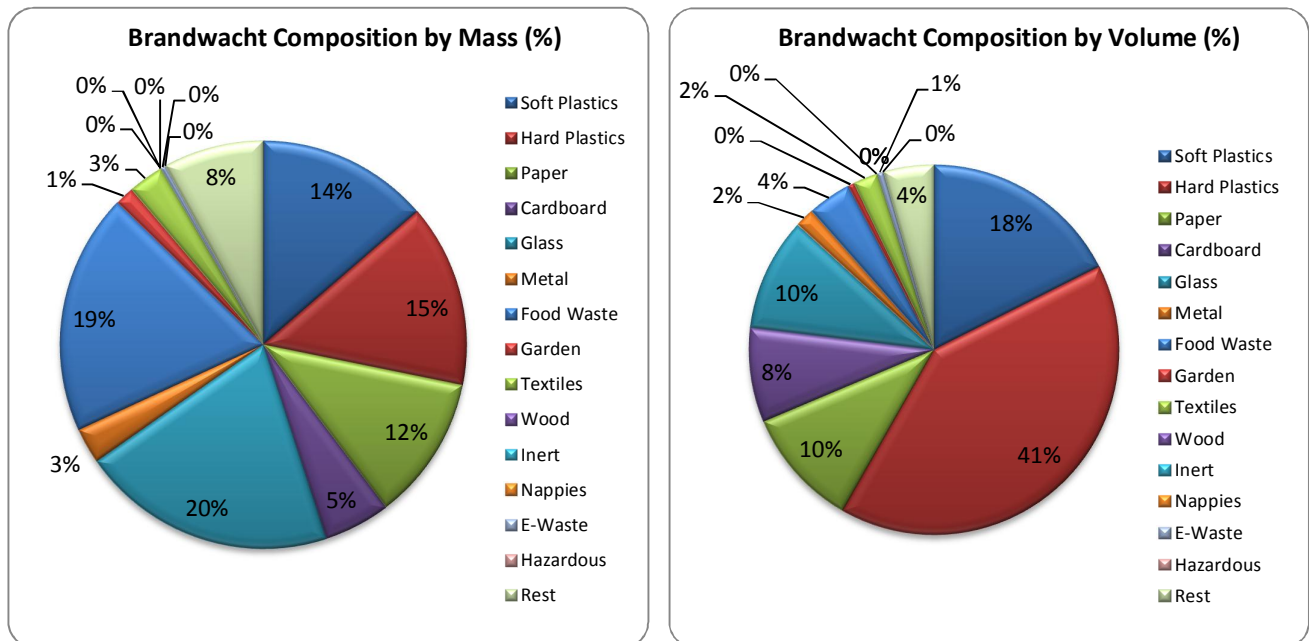
3.1.35 SANTOS BAY (1 SAMPLE)

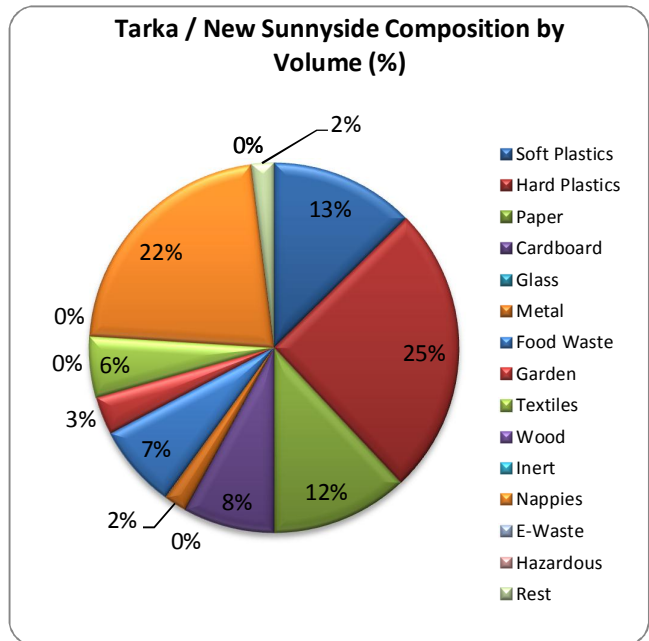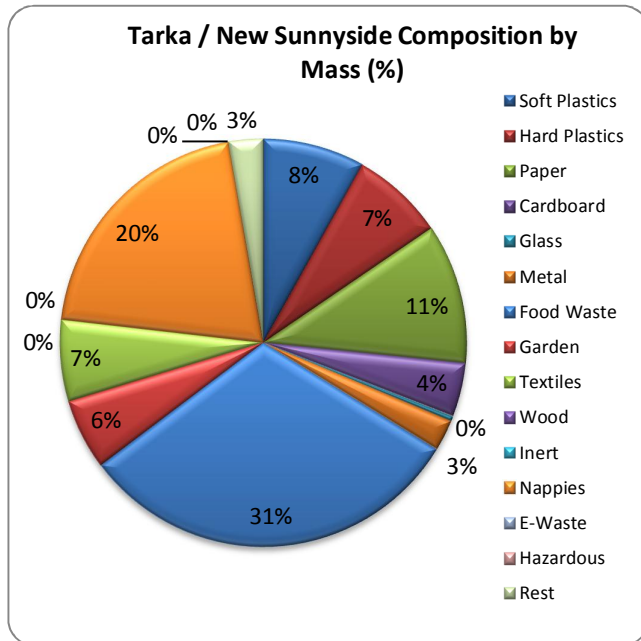| Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	0.25	6.49	0.002
Hard Plastics	0.80	20.78	0.011
Paper	0.05	1.30	0.000
Cardboard	0.00	0.00	0.000
Glass	1.80	46.75	0.004
Metal	0.10	2.60	0.000
Food Waste	0.85	22.08	0.001
Garden	0.00	0.00	0.000
Textiles	0.00	0.00	0.000
Wood	0.00	0.00	0.000
Inert	0.00	0.00	0.000
Nappies	0.00	0.00	0.000
E-Waste	0.00	0.00	0.000
Hazardous	0.00	0.00	0.000
Rest	0.00	0.00	0.000
Total	**3.85**	**100.00**	**0.018**

Table 3.35: Results for Santos Bay (1 sample)
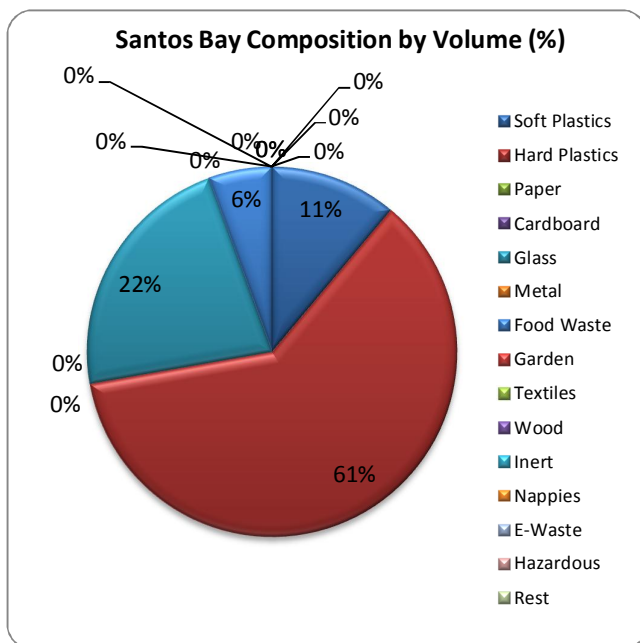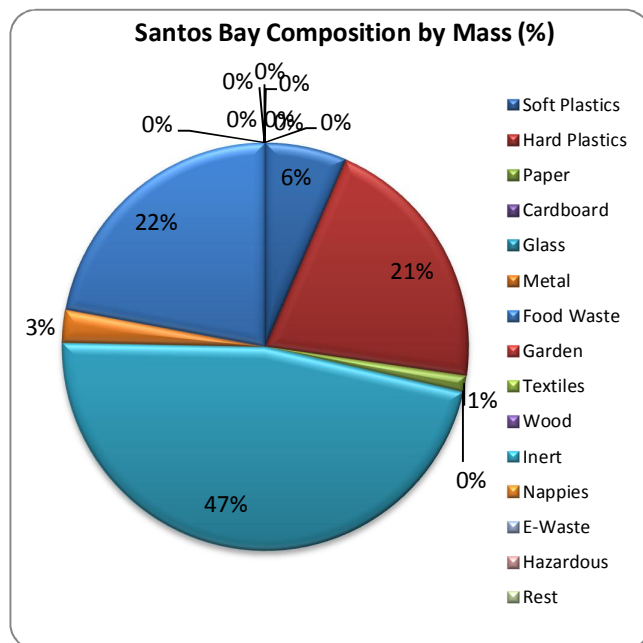
3.1.36 TARKA / NEW SUNNYSIDE (9 SAMPLES)

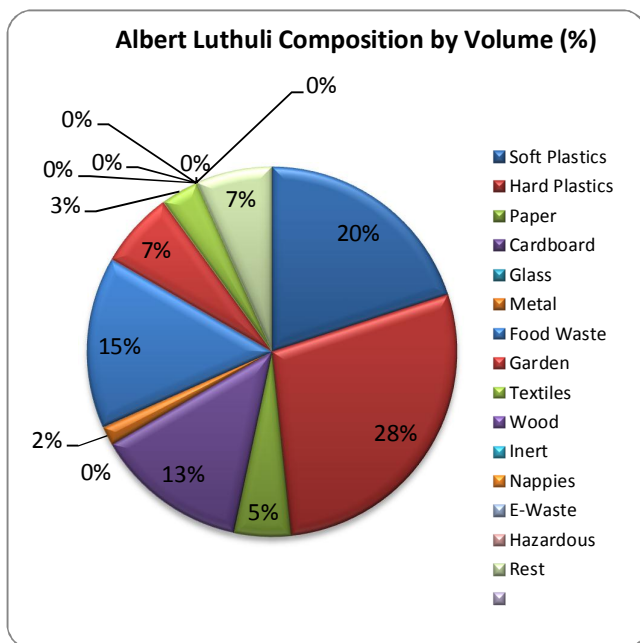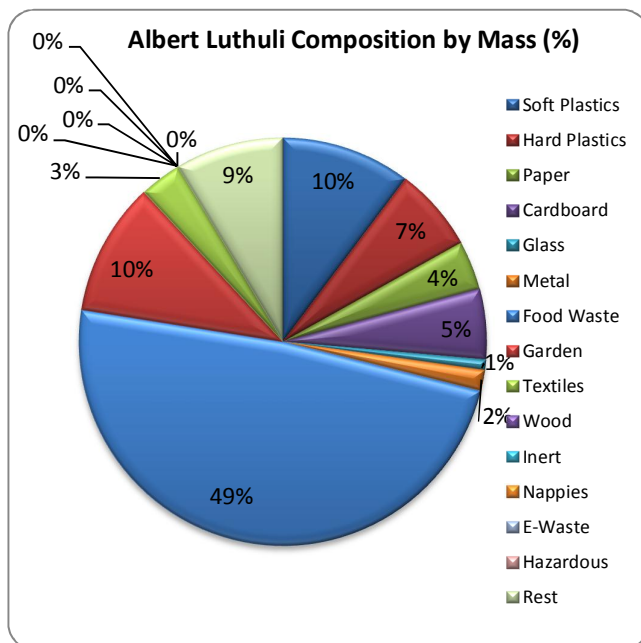| Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	2.95	8.09	0.019
Hard Plastics	2.70	7.41	0.038
Paper	4.05	11.11	0.018
Cardboard	1.55	4.25	0.012
Glass	0.15	0.41	0.000
Metal	0.90	2.47	0.003
Food Waste	11.30	31.00	0.011
Garden	2.05	5.62	0.005
Textiles	2.35	6.45	0.008
Wood	0.00	0.00	0.000
Inert	0.00	0.00	0.000
Nappies	7.45	20.44	0.033
E-Waste	0.00	0.00	0.000
Hazardous	0.00	0.00	0.000
Rest	1.00	2.74	0.003
Total	**36.45**	**100.00**	**0.149**

Table 3.36: Results for Tarka / New Sunnyside (9 samples)

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3.1.37 ALBERT LUTHULI (5 SAMPLES)

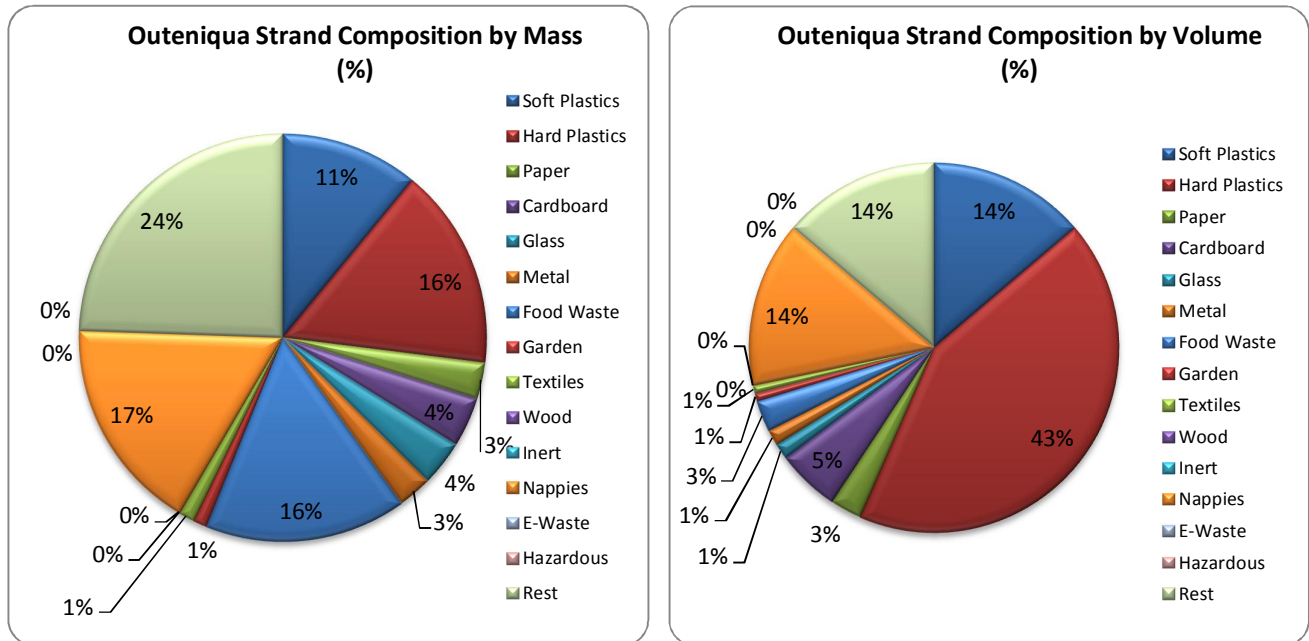| Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	1.85	10.28	0.012
Hard Plastics	1.20	6.67	0.017
Paper	0.70	3.89	0.003
Cardboard	1.00	5.56	0.008
Glass	0.15	0.83	0.000
Metal	0.30	1.67	0.001
Food Waste	8.75	48.61	0.009
Garden	1.90	10.56	0.004
Textiles	0.60	3.33	0.002
Wood	0.00	0.00	0.000
Inert	0.00	0.00	0.000
Nappies	0.00	0.00	0.000
E-Waste	0.00	0.00	0.000
Hazardous	0.00	0.00	0.000
Rest	1.55	8.61	0.004
Total	**18.00**	**100.00**	**0.060**

Table 3.37: Results for Albert Luthuli (5 samples)

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3.1.38 OUTENIQUA STRAND (4 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	3.05	10.97	0.020
Hard Plastics	4.45	16.01	0.062
Paper	0.80	2.88	0.004
Cardboard	1.10	3.96	0.008
Glass	1.00	3.60	0.002
Metal	0.75	2.70	0.002
Food Waste	4.45	16.01	0.004
Garden	0.30	1.08	0.001
Textiles	0.35	1.26	0.001
Wood	0.00	0.00	0.000
Inert	0.00	0.00	0.000
Nappies	4.75	17.09	0.021
E-Waste	0.00	0.00	0.000
Hazardous	0.00	0.00	0.000
Rest	6.80	24.46	0.020
Total	**27.80**	**100.00**	**0.145**

Table 3.38: Results for Outeniqua Strand (4 samples)

Outeniqua Strand Composition by Mass (%)

Outeniqua Strand Composition by Volume (%)

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3.1.39 LINK SIDE (5 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	0.65	5.02	0.004
Hard Plastics	1.10	8.49	0.015
Paper	0.40	3.09	0.002
Cardboard	0.95	7.34	0.007
Glass	4.10	31.66	0.010
Metal	0.30	2.32	0.001
Food Waste	0.75	5.79	0.001
Garden	3.75	28.96	0.008
Textiles	0.00	0.00	0.000
Wood	0.00	0.00	0.000
Inert	0.00	0.00	0.000
Nappies	0.00	0.00	0.000
E-Waste	0.00	0.00	0.000
Hazardous	0.00	0.00	0.000
Rest	0.95	7.34	0.003
Total	**12.95**	**100.00**	**0.051**

Table 3.39: Results for Link Side (5 samples)

Link Side Composition by Mass (%)

Link Side Composition by Volume (%)
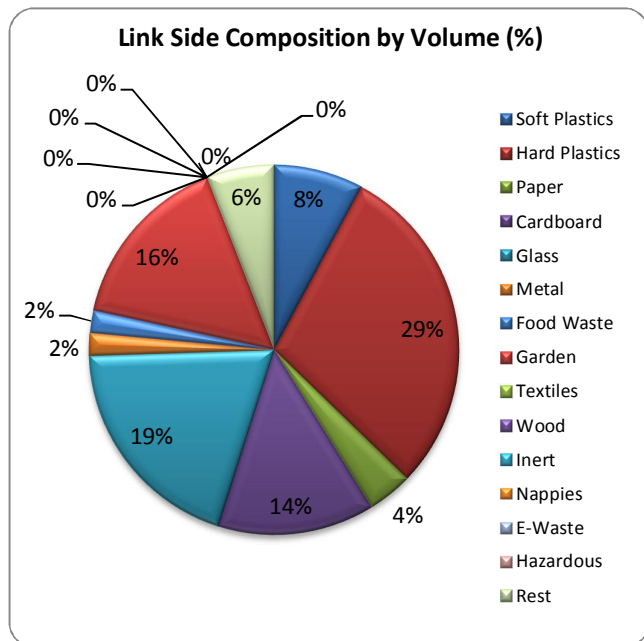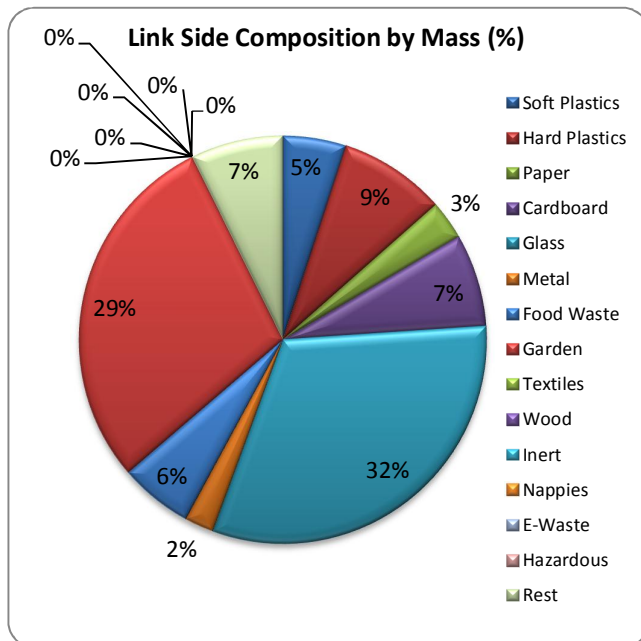
3.1.40 GREENHAVEN (9 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	4.85	9.90	0.031
Hard Plastics	3.20	6.53	0.044
Paper	2.70	5.51	0.012
Cardboard	4.60	9.39	0.035
Glass	3.15	6.43	0.008
Metal	1.35	2.76	0.004
Food Waste	16.95	34.59	0.016
Garden	0.00	0.00	0.000
Textiles	0.75	1.53	0.003
Wood	0.00	0.00	0.000
Inert	0.00	0.00	0.000
Nappies	8.95	18.27	0.039
E-Waste	0.05	0.10	0.000
Hazardous	0.00	0.00	0.000
Rest	2.45	5.00	0.007
Total	**49.00**	**100.00**	**0.201**

Table 3.40: Results for Greenhaven (9 samples)

Greenhaven Composition by Mass (%)
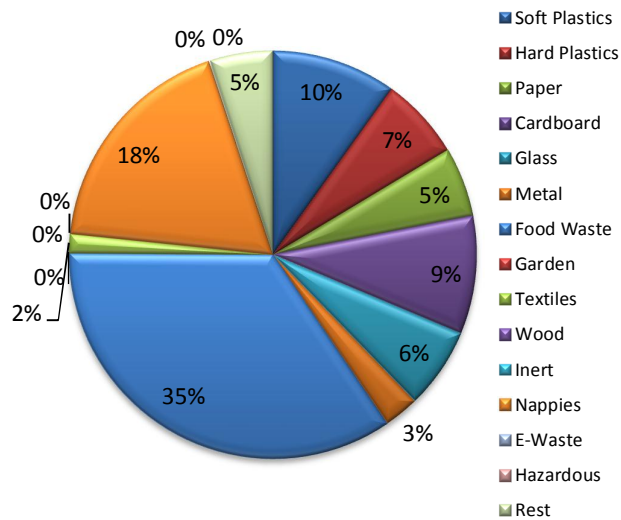
Greenhaven Composition by Volume (%)
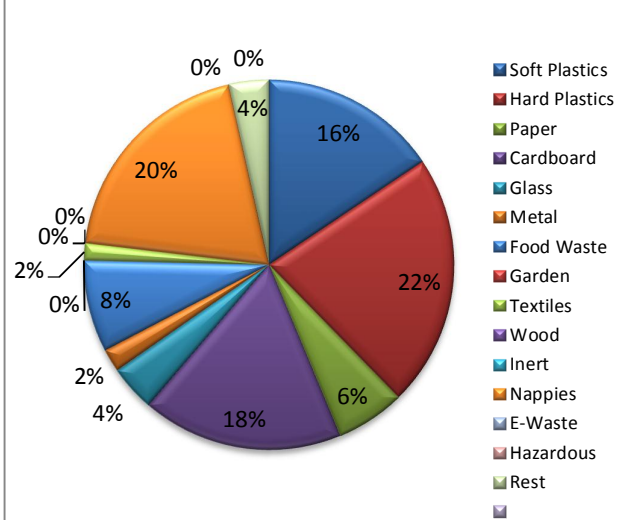
3.1.41 BLUE RIDGE PINNACLE POINT (2 SAMPLES)

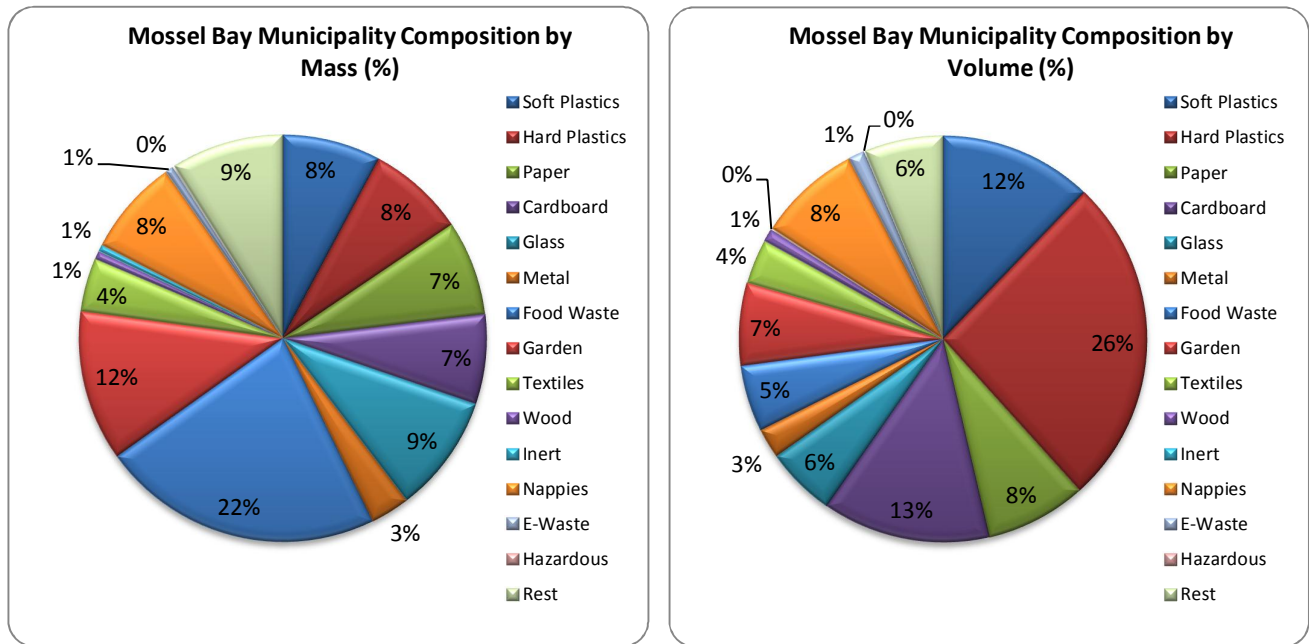| Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	0.40	14.04	0.003
Hard Plastics	0.20	7.02	0.003
Paper	0.25	8.77	0.001
Cardboard	0.85	29.82	0.007
Glass	0.00	0.00	0.000
Metal	0.00	0.00	0.000
Food Waste	0.00	0.00	0.000
Garden	0.00	0.00	0.000
Textiles	0.00	0.00	0.000
Wood	0.00	0.00	0.000
Inert	0.00	0.00	0.000
Nappies	0.00	0.00	0.000
E-Waste	0.00	0.00	0.000
Hazardous	0.00	0.00	0.000
Rest	1.15	40.35	0.003
Total	**2.85**	**100.00**	**0.016**

Table 3.41: Results for Blue Ridge Pinnacle Point (2 samples)
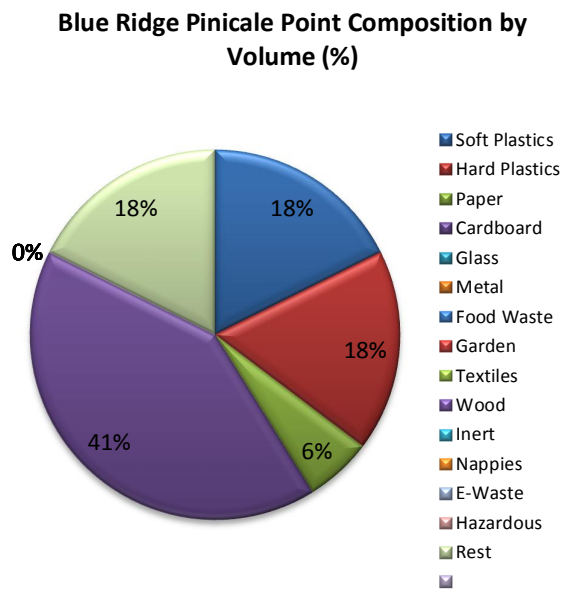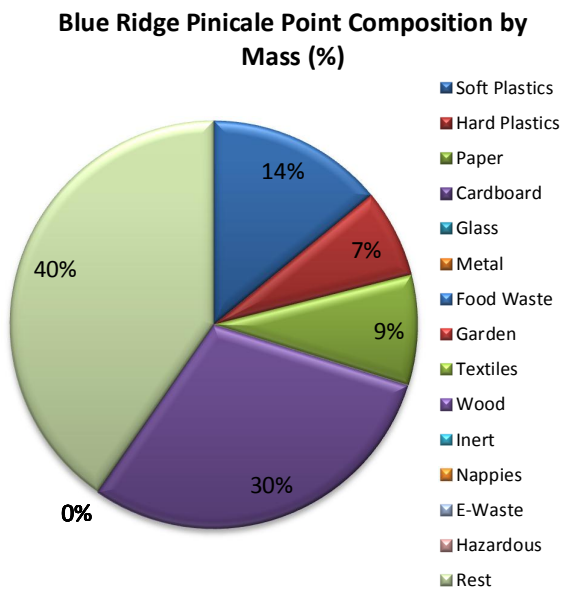
3.1.42 TOTAL MOSSEL BAY MUNICIPALITY (768 SAMPLES)

Waste Type	Mass (kg)	Percentage of total	Calculated Volume
Soft Plastics	300,43	7,82	1,926
Hard Plastics	297,69	7,75	4,135
Paper	289,42	7,53	1,269
Cardboard	274,44	7,14	2,111
Glass	360,52	9,38	0,877
Metal	119,85	3,12	0,375
Food Waste	860,55	22,40	0,836
Garden	460,65	11,99	1,035
Textiles	163,44	4,25	0,560
Wood	25,05	0,65	0,161
Inert	21,22	0,55	0,020
Nappies	294,67	7,67	1,298
E-Waste	24,55	0,64	0,205
Hazardous	6,1	0,16	0,018
Rest	343,64	8,94	0,987
Total	**3842,22**	**100,00**	**15,812**

Table 3.42: Results for Mossel Bay Municipality (768 samples)

Mossel Bay Municipality Composition by Mass (%)

Mossel Bay Municipality Composition by Volume (%)

4. CONCLUSIONS

Of the 768 bags that were sampled a total mass of 3842,22 kg (3,84 tons) of waste was recorded, with a compacted volume of 15,812 m³.

Food Waste was the most prominent component by mass (22%) of the waste types that were sampled, however only makes up 5% of the total waste by volume. Hard Plastics was the most prominent component by volume (26%) of the waste types that were sampled.

42% of the waste types that were sampled by mass were recyclable materials: Glass (9%), Soft Plastics (8%), Hard Plastics (8%), Paper (7%), Cardboard (7%) and Metal (3%). However, by volume, 68% of the waste types that were sampled were recyclable materials: Hard Plastics (26%), Cardboard (13%), Soft Plastics (12%), Paper (8%), Glass (6%) and Metal (3%).

Garden waste constituted 12% of the total waste sampled by mass and 7% by volume. It must be noted that Mossel Bay Municipality does not accept the removal of garden waste; therefore the garden waste component is wrongfully co-disposed with general household waste.

E-waste constituted a mere 0,64% of the total waste sampled by mass and 1,3% by volume. E-waste is however classified as hazardous waste and contains recyclable materials that can be recovered. The remaining hazardous components of the E-waste should be disposed of at an appropriate facility. There is an E-waste disposal facility situated at the Sonskynvallei transfer station.

Hazardous Waste constituted a mere 0,16% of the total waste sampled by mass and 0,11% by volume. Although minimal, hazardous waste is not permitted to be disposed with household general waste.

The remaining 22% of the waste types by mass and 19% by volume was Nappies, Textiles, Wood, Inert and Rest. These waste types cannot be recycled and there is no or limited (unaffordable) alternative waste technologies available in South Africa. Therefore this is considered the portion that will be necessary to dispose of at a landfill site.

The results obtained from the different sub areas within Mossel Bay Municipality illustrated different trends in waste generation. These trends will be significant in identifying and prioritising the type of waste minimisation initiatives to be implemented in the various sub-areas. E.g. Home composting initiatives should be implemented in the sub areas where Garden Waste was the prominent component of the waste sampled.

It was generally considered that the participation rate in the two-bag recycling system was prominent in the higher income areas. However the study indicated that the majority (by volume) of the waste generated in the higher income areas are recyclable materials.

The prediction of uniformity and consistency of waste type occurrence is complex due to the heterogeneous nature and variability of waste. Therefore it is not likely to determine accurate projections of the likelihood of the occurrence of particular waste types in a waste stream.

5. ASSUMPTIONS

Based on the figures provided by Mossel Bay Municipality for the tonnages of household waste disposed of for the period July 2014 – June 2016 (two financial years), an estimated 2 307 tons of waste is disposed of at the PetroSA landfill site in Mossel Bay on a monthly basis. It must be noted that during the summer holiday season there is a spike in the amount of waste generated, and has therefore increased the monthly average.

When applying the results of the characterisation study to the monthly average, the following tonnages per waste type being landfilled can be assumed:

Waste Type	Mass (Tons)	Percentage of total Mass (%)	Calculated Volume (m³)
Soft Plastics	180,41	7,82	1156,47
Hard Plastics	178,79	7,75	2483,19
Paper	173,72	7,53	762,24
Cardboard	164,72	7,14	1267,08
Glass	216,40	9,38	526,52
Metal	71,98	3,12	224,94
Food Waste	516,77	22,40	502,21
Garden	276,61	11,99	621,60
Textiles	98,05	4,25	335,79
Wood	15,00	0,65	96,15
Inert	12,69	0,55	11,97
Nappies	176,95	7,67	779,52
E-Waste	14,76	0,64	123,00
Hazardous	3,69	0,16	10,60
Rest	206,25	8,94	592,67
Total	**2307**	**100,00**	**9493,95**

Table 5.1: Assumed tonnages per waste type per month

When referring to Table 5.1 above, the recyclable portion (soft plastic, hard plastic, paper, cardboard, glass and metal) comprises of 43% of the total waste landfilled at PetroSA landfill site on a monthly basis. This amounts to a total of approximately 986,02 tons and 6420,44 m³ of recyclable materials that could potentially be diverted from landfill and could result in a significant transport and disposal cost saving.

It is assumed that approximately 516,77 tons (502,21m³) of food waste and 276,61 tons (621,60m³) of garden waste is being landfilled on a monthly basis.

It is alarming to note that approximately 14,76 tons of E-waste and 3,69 tons of Hazardous Waste is assumed to be disposed of on a monthly basis.

The remaining waste types (Textiles, Wood, Inert, Nappies and Rest) amounts to approximately 508,94 tons (1816,10m³) and is considered the portion that has no alternative than landfill.
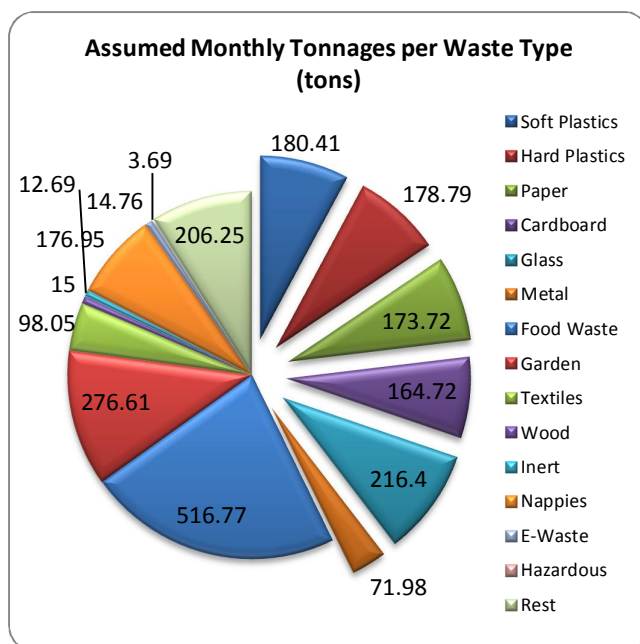
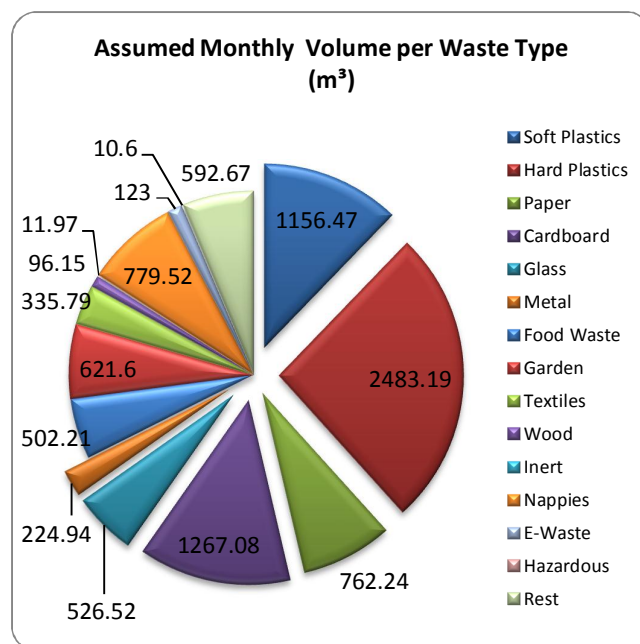**Figure 5.2: Pie Chart indicating assumed portion of recyclable materials in tons**

Figure 5.3: Pie chart indicating assumed portion of recyclable materials in m³

6. CHALLENGES

6.1 VENUE

The venue acquired by Mossel Bay Municipality for the study, the Law Enforcement Storage Facility located in Schoeman Street, did not have ablution facilities or running water. This proved challenging as the participants needed to walk vast distances to make use of ablution facilities and a water tank for the cleaning of basins, which was time consumptive.

6.2 DATA CAPTURING

The capturing of data from the raw data sheets to an electronic format (spreadsheets) was time consuming and may have resulted in possible human error. The data sheets were scrutinised on a number of occasions in order to ensure that human error was eliminated.

6.3 LACK OF SUPERVISION

The lack of supervision of the Youth Jobs in Waste participants resulted in longer lunch breaks and absenteeism.

6.4 INSUFFICIENT SAMPLING PLAN

The lack of a sufficient sampling plan resulted in a shortage of a representative sample. A sample size of 850 was determined in order to ensure a representative sample, however, only a total of 768 samples were collected. The sample size of 768 was deemed to be sufficient in order to represent an indication of waste generation trends.

7. RECOMMENDATIONS

7.1 As indicated in the results of the study, a large portion of recyclable material is being disposed of at landfill. It is therefore recommended that recycling initiatives be significantly intensified in Mossel Bay Municipality.

7.2 This report should be used as a guideline to prioritise waste minimisation initiatives per sub area. E.g. Composting initiatives should be implemented in areas where garden and food waste generation is prominent.

7.3 Waste generation is affected by seasonal variation and therefore it would be recommended that waste characterisation studies be conducted at three month intervals. However, due to personnel and financial constraints, it is acceptable to carry out a minimum of two surveys six months apart.

7.4 Categorise the waste into a bigger variety of waste types i.e. break up waste types more specifically e.g. Categorise plastics into different polymer groups.