

# A Practical Approach to Address the Lack of Municipal Waste Management Quantification Systems at Municipal Waste Management Facilities in the Western Cape

Dryden, C\*, Hoon A G, Hanekom E and Arendse GM

Department of Environmental Affairs and Development Planning (DEADP), Provincial Government of the Western Cape, Private Bag X9086, Cape Town, 8000, South Africa  
E-mail: [Chantal.Dryden@westerncape.gov.za](mailto:Chantal.Dryden@westerncape.gov.za)

## ABSTRACT

The National Waste Information Regulations came into effect on 1 January 2013 and requires municipalities to report on their waste generated, recovered, treated and disposed. Currently, only 7 out of 193 waste management facilities have weighbridges and most waste management facilities don't have continuous nor consistent record keeping. Municipalities are thus unable to plan properly for future waste management needs and landfill airspace in the Western Cape, is scarce. The Department of Environmental Affairs and Development Planning (DEADP) developed a Microsoft Excel-based Waste Calculator, to assist municipalities to record waste volumes. Most municipalities don't have gate controllers on site. Some gate controllers are not knowledgeable and waste volumes can thus result in data duplication and data inaccuracies, etc. This paper evaluates the consultative approach taken by DEADP to enable municipalities to collate accurate and reliable waste data to inform decision making at all 3 spheres of government.

**KEYWORDS:** Waste Management Facility, Waste Calculator, Gate Controller, Solid Waste Manager

## 1. INTRODUCTION

The DEADP, hereafter referred to as the "Department", developed the Monitoring and Evaluation (M&E) system in March 2009, in consultation with municipalities; however municipalities found it difficult to report to the agreed 52 indicators, related to waste management. After further consultation with municipal officials, the indicators were revised and reduced to 22 indicators to simplify the reporting requirements. Due to the inconsistencies and inaccurate waste data and the irregular reporting frequencies from municipalities through the M&E system, the Waste Calculator was developed by the Department. The main aim was to assist municipalities to record and quantify waste disposed at waste management facilities. This brought about a need to standardise the quantification and measuring unit in order to gather consistent data from various sources and make comparisons and improve analysis of the waste data. Most municipalities in the Province have no accurate and consistent baseline information and no proper record keeping mechanism in place. In addition, most municipalities do not prioritise the management of waste or the allocation of waste management staff to this function. This becomes evident at waste management facilities where access is not restricted and where there are no gate controllers monitoring the type and amount of waste that is disposed. The main focus of the Waste Calculator was to implement it at facilities with no weighbridges and where no data estimation methods were not in place.

## 2. LEGISLATIVE FRAMEWORK

The National Waste Information Regulations, 2012 (Gazette No. 35583) promulgated in terms of National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) requires waste holders to register and report. Section 3(2) of the regulations requires that "Any person who conducts an activity in a province that has a waste information system in terms of Section 62 of the Act and collects the minimum information required by these regulations must submit the information to the provincial waste information system". This implied that waste holders in the Western Cape must register and report to the Integrated Pollutant and Waste Information System (IPWIS). This further meant that any waste data submitted by and received from waste holders must be exported to the national waste information system, namely, the South African Waste Information System (SAWIS), in the required format and conforms to the minimum requirements of the national system. SAWIS required waste holders to report waste quantities in tonnages, whereas currently, most waste management facilities either quantify their waste in volumes or don't have estimation methods in place.

### 3. COLLECTING AND CAPTURING WASTE DATA

The Waste Calculator took into consideration the SAWIS requirements for waste reporting concerning the waste type and also included the waste densities relevant to a particular waste type, as indicated in the "Guideline on Implementing the South African Waste Information System" developed by the Department of Environmental Affairs and Tourism (DEAT), now referred to as the Department of Environmental Affairs (DEA). A draft Waste Calculator sheet was introduced and consultation sessions were held with municipal solid waste managers and their relevant waste management staff at the various municipalities in the province. Municipalities were trained on numerous occasions by the Department on the use of the Waste Calculator and a desktop shortcut was created for each Solid Waste Manager for easy access on their computers. It contained the facility name, the vehicle registration number, the truck capacity, the number of loads per vehicle, the waste type and waste density. An example of the Waste Calculator equation can be seen in Equation 1. The last column in the Waste Calculator was the estimated waste, which was a multiplication of the vehicle capacity, the number of loads and the waste density to equal and subsequently convert to an estimated waste tonnage. The waste was categorised into Domestic/Municipal Waste, Garden/Organic Waste and Commercial/ Industrial Waste. Each of these categories had waste types linked to it and each waste type had a different density that was used, which was dependant on the contents of each truck or vehicle entering the waste management facility.

Equation 1:

$$\text{Truck capacity (m}^3\text{) X Number of loads X Waste Density (kg/m}^3\text{)}$$

In addition, the Department developed a Microsoft Excel Waste Gate Controller sheet, which was used by gate controllers at the waste management facilities. Most municipalities did not have gate controllers employed at their waste management facilities and some of these gate controllers at the facilities, were not literate and also would not have access to the Waste Calculator sheet as this required a desktop PC with Microsoft Excel. The Gate Controller sheet was specifically developed to be used as a hardcopy register in order for the gate controllers to capture the waste data on a daily basis. The completed gate controller sheets must be submitted to the Solid Waste Manager on a daily and weekly basis for capturing and collation and thus feeds into the Waste Calculator. The waste data received from the gate controller must be quality assured by the Solid Waste Manager before capturing on the Waste Calculator to ensure consistency. The collection and capturing of waste data requires the gate controller and solid waste manager to be well trained and proficient to ensure that the estimates being generated are as accurate and consistent as possible. A Waste Calculator guideline manual was developed to assist solid waste managers with the Waste Calculator that was developed on a Microsoft Excel sheet. Certain functions of Microsoft Excel, such as formulas and data validation entries were used on the spreadsheet to easily select required waste densities and thereby automate the estimated waste data. This required the solid waste managers to insert minimum information on the spreadsheet. With the result, that when the Waste Calculator spreadsheet was either emailed or transferred from a portable memory hard drive to the municipal solid waste managers, some of the formulas and information relevant to the spreadsheet was lost due to the different Microsoft Excel versions. The manual was developed as a tutorial to provide a step by step illustration on how to recapture the formulas, in the event that the formulas and data validation entries were lost.

### 4. SUBMISSION OF WASTE DATA

Municipal managers and solid waste managers were requested via emails, formal correspondence and quarterly Western Cape Waste Management Officer's Forums to submit the Waste Calculator sheets on a monthly basis. These Waste Calculator sheets were either emailed or hand delivered in hard copy format to the Department. The submission of the reports would encourage a monthly norm of reporting waste data to the Department, parallel to the requirements for IPWIS waste reporting. The waste data received from the waste management facilities would enable municipalities to report in estimated tonnages on the waste category, being generated and disposed and subsequently captured by the solid waste manager into the IPWIS Reporting Module. Via IPWIS, the waste data received from the various municipalities would be imported to the SAWIS, in the correct and required format. An agreement was made between the Department and the municipalities to submit their waste data 14 days after the end of the reporting month. However, challenges were still encountered with the submission of data with certain municipalities submitting their Waste Calculator data at the end of a month, whereas other municipalities submitted waste data on an irregular basis. At times, batches of monthly waste data were submitted two or three months after a required period of reporting. In cases where no reports were received for a particular month, the Department contacted the Municipality via telephone and emails and requested the waste data.

5. RESULTS (PRO'S AND CON'S) OF SUBMITTED DATA

Only 54 waste management facilities submitted their Waste Calculator sheets during the 2013/14 financial period. The submission of 380 waste reports were received and therefore the submission of waste data was not consistent nor regular and therefore the waste data contained gaps due to various reasons such as no gate controllers on site, illiteracy, lack of understanding by gate controllers and inconsistency of recording waste streams, etc. The waste data was analysed and due to staff constraints the data was not verified at the time, however these graphs will depict the information as analysed by the Department.

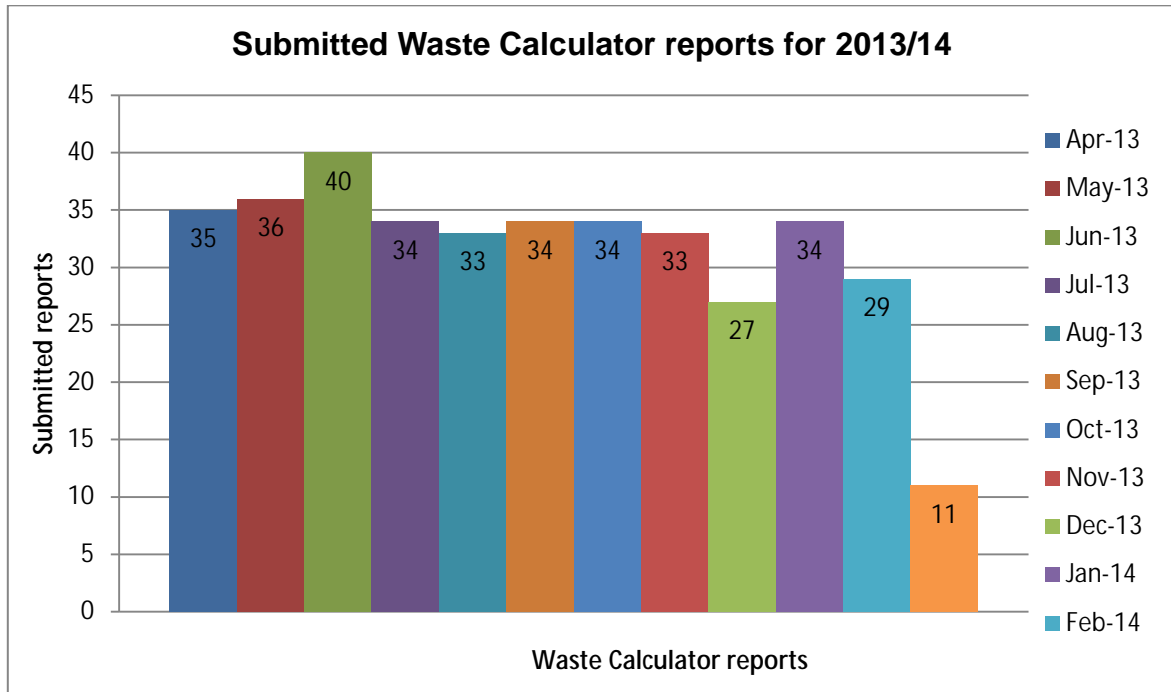


Figure 1a Total number of Waste Calculator sheets submitted during the financial year.

Figure 1a represents the Waste Calculator reports the Department received for a 12 month period, where the most reports submitted was in June 2013. Due to the inability of municipalities to employ waste gate controllers, this resulted in some municipalities not submitting Waste Calculator reports at all. It's vital that these reports are submitted on a monthly basis as the data will eventually be captured into the IPWIS Reporting Module by the solid waste manager per month. Figure 1b depicts the municipalities reporting to the Department during the 2013/14 reporting year.

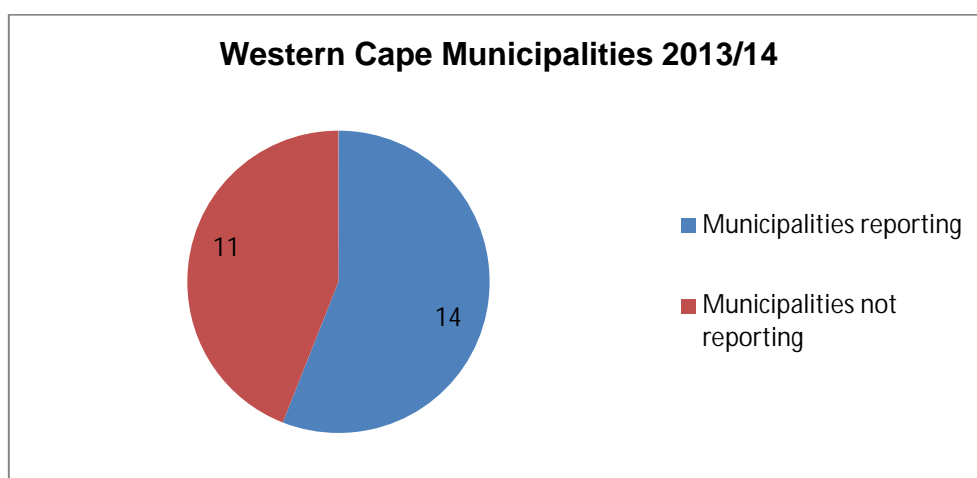


Figure 1b Number of Municipalities reporting and not reporting in 2013/14.

## 6. WASTE CALCULATOR REPORTS SUBMITTED PER MUNICIPAL DISTRICT

### CAPE WINELANDS DISTRICT MUNICIPALITY

All 5 municipalities within this District submitted their waste reports. Drakenstein Municipality submitted 27 reports in total for their 3 waste management facilities, namely Hermon, Saron and Gouda Drop-off facilities. Waste reports were not submitted for January, February and March 2014. Witzenberg Municipality submitted 7 Waste Calculator reports for their 2 facilities, namely Prince Alfred Hamlet builder rubble compost and Wolseley landfill facilities. The submission of these reports was irregular and thus inconsistent submission of these reports occurred.

Stellenbosch Municipalities submitted 3 reports for the Stellenbosch landfill facility. Breedevalley Municipality submitted 12 reports for the Worcester landfill facility. Langeberg Municipality submitted reports of the Ashton and Bonnievale landfill facilities, Robertson Compost facility, Montagu, Robertson and McGregor Transfer Stations. Only 9 waste reports were received for this financial year.

### OVERBERG MUNICIPALITY

In the Overberg District there are 4 municipalities. The Overstrand Municipality submitted 88 Waste Calculator reports for the Gansbaai Landfill, Hermanus and Kleinmond Transfer Stations, Bettys Bay, Hawston, Voelklip, Pearly Beach and Stanford Drop off' s facilities. Reports were submitted on a monthly basis with the exception that no report was received for March 2014.

Theewaterskloof Municipality submitted 36 waste reports for their facilities. These facilities included the Villiersdorp and Grabouw Transfer Stations, Riviersonderend, Caledon and Genadendal Landfills and the Botrivier Drop-off facilities. Waste reports were only received for a period of 6 months, thus irregular and inconsistent reporting occurred for this municipality.

The Cape Agulhas Municipality submitted waste reports for the Waenhuiskrans and Struisbaai Drops off facilities and the Napier and Bredasdorp Landfill sites. This municipality submitted 41 reports for the year.

### EDEN DISTRICT MUNICIPALITY

In this District, there are 7 municipalities. No reports were submitted by the municipalities in the Eden District, namely, George, Hessequa, Oudtshoorn, Knysna, Bitou and Mossel Bay Municipalities and therefore the Department has no waste baseline data for the waste management facilities in these municipalities.

### CENTRAL KAROO DISTRICT MUNICIPALITY

In this District, there are 3 municipalities, of which only 1 munc reported on their waste data. Prince Albert Municipality only has one waste management facility submitting waste collected and recorded on site. In total, only 3 waste reports for December 2013 and January and February 2014 were submitted.

### CITY OF CAPE TOWN

The City of Cape Town only submitted 21 reports for their 7 facilities. Waste Calculator reports were submitted for Athlone Transfer Station, Swartklip, Vissershok, Coastal Park landfills, Bellville Compost Plant and the Kraaifontein Integrated Waste Management Facilities for April, May and June 2013.

### WEST COAST DISTRICT MUNICIPALITY

In this District, there are 5 municipalities, of which only 3 municipalities submitted waste data. Swartland Municipality was the only municipality that submitted regular Waste Calculator reports to the Department for the 2013/2014 financial year. These reports collected and recorded waste data for Highlands Landfill, Moorreesburg, Riebeeck Wes, Riebeeck Kasteel, Yzerfontein and Darling Transfer Stations.

Cederberg Municipality submitted waste reports for all 4 landfill facilities, namely Lamberts Bay, Elands Bay, Clanwilliam and Citrusdal waste management facilities. Although all the waste management facilities reported, only 8 waste reports were submitted to the Department in January and February 2014.

Bergvrievier Municipality submitted reports for 5 waste management facilities, namely Porterville and Piketberg Landfill facilities, Veldrift and Piketberg Transfer Stations and the Aurora Drop-off facility. All 12 waste reports were received for the Porterville landfill site and Veldrift Transfer Station. Two waste reports were submitted for Langebaan Landfill for April and May 2013.

Table 1: Number of Waste Calculator sheets submitted by Municipalities in 2013/14

Submitted Waste Calculator reports for 2013/2014															
Municipality	Facility Name	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Total	Total/ Municipality
Swartland Municipality	Highlands Landfill	1	1	1	1	1	1	1	1	1	1	1	1	12	72
	Moorreesburg Transfer Station	1	1	1	1	1	1	1	1	1	1	1	1	12	
	Riebeeck Wes Transfer Station	1	1	1	1	1	1	1	1	1	1	1	1	12	
	Riebeeck Kasteel Transfer Station	1	1	1	1	1	1	1	1	1	1	1	1	12	
	Yzerfontein Transfer Station	1	1	1	1	1	1	1	1	1	1	1	1	12	
	Darling Transfer Station	1	1	1	1	1	1	1	1	1	1	1	1	12	
Witzenberg Municipality	Prince Alfred Hamlet Builders Rubble and Compost Facility	0	0	0	0	0	1	1	0	0	1	1	0	4	7
	Wolseley Landfill	1	1	0	1	0	0	0	0	0	0	0	0	3	
Stellenbosch Municipality	Stellenbosch Landfill	0	0	0	0	0	0	0	0	1	0	1	1	3	3
Drakenstein Municipality	Heron Drop off	1	1	1	1	1	1	1	1	1	0	0	0	9	27
	Saron Drop off	1	1	1	1	1	1	1	1	1	0	0	0	9	
	Gouda Drop off	1	1	1	1	1	1	1	1	1	0	0	0	9	
Breedevalley Municipality	Worcester Landfill	1	1	1	1	1	1	1	1	1	1	1	1	12	12
City of Cape Town	Athlone Transfer Station	1	1	1	0	0	0	0	0	0	0	0	0	3	21
	Swartklip Landfill	1	1	1	0	0	0	0	0	0	0	0	0	3	
	Vissershok Landfill	1	1	1	0	0	0	0	0	0	0	0	0	3	
	Coastal Park Landfill	1	1	1	0	0	0	0	0	0	0	0	0	3	
	Belville Compost Plant	1	1	1	0	0	0	0	0	0	0	0	0	3	
	Kraaifontein Integrated Waste Management Facility	1	1	1	0	0	0	0	0	0	0	0	0	3	
Overstrand Municipality	Belville Landfill	1	1	1	0	0	0	0	0	0	0	0	0	3	88
	Gansbaai Landfill	1	1	1	1	1	1	1	1	1	1	1	0	11	
	Hermanus Transfer Station	1	1	1	1	1	1	1	1	1	1	1	0	11	
	Kleinmond Transfer Station	1	1	1	1	1	1	1	1	1	1	1	0	11	
	Bettysbay Drop off	1	1	1	1	1	1	1	1	1	1	1	0	11	
	Hawston Drop off	1	1	1	1	1	1	1	1	1	1	1	0	11	
	Voelklip Drop off	1	1	1	1	1	1	1	1	1	1	1	0	11	
Pearly Beach Drop off	1	1	1	1	1	1	1	1	1	1	1	0	11		

	Stanford Drop off	1	1	1	1	1	1	1	1	1	1	1	0	11	
Theewaterskloof Municipality	Villiersdorp Transfer Station	0	0	0	1	1	1	1	1	0	1	0	0	6	36
	Riviersonderend Landfill	0	0	0	1	1	1	1	1	0	1	0	0	6	
	Grabouw Transfer Station	0	0	0	1	1	1	1	1	0	1	0	0	6	
	Genadendal Landfill	0	0	0	1	1	1	1	1	0	1	0	0	6	
	Caledon Landfill	0	0	0	1	1	1	1	1	0	1	0	0	6	
	Botrivier Drop off	0	0	0	1	1	1	1	1	0	1	0	0	6	
Cape Agulhas Municipality	Waenhuiskrans Drop off	0	1	1	1	1	1	1	1	1	1	1	0	10	41
	Breadasdorp Landfill	1	1	1	1	1	1	1	1	1	1	1	0	11	
	Struisbaai Drop off	0	1	1	1	1	1	1	1	1	1	1	0	10	
	Napier Landfill	0	1	1	1	1	1	1	1	1	1	1	0	10	
Langeberg Municipality	Ashton Landfill	1	0	1	0	0	0	0	0	0	0	0	0	2	9
	Robertson Compost Facility	0	0	1	0	0	0	0	0	0	0	0	0	1	
	Robertson Transfer Station	1	0	1	0	0	0	0	0	0	0	0	0	2	
	Montagu Transfer Station	0	0	1	0	0	0	0	0	0	0	0	0	1	
	Bonnievale Landfill	1	0	1	0	0	0	0	0	0	0	0	0	2	
	McGregor Transfer Station	0	0	1	0	0	0	0	0	0	0	0	0	1	
Bergrivier Municipality	Porterville Landfill	1	1	1	1	1	1	1	1	1	1	1	1	12	51
	Veldrift Transfer Station	1	1	1	1	1	1	1	1	1	1	1	1	12	
	Aurora Drop off	0	1	1	1	1	1	1	1	1	1	1	1	11	
	Piketberg Transfer Station	1	1	1	1	1	1	1	1	0	0	0	0	8	
	Piketberg Landfill	1	1	1	1	1	1	1	1	0	0	0	0	8	
Cederberg Municipality	Lamberts Bay Landfill	0	0	0	0	0	0	0	0	0	1	1	0	2	8
	Elandsbay Landfill	0	0	0	0	0	0	0	0	0	1	1	0	2	
	Clanwilliam Landfill	0	0	0	0	0	0	0	0	0	1	1	0	2	
	Citrusdal Landfill	0	0	0	0	0	0	0	0	0	1	1	0	2	
Prince Albert Municipality	Prince Albert Landfill	0	0	0	0	0	0	0	0	1	1	1	0	3	3
Saldanhabay Municipality	Langebaan Landfill	1	1	0	0	0	0	0	0	0	0	0	0	2	2

7. AN ANALYSIS OF DATA SUBMITTED BY THE CAPE AGULHAS MUNICIPALITY

Cape Agulhas Municipality is used as an example to show the analysis of data given that they submitted the most consistent Waste Calculator reports. Domestic or Municipal waste at the Napier landfill, as depicted in Figure.2, amounted to 1146.13 tons, while construction and organic waste amounts to 229.71 and 464.61 tons respectively. No waste reports were submitted for this waste management facility for April 2013. Majority of the waste stream consists of domestic/municipal waste, which fluctuates during holiday seasons. The average tonnage of domestic/municipal waste amounted to 95.51 tons per month. The average tonnage for garden/organic waste amounted to 38.72 tons per month. Landfill airspace can be saved if the garden/organic is diverted and chipped, used for composting or mulch. The disposal of construction waste amounts to 19.14 tons per month and is a fifth of the general waste disposed of at the facility.

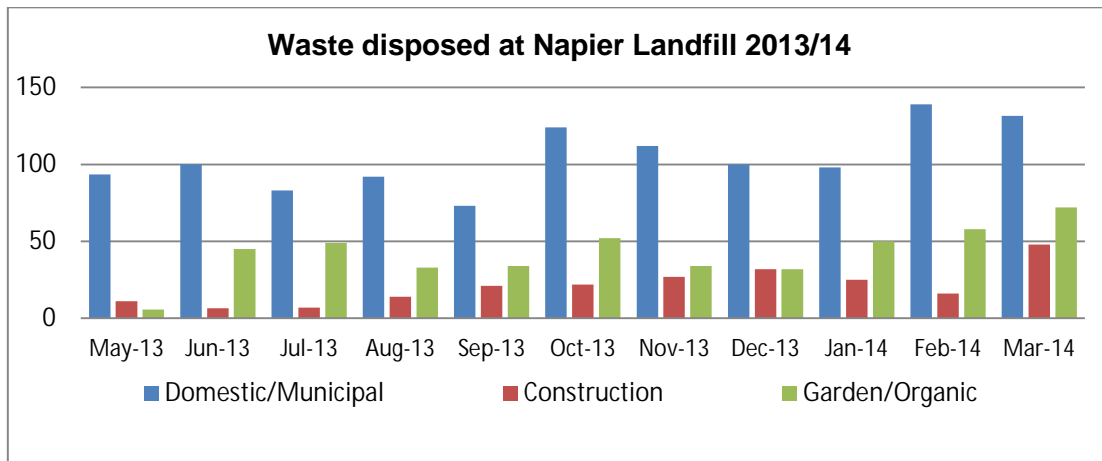


Figure 2 Waste reports submitted for Napier Landfill facility.

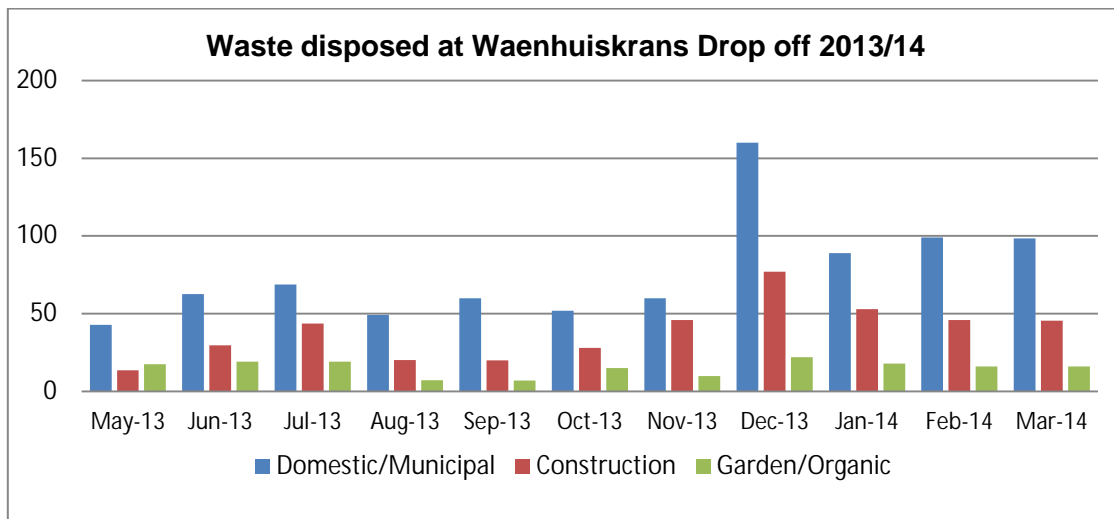


Figure 3 Waste reports submitted for Waenhuiskrans Drop-off facility

December 2013 experience a peak in the municipal, construction and garden waste collected and recorded at this facility. Domestic waste estimated to 842.02 tons, construction waste amounted to 422.78 and garden waste amounted to 267.2 tons of waste. See Figure. 3. The Waenhuiskrans is a holiday destination and thus the general waste at the facility peaks in the month of December for due to holiday makers. The garden/organic waste was 13.93 tons per month and thus minimal, whereas construction waste due to housing or property development in the area consists of 35.23 tons per month.

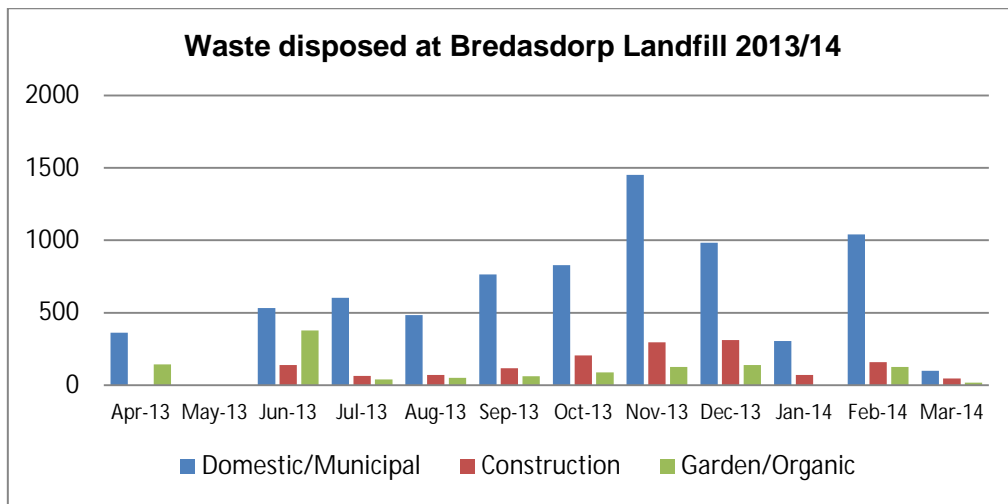


Figure 4 Waste reports submitted for Bredasdorp Landfill.

Domestic or Municipal waste at the Bredasdorp landfill facility amounted to 7449 tons of waste and peaked for November 2013. Construction and garden waste amounted to 1475 and 1165 tons respectively. No commercial waste was disposed of during the 12 month period. Majority of the waste stream is made up of domestic/municipal waste which amounts to 620.72 tons per month. This can be due to the many tourists visiting the area, either staying or passing through to get to other scenic areas. See Figure.4.

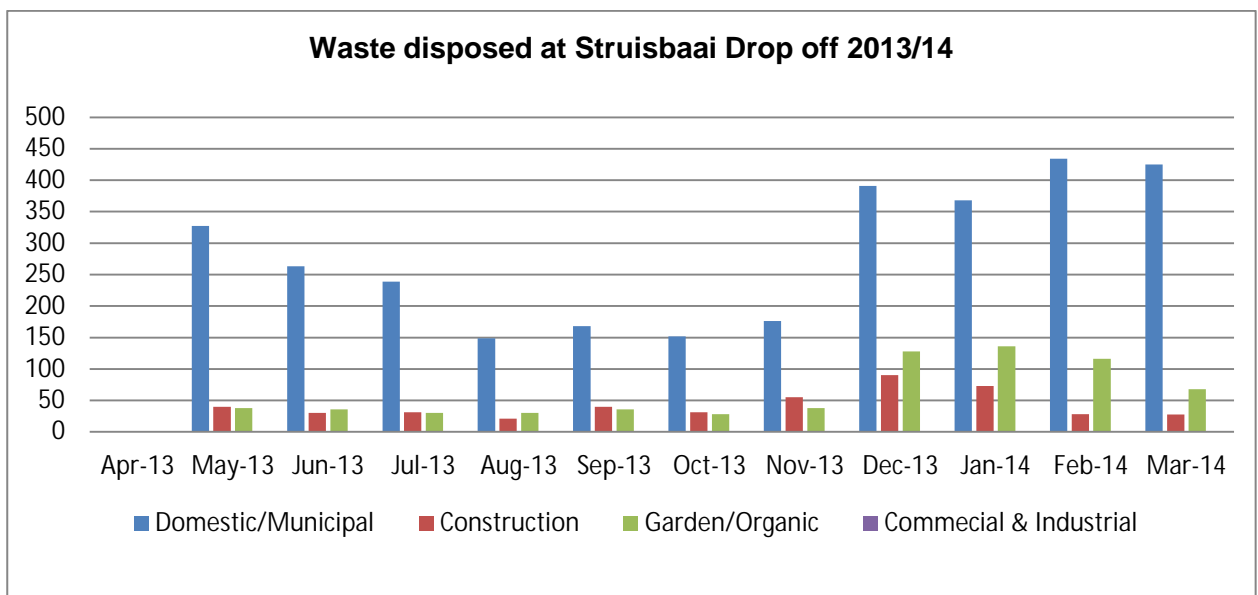


Figure 5 Waste reports submitted for Struisbaai Drop off

Domestic or Municipal waste at the Struisbaai Drop-off facility amounted to 3091.76 tons of waste and peaked from December 2013 through till March 2014. Construction and Garden waste amounted to 466.75 and 684.03 tons respectively. No commercial waste was disposed of during the 12 month period. Majority of the waste stream is made up of domestic/municipal waste which amounts to 257.65 tons per month. Struisbaai is also a tourist destination and is frequented by various foreign and local visitors. The graph indicates a peak during the holiday months, with a decline off season period. See Figure.5.

8. DISCUSSION

Some reports submitted by the municipalities emphasized points of concern or issues that can be addressed to ensure that waste data recorded at the waste management facilities is more accurately estimated, consistent and thus beneficial to municipalities to implement measure to deal with the waste during seasonal periods and attention can be focused to address the waste related concerns.



- Facilities with weighbridges

Waste Management facilities that have weighbridges are in a better position to report on actual waste quantities and waste types being disposed at waste management facilities. A comparison could be made with submitted data received from the municipalities initiating an exercise with waste management facilities that have weighbridges; where municipal trucks and vehicles disposing of waste at the waste management facilities would normally use the weighbridge at the facility and a gate controller would use the Waste Calculator sheet to record the estimated quantity of waste being disposed. These 2 data quantification methods can be compared to calculate the variance or accuracy of waste type densities and data that is prescribed to estimate waste tonnages.

- Facilities with gate controllers

Waste Management facilities require gate controllers at the facility to monitor and record the vehicle capacity and number of loads, as well as the waste type being disposed. These gate controllers need to be trained by the Department and/or municipalities on the use of the gate controller sheet to ensure consensus of data when completing the required sheets. Gate controllers who have not been trained in the use of the sheet could contribute to recording inconsistencies, which could result in inaccurate data being submitted to the solid waste manager, for collation. Gate Controllers play a vital role in ensuring that waste data at facilities is recorded in the proper manner to ensure that the waste data collected at facilities can be useful to municipalities. However, a weighbridge at a waste management facility will ensure that reliable data is available to improve overall decision making.

- Facilities submitting duplicated data

It is important to ensure that the data collected and recorded by the gate controllers at waste management facilities is accurate and consistent with the actual generation and potential diversion of waste in the local area. In certain instances, submitted Waste Calculator sheets displayed waste quantities that exactly matched the previous month's waste data that was submitted to the Department.

- Effectiveness of the Waste Calculator to provide estimated waste data

The effectiveness of the Waste Calculator can be valuable to municipalities where there are neither weighbridges nor mechanisms for waste quantification systems in place. Gate controllers can be employed or sourced through the EPWP programme and training could be provided to these individuals to collect, collate and record waste data at the facilities. If the Waste Calculator is used optimally and the correct waste data is recorded by the gate controllers and Solid Waste Manager, an estimated quantity of waste tonnages can be accurately calculated. The Waste Calculator can be customised to the current vehicle capacity at a particular municipality to ensure less data input on site by the gate controllers.

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