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# STELLENBOSCH MUNICIPALITY ORGANIC WASTE DIVERSION PLAN

**NOVEMBER 2021**

**FINAL**

STELLENBOSCH
STELLENBOSCH • PNIEL • FRANSCHHOEK
MUNISIPALITEIT • UMASIPALA • MUNICIPALITY


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**SYNOPSIS**

The project entails the development of an organic waste diversion plan for the Stellenbosch Municipality

**KEY WORDS:**

Waste characterisation, Stellenbosch Municipality, Organic Waste, diversion.



**QUALITY VERIFICATION**

This report has been prepared under the controls established by a quality management system that meets the requirements of ISO 9001: 2015 which has been independently certified by DEKRA Certification.

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## ABBREVIATIONS & DEFINITIONS

| | |
|---|---|
| **AD** | Anaerobic Digestion |
| **AISWM** | Advanced Integrated Solid Waste Management |
| **CBD** | Central Business District |
| **CCT** | City of Cape Town |
| **DALRRD** | Department of Agriculture, Land Reform and Rural Development |
| **DEA&DP** | Department of Environmental Affairs and Development Planning |
| **DFFE** | Department of Forestry, Fisheries and the Environment |
| **EA** | Environmental Authorisation |
| **EPR** | Extended Producer Responsibility |
| **EPWP** | Expanded Public Works Programme |
| **GHG** | Greenhouse Gas |
| **GN** | Government Notice |
| **IVC** | In-vessel composting |
| **ISWM** | Integrated Solid Waste Management |
| **IWMP** | Integrated Waste Management Plan |
| **LFG** | Landfill Gas |
| **MBT** | Mechanical Biological Treatment |
| **MRF** | Materials Recovery Facility |
| **MSA** | Municipal Systems Act |
| **MSW** | Municipal Solid Waste |
| **NEMA** | National Environmental Management Act (No. 107 of 1998) |
| **NEMWA** | National Environmental Management: Waste Act (No. 59 of 2008) |
| **NOWCS** | National Organic Waste Composting Strategy |
| **NWMS** | National Waste Management Strategy |
| **ORASA** | Organic Recycling Association of South Africa |
| **ORTS** | Organic Refuse Transfer Station |
| **OWDP** | Organic Waste Diversion Plan |
| **OZCF** | Oranjezicht City Farm |
| **RFQ** | Request for Quotation |
| **RTS** | Refuse Transfer Station |
| **SAWIS** | South African Waste Information System |
| **SDG** | Sustainable Development Goals |
| **SM** | Stellenbosch Municipality |
| **SU** | Stellenbosch University |
| **UK** | United Kingdom |
| **UN** | United Nations |
| **WAAI** | Wellington Association Against the Incinerator |
| **WDF** | Waste Disposal Facility |
| **WFD** | Waste Framework Directive |
| **WM** | Witzenberg Municipality |
| **WMO** | Waste Management Officer |
| **ZTL** | Zero To Landfill |

## 1 INTRODUCTION AND BACKGROUND

JG Afrika were appointed to compile an Organic Waste Diversion Plan (OWDP) for the Stellenbosch Municipality (SM).

Organic waste currently makes up approximately 30% of the waste stream in the Western Cape and should be regarded as a resource that has intrinsic economic value if separated properly and used either for compost, nutrient extraction or as an energy source. In addition, diverting organic waste from landfills will save landfill airspace and reduce the greenhouse gas emissions from landfills.

The Department of Environmental Affairs and Development Planning (DEA&DP) took a policy decision to implement a 50% restriction on organic waste being disposed to landfill by 2022 and a full prohibition of organic waste disposed to landfill by 2027. The Western Cape Integrated Waste Management Plan (IWMP) (2017- 2022) puts an obligation on municipalities to divert 50% of organic waste streams away from landfill sites by 2022 and a complete ban on organic waste disposed at landfill sites by 2027.

DEA&DP subsequently amended the conditions of authorisations (Permits/Licences) for Waste Disposal Facilities (WDFs) in the Western Cape during 2017/2018 to insert up to date conditions in all licences for all waste facilities that receive waste for disposal. This condition requires a 50% reduction in the amount of organic waste that is disposed of to WDFs by 2022, followed by a complete ban of organics to WDFs by the year 2027.

DEA&DP required an OWDP to have been submitted by SM by 12 December 2018, and annually thereafter for the Devon Valley WDF in SM.

The Department extended the submission date to 31 March 2021, as requested by SM. JG Afrika were appointed in April 2021. The Department included the requirement that budget must be made available within the 2021 financial year to implement the OWDP, to accomplish the **50% diversion goal by 2022.**

DEA&DP state that the information within the OWDP is required to provide a status quo of current organic waste sources, and volumes disposed of and current rates and procedures for the diversion of organic waste from landfill. The OWDP is also required to set annual targets and identify procedures from 2018 that will be implemented to meet these targets for the diversion of organic waste from municipal WDF, to reach a 50% diversion by the year 2022, and 100% diversion of organic waste by 2027. Please see **Annexure A** for an extract of the organic waste diversion requirement in the Devon Valley WDF licence and letter addressed to SM, as well as the extension letter from DEA&DP.

## 2 WHAT IS ORGANIC WASTE?

Organic Waste is generally defined as garden waste/greens, food waste and wood waste.

The SM By-law relating to Integrated Waste Management provides the following definition for garden waste:

- organic waste, including but not limited to, soil, grass cuttings, leaves and branches; and
- any biodegradable material, which emanates from gardening, landscaping, or other types of activities at residential, business, or industrial properties; but
- excludes waste products of animal origin.

The Norms and Standards for Organic Waste Composting provide the following definitions:

- *Organic waste*: means waste of biological origin which can be broken down, in a reasonable amount of time, into its base compounds by micro-organisms and other living things.
- *Organics*: means both processed and unprocessed compostable organic waste.

National Environmental Management: Waste Act (Act No. 59 of 2008) (NEMWA): GNR 625, National Waste Information Regulations provide waste categories in order to regulate the collection and reporting of waste data and information to the South African Waste Information System (SAWIS).

The following table provides the categories/types of organic waste that should be reported to the SAWIS, under General Waste (Level 1).

| Level 1 –General Waste | | | |
|---|---|---|---|
| Level 2 - Major Waste Type | | Level 3 – Specific Waste Type | |
| GW20 | Organic waste | 01 | Garden waste |
| | | 02 | Food waste |

*Note that amendments to the National Waste Information Regulations have been proposed which include 03 – Wood Waste under Organic waste, however, these changes have not been promulgated*.

For the purpose of this Plan, "*organic waste*" is regarded as waste which is produced by all waste generators served by municipal collection services for general municipal waste. The main categories of organic waste would include:

- **Food waste:** mix of cooked and raw leftovers after the preparation and consumption of human food originating from households/residential areas as well as from commercial activities, such as restaurants, canteens, bars, etc.
- **Greens or garden waste:** waste coming from maintaining private residential areas/gardens (households) as well as from Municipal public areas, such as parks, playgrounds, verges etc.
- **Industrial waste:** the mixture of different types of residues of raw vegetables/food waste and woody materials such as packaging. This can include organic waste streams from agro-industries, such as food and animal feed processing or the processing of agricultural products for other purposes.

## 3 MOTIVATION FOR ORGANIC WASTE DIVERSION

The benefits of organic waste diversion are discussed in detail as part of the Literature Review, however the following are the overarching benefits of diverting organic waste from landfill:

- Reduced cost of landfill disposal.
- Landfill air space savings.
- Reduction in greenhouse gas emissions.
- Reduced possibility of environmental pollution from landfill management i.e., leachate generation and improved air quality impacts.
- Long term/future avoided costs and savings as a result of saved landfill airspace.
- Positive impact as a result of recovering a valuable resource (organics) and processing these to produce beneficial soil amendments (i.e., compost) or used for electricity generation (i.e., biogas)
- Practical application of a circular economy strategy to waste management which keeps organic materials in circulation at their highest value.

## 4 STATUS QUO

The status quo of organic waste management systems and related infrastructure in SM is presented in this section. It should be noted that this information focuses specifically on organic waste and aims to supplement the more general and overarching Status Quo information provided in the SM IWMP.

## 4.1 Brief overview of waste management services and infrastructure

The SM IWMP, dated September 2020, was reviewed, and used to obtain the following summary information and overview of waste management infrastructure.

SM operate one landfill site in Devon Valley, however, since August 2019 the Municipality have made use of the Vissershok Private Landfill (Vissershok Waste Management Facility (Pty) Ltd) in the City of Cape Town (CCT) which is operated by Enviroserv and Averda, as Devon Valley has reached capacity and while approval for a new cell is underway.

General waste from the Stellenbosch municipal area is therefore transported to the Klapmuts Refuse Transfer Station (RTS), where it is transferred into skips and taken to Vissershok by truck.

SM provides approximately 38 500 households with solid waste management services as follows:

- 28 751 collection points spread across the 22 wards of the Municipality.
- This is approximately 20 000 wheelie bins and 4 000 standard refuse bags as of 2019.
- The Municipality utilises 11 refuse collection trucks, operated by more than 60 crew members in a 30-hour working week.
- 100% of urban households receive kerb side collection once per week.
- All the urban and informal areas of SM have access to at least a basic refuse removal service.
- Some refuse removal services exist in the rural areas and farming communities.
- All rural areas have access to drop-off facilities.

The Municipality provides a two-bag collection system in middle to high income areas where black bags and clear bags (containing recyclables) are collected once a week. Households are required to separate and sort waste at source into two streams, namely general landfill waste (black bags) and recyclable waste (clear bags). The recyclables were previously transported to a mini materials recovery facility (MRF) situated adjacent to the Devon Valley landfill site, however from August 2019 to 31 March 2021, these were taken directly to the Kraaifontein MRF in the CCT for sorting.

The following areas are currently included in the two-bag collection programme:

- Uniepark, Karindal, Aanhou Wen, Rozendal
- Mostertsdrift
- Simonswyk
- Universiteits Oord
- Technopark
- Die Boord, Fairways, Die Wingerd, Harringtons Place
- Paradyskloof, Schuilplaats, Lieberheim, Anesta, Eden, La Pastorale
- Brandwacht
- Dalsig, Bo-Dalsig
- Krigeville
- Onder Papegaaiberg, Devon Vallei, Devon Park, Kleinvallei
- La Colline/Die Rand
- Die Laan
- Dorp/Stasie street
- Franschhoek
- Idas Valley, Lindida, Arbeidslus
- Raithby
- Agape Retirement Village
- Blaauwklippen Road
- Jamestown
- Cloetesville
- Brandwacht-aan-rivier
- Parmalat
- Jonkershoek
- Welgevonden

The recently constructed MRF adjacent to the landfill started operations on 1 April 2021. Clear bags collected in the Municipality are taken to this new facility for sorting and recycling. The MRF has the capacity to process 450 tons of incoming material per month and can employ up to 40 people.[1] Currently 19 people are employed at the MRF and 8 people are collecting recyclables. The Municipality plans to expand the separation at source programme to include more households in the initiative. Recyclable material that is

[1] https://stellenbosch.gov.za/2021/03/25/stellenbosch-launches-new-waste-material-recovery-facility/

accepted includes paper, newspapers, magazines, cardboard, glass, plastic bottles and containers, food tins, cooldrink tins, juice boxes and milk containers.

The Municipality also opened a public drop-off, located at the MRF in April 2021. Residents may bring clean recyclable materials to the facility during operating hours and are also allowed to bring garage waste for free disposal in vehicles with a maximum carry capacity of 1.5 tons. This is to allow residents to dispose of their waste responsibly.

The Municipality currently diverts organic waste from landfill by means of chipping and composting garden waste that is received at the landfill site. Garden waste is dropped off by residents and businesses at the landfill. This has continued on site despite the closure of the landfill site. Chipping takes place at the landfill site under a private contract (tender), that will end on 30 June 2022, at the Devon Valley Landfill Site. Franschhoek residents may drop their garden waste off at the Franschhoek drop off facility, and Klapmuts residents at the Klapmuts RTS.

SM does not currently have a dedicated garden waste collection service, or collection drop-off points, only the drop off facilities. SM has however implemented a tariff for green waste collection, which commenced in July 2021.

The SM currently only has one fully operational licensed RTS at Klapmuts with one mini public drop off located in Franschhoek. The IWMP states that the Klapmuts drop-off does not require licensing due to its size/thresholds and therefore falls under the Norms and Standards. The Klapmuts RTS is currently operating at full capacity, however this is only since the closure of the Devon Valley landfill site.

The IWMP states that there is a need for the development of a larger transfer station in the Franschhoek area. The SM recently underwent a Section 78(3) process as required by the Municipal Systems Act (MSA) in order for the Municipality to outsource municipal waste management functions to private parties. The process has been approved by Council and the approval allows for all municipal waste management services to be outsourced to private companies, with the exception of waste collection, transportation as well as fleet and storage management, which will stay a Municipal function.

The Municipality is planning the construction of an organic waste RTS (ORTS) at the Devon Valley MRF to collect and divert pre and mixed organic waste. The Basic Assessment process has been completed and an Environmental Authorisation (EA) was issued on 28 April 2021. Construction is expected to commence in the 2022/23 Financial Year.

The ORTS is expected to consist of a facility building of approximately 1 200m² in area with the capacity to store one day's waste and will comprise of:

- a container handling/skip handling area;
- a tipping hall/drop-off area and area for future conveyer/compaction loading hall and system;
- ablution facilities;
- mess/kitchen facilities;
- site offices;
- pure-organic waste storage and transfer station;
- organic mixed waste storage and transfer station; and
- space for an additional transfer bay.

The SM are currently undertaking a Landfill Gas (LFG) Feasibility Study for Devon Valley LFS to understand the amount of gas being generated and if investment into the capture of the gas is feasible, this is expected to be completed by the end of 2021.

## 4.2 Current Organic Waste Diversion practices

### *4.2.1 Green waste chipping*

Green (garden) waste is accepted at the Devon Valley Landfill Site under a contract with Landfill Consult. Green waste is chipped on site and taken to a licensed composting facility by Landfill Consult. The municipality keeps a record of the incoming volumes of green waste, as well as chipped material leaving the site.

### *4.2.2 Stellenbosch Municipality home composting trial*

Stellenbosch Municipality has a tender in place since 1 July 2021 for the procurement of household compost bins for a home composting trial. The home composting bins will be provided to selected residents in Franschhoek, where the volume and weight of the waste / compost generated by each trial participant will be monitored by the SM.

### *4.2.3 Organic waste management at Stellenbosch University*

Stellenbosch University (SU) has implemented a campus-wide three-bin system aimed at separating organic, recyclable and non-recyclable waste.

Garden waste from the University is taken to a composting facility run by a service provider on land owned by SU. The windrows at the facility are turned monthly and compost takes 3-4 months to be ready.

Food waste from kitchens and cafeterias is disposed of in waste food containers/bins and is collected in the food containers. This is collected by SU's waste service provider as part of their contract and was being taken to a waste-to-nutrient plant located in Philippi, Cape Town.

The University was also trialling a Bio-bin (forced aeration in-vessel composting pre-treatment process) on campus prior to the Covid-19 Pandemic.

The University is also considering either of the following for food/organic waste generated on campus:

1. Food waste, including compostable packaging to be taken to a compost facility for composting.
2. The SU waste service provider to transport organic waste generated at the University to an Anaerobic Digester (AD) facility located in Elgin.

In addition to the three-bin system, the SU has implemented a strategy to complement their organic waste strategy and ensure that packaging sold and used on campus that is associated with food served or sold is compostable.

## 4.3 Stellenbosch Municipality's Waste Characterisation Studies

SM conducted waste characterization studies in 2012 and 2017 to determine the composition of waste being disposed of to landfill within the Municipal area.

The consolidated data provides an overall broad characterisation of the waste sampled (by weight) for all the areas sampled within SM and is presented in **Figure 1**. The following should be noted with regards to the categories illustrated:

- Packaging/Recycling is a broad category where data has been combined to include glass, metal, plastic, paper and board, Tetrapak and multilayer.
- Organic waste and garden waste have been kept as separate items.
- Household Hazardous Waste (HHW) included batteries, fluorescent bulbs, cleaning chemicals, medical waste, nappies and sanitary products.

The report indicated that by diverting recyclables, i.e. plastic, paper and cardboard, glass and metal waste streams along with organic and garden waste, waste being disposed of to landfill can be drastically reduced by at least 50% and potentially up to 80% in certain areas. However, this would depend on the level of contamination and quality of recyclables and would probably require the implementation of a three-bag system for separation at household level of recyclable, non-recyclable and organic waste. Certain areas could also be provided with a targeted garden waste collection system.

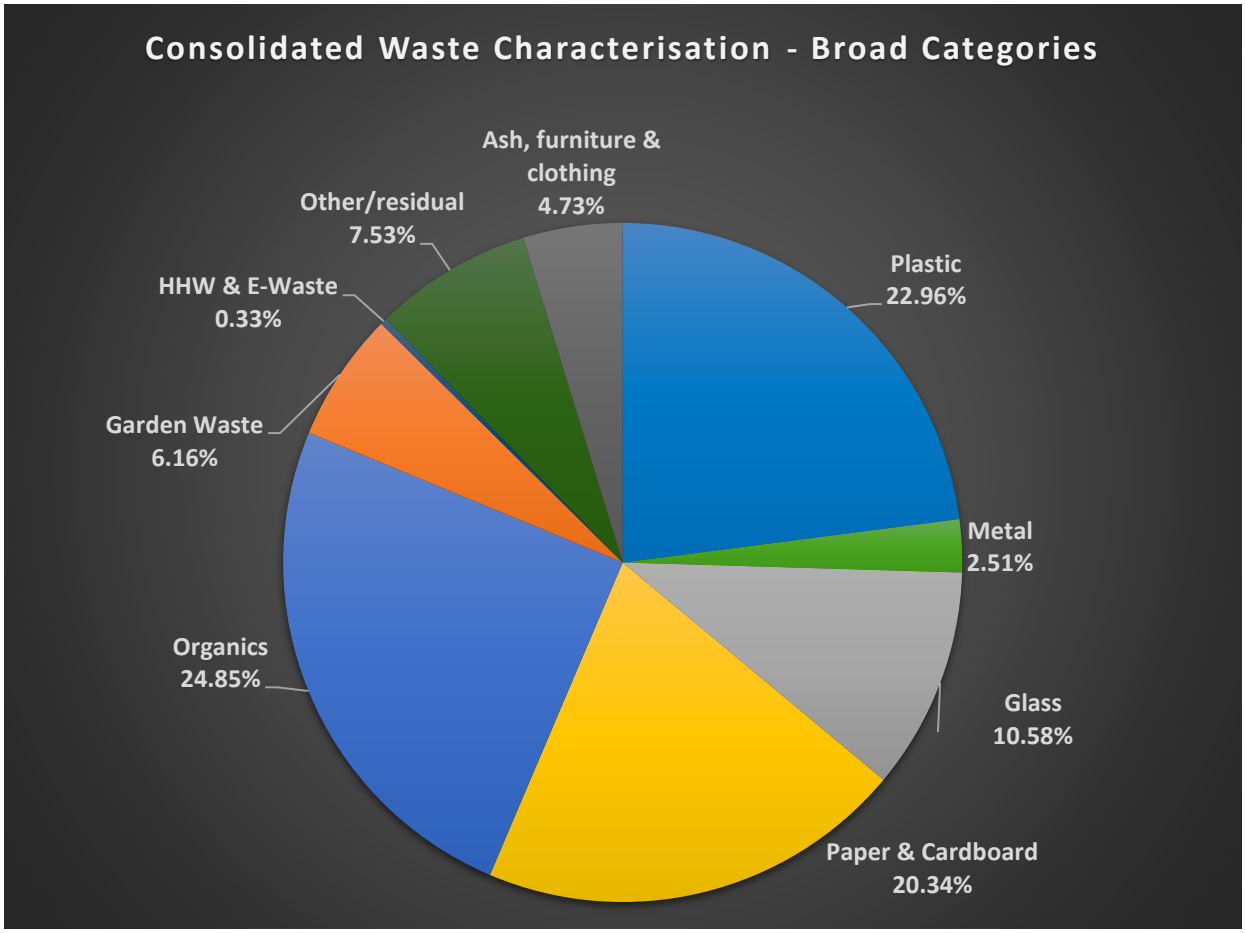



*Figure 1: Consolidated Waste Characterisation Data showing the categories for all areas*

**Figure 2** provides broader categories which have been consolidated as follows, with the aim of providing a simpler visual comparison of the diversion potential per area:

- **Recyclable** (glass, metal, plastic, paper & cardboard);
- **Organic** (household organic & garden waste); and
- **Non-recyclable** (residual, other and HHW).

The orange section of the bar chart indicates the non-recyclable component of waste which cannot readily be diverted from landfill. This data has also been presented in tabulated format in **Table 1**. This has not been compared to income level due to the wide range of income levels per area.

*Table 1: Waste Characterisation Data consolidated into recyclable, organic and non-recyclable streams*

| Area Name | Ward No | Recyclable %[2] | Organic %[3] | Non-recyclable % [4] |
|---|---|---|---|---|
| Franschhoek (incl Groendal) | 1 | 58.5 | 31.6 | 9.9 |
| Langrug | 2 | 46.2 | 2.2 | 51.6 |
| Wemmershoek and La Motte | 3 | 60.2 | 22.5 | 17.2 |
| Kylemore and Farms | 4 | 54.4 | 31.3 | 14.3 |
| Pniel | 4 | 56.6 | 31.5 | 11.9 |
| Idas Valley | 5 | 56.6 | 31.6 | 11.7 |
| Jonkershoek | 5 | 69.3 | 17.3 | 13.4 |
| Uniepark and Mostertsdrift | 7 | 59.5 | 32.9 | 7.6 |
| Simonswyk | 7 | 43.6 | 47.1 | 9.2 |
| Uniepark | 7 | 37.8 | 55.1 | 7.2 |
| Mostertsdrift | 7 | 46.7 | 41.4 | 11.9 |
| Noordwal and Die Laan | 8 | 58.6 | 35.5 | 5.9 |
| Stellenbosch CBD | 9 | 60.5 | 26.6 | 12.9 |
| La Colline | 10 | 57.2 | 34.8 | 8.0 |
| Onder Papegaaiberg | 11 | 66.6 | 22.2 | 11.2 |
| Devon Valley | 11 | 75.8 | 18.7 | 5.5 |
| Plankenbrug | 12 | 63.9 | 23.0 | 13.0 |
| Kayamandi | 12, 13, 14, 15 | 52.7 | 32.0 | 15.3 |
| Cloetesville Industrial | 16 | 52.7 | 35.4 | 12.0 |
| Cloetesville | 16 | 51.9 | 34.5 | 13.6 |
| Welgevonden | 17 | 62.9 | 27.1 | 10.0 |
| Klapmuts | 18 | 55.9 | 19.6 | 24.4 |
| Koelenhof | 19 | 57.7 | 32.7 | 9.6 |
| Raithby | 20 | 60.1 | 25.3 | 14.6 |
| Technopark | 21 | 64.9 | 33.8 | 1.2 |
| Paradyskloof | 21 | 50.1 | 37.1 | 12.8 |
| Jamestown | 21 | 56.7 | 36.2 | 7.1 |
| Die Boord | 22 | 52.0 | 40.3 | 7.7 |
| Brandwacht | 22 | 46.9 | 46.6 | 6.5 |

What is notable is that the ward of Langrug appears to generate a much lower percentage of organic waste compared to other wards and areas of similar demographics. One of the factors that may account for this is that Langrug has been part of the Genius of Space project, which has focussed on sustainability in the area amongst other issues.

[2] glass, metal, plastic, paper & cardboard
[3] household organic & garden waste
[4] residual, other & HHW

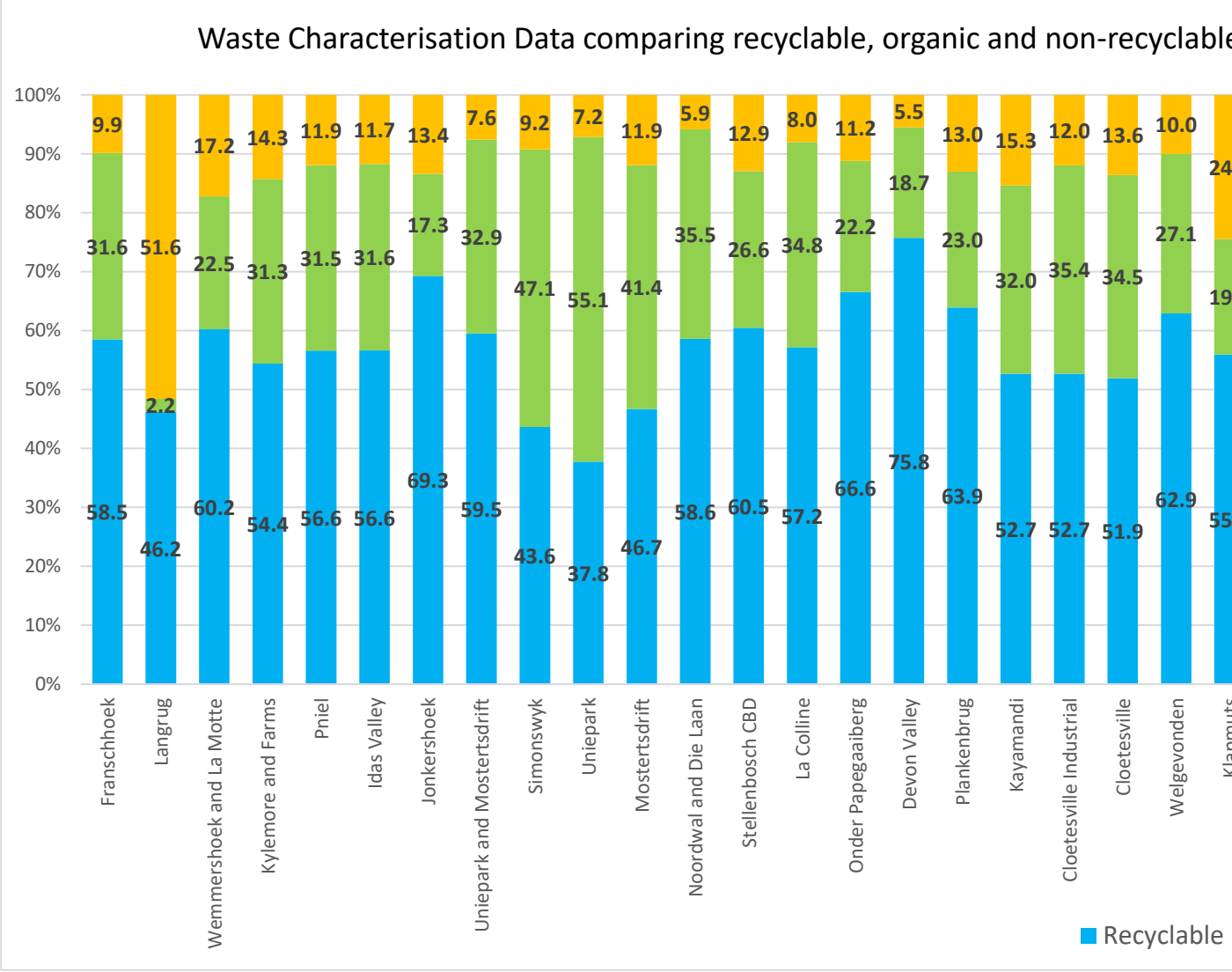



*Figure 2: Waste Characterisation Data with data consolidated into recyclable, organic and non-recyclable waste streams*

**Table 1 Table 1**. The recyclable and non-recyclable waste fractions are combined and represented as 'Other' on the map. **Figure 3** illustrates that the largest proportions of the organic waste within SM are generated in Central Stellenbosch, Kylemore and Pniel, Franschhoek and Koelenhof, while the organic waste fraction generated in Langrug is the least.

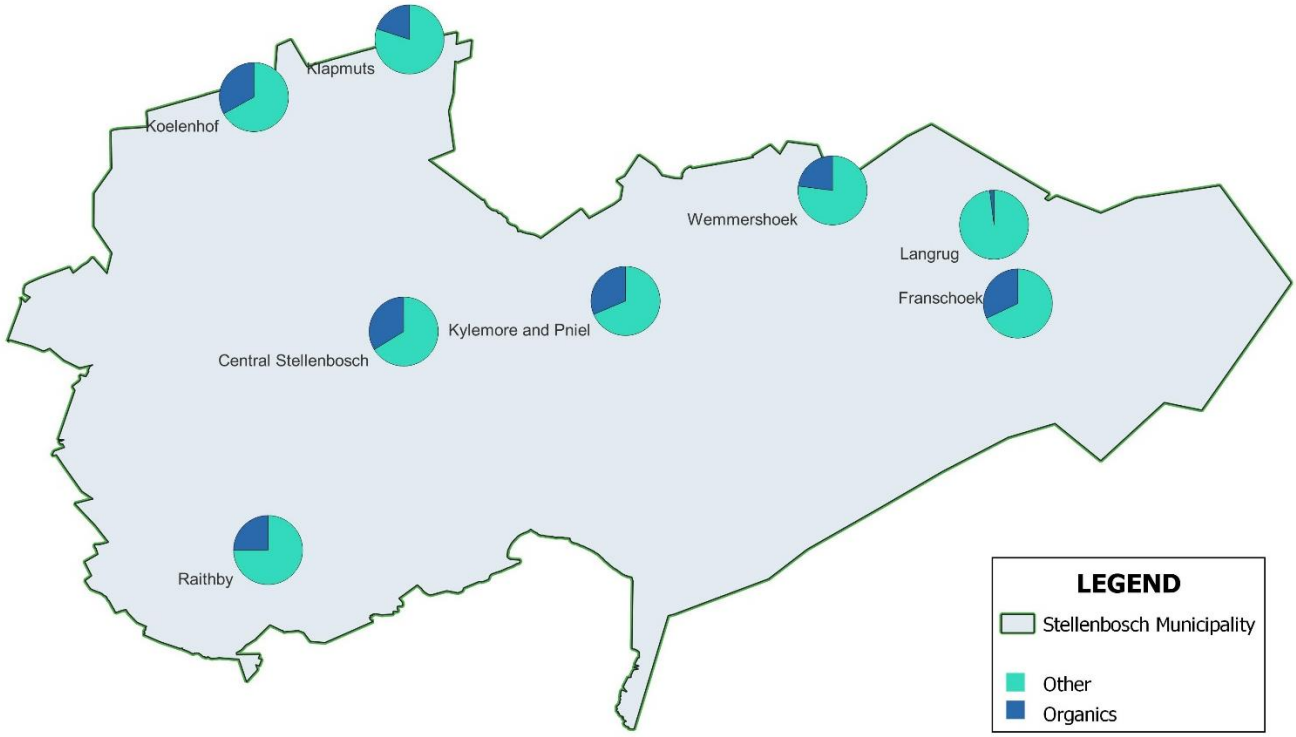



*Figure 3: Spatial distribution of SM organic waste*[5]

### *4.3.1 Waste Characterisation Findings from Stellenbosch University*

The University was included separately from the rest of the municipality. The characterisation sorted waste data into different categories to the characterisation undertaken for the Municipal waste stream, this data is therefore represented separately, see **Figure 4**.

The characterisation does not appear to represent the entire University's buildings but is likely to provide a good indication of the character of the waste**. Figure 5** provides an indication of the waste characterisation per building facility i.e., Men's and Ladies Residences, the faculty buildings and the Neelsie[6]. The Neelsie and Ladies Residences appear to generate the most organic waste.

It is recommended that the SM engage with the SU to understand the potential for collaboration on waste minimisation and waste diversion efforts.

[5] Central Stellenbosch includes the following areas: Welgevonden, Cloetsville, Kayamandi, Plankenberg, Onder Papegaaiberg, Die Boord, Brandwacht, Devon Valley, Paradyskloof, Techno Park, Jonkershoek, Mostertsdrift, Uniepark, Idas Valley, Simonswyk, Jamestown.

[6] The Neelsie is the main and largest cafeteria area on campus.

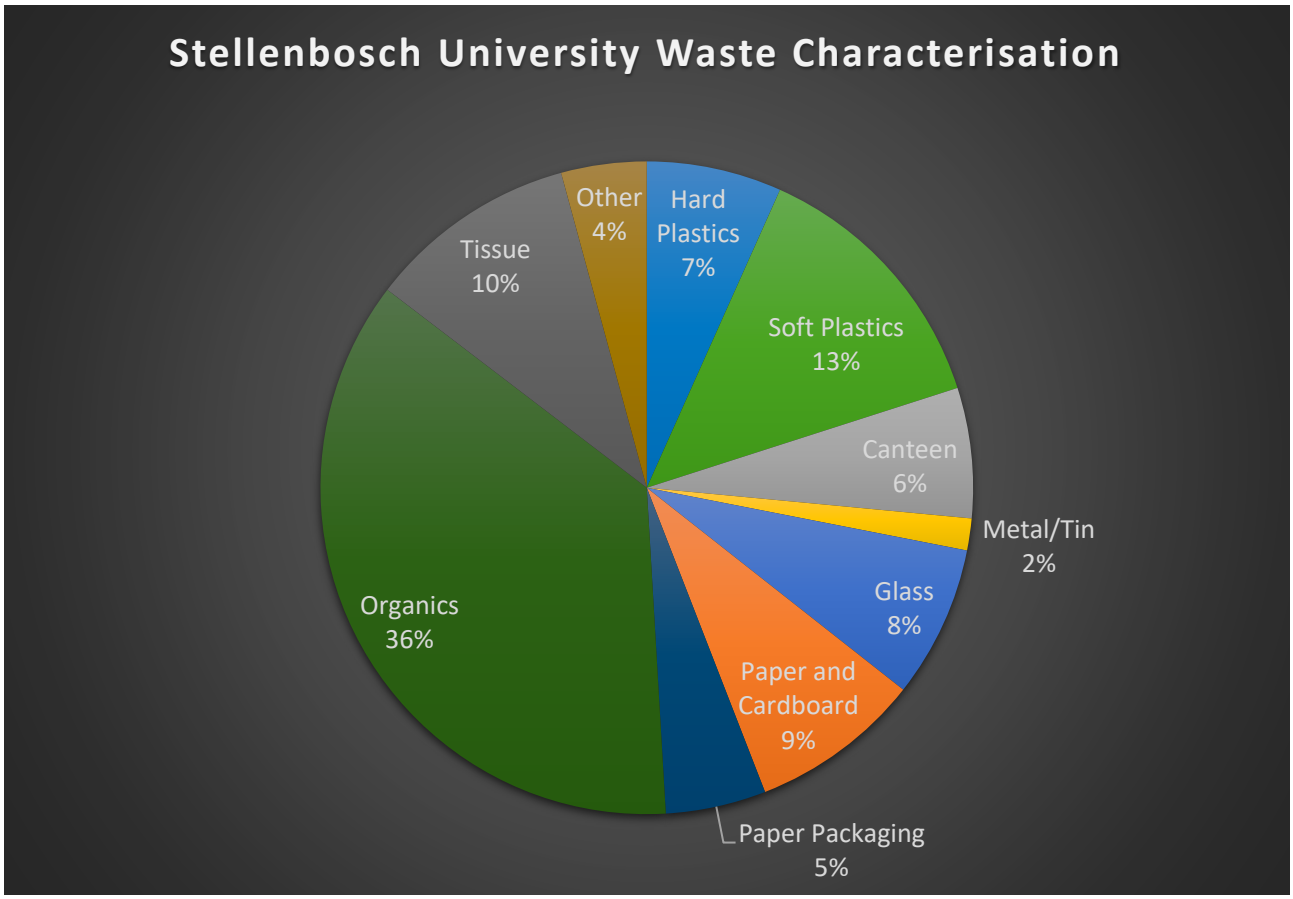
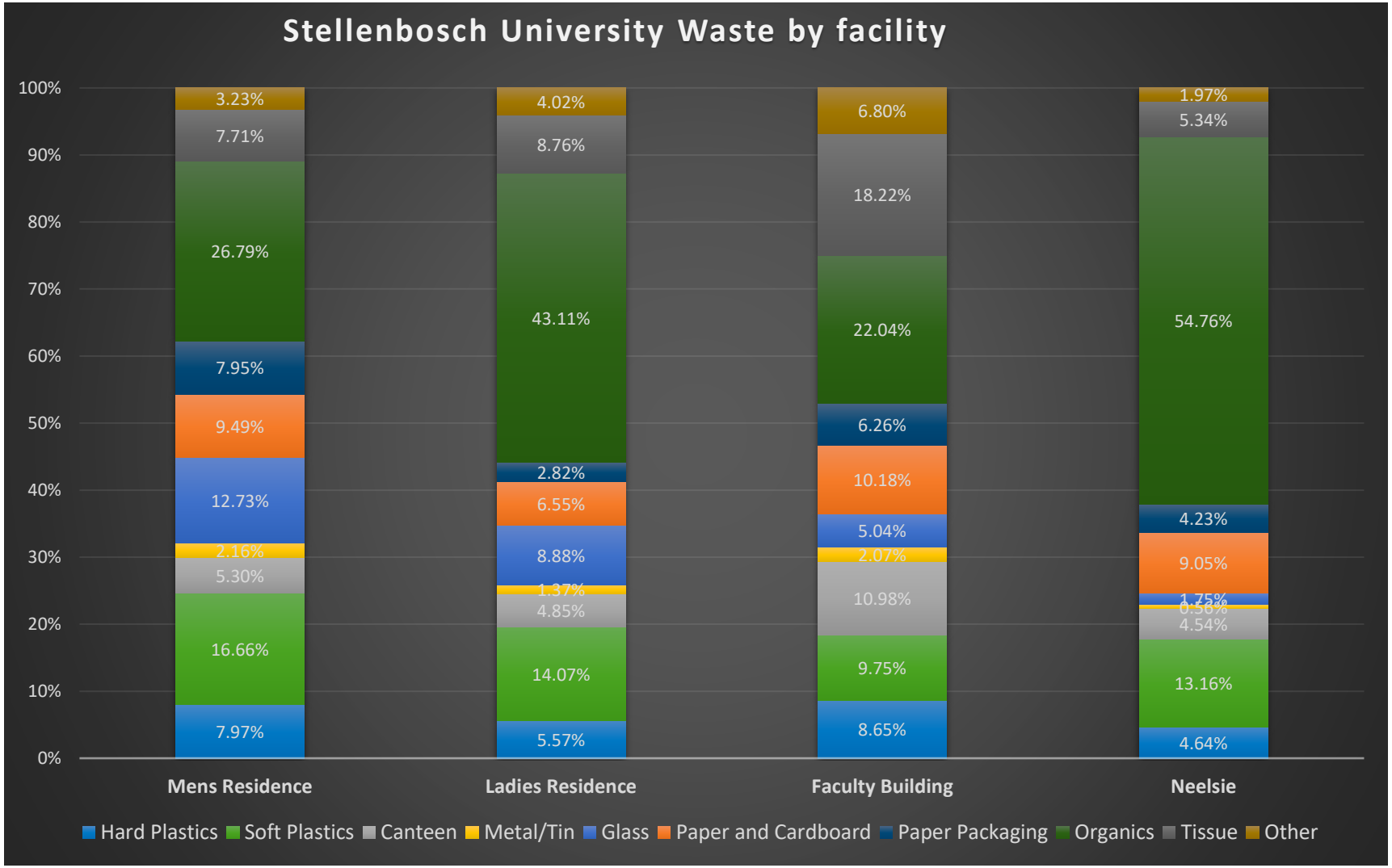



*Figure 4: Stellenbosch University Waste Characterisation*

*Figure 5: Stellenbosch University Waste Characterisation (%) by facility type*



#### *4.3.2 SM Waste Characterisation Report Conclusion*

The following conclusion was provided by the SM Waste Characterisation Report.

The graphical representation of the waste characterisation data indicates the following:

- As there is a variation in waste character per area, the solutions to divert waste from landfill do not have to be a "one size fits all" solution or approach and that different solutions in different areas may be more appropriate.
- A multi-pronged approach will be required to effectively divert and remove the recyclable, organic and garden waste fractions in different areas from landfill.
- As a minimum, a three-bag household separation at source programme should be implemented for:
  - organics (excluding garden waste),
  - recyclables/packaging, and
  - general waste.
- A system for diversion of garden waste should be considered, either separate household bin and collection or potentially provision of composting bins, where appropriate.
- It is recommended that the Municipality engage with the University and offer input into waste minimisation and waste diversion efforts.
- It is also recommended that the Municipality engage with existing collectors and recyclers to understand that challenges and collaboratively come up with potential solutions to bring about greater diversion of waste from landfill.

It is recommended that a collaborative approach is undertaken in order to allow the growth of the recycling industry, the Municipality could work with businesses in the area to support development of a recycling industry and secondary markets and potentially for a collective approach to organic waste management.

## 5 LITERATURE AND LEGISLATIVE REVIEW

This section presents current legislation that is applicable to organic waste management, and a literature review.

### 5.1 Legislative review

The Western Cape Government Department of Environmental Affairs and Development Planning (DEA&DP) has taken a policy decision to institute a 50% restriction on organic waste being disposed to landfill by 2022 and a full (100%) prohibition of organic waste disposed to landfill by 2027.

This is due to the following[7]:

- A large proportion of organic waste within the waste stream. Approximately 30% of the waste stream in the Western Cape is made up of organic waste. Therefore, it recognised that the large volumes of organic waste are taking up scarce landfill space.
- The negative environmental, social, and economic impacts of disposal of organic waste to landfill. For instance, the disposal of organic waste to landfill results in the increased generation of leachate, which has the potential to contaminate groundwater. Leachate requires expensive landfill containment barriers to mitigate against surface and groundwater contamination.
- The anaerobic decomposition of organic waste disposed of to landfill results in the generation of methane gas, which is a greenhouse gas (GHG). Methane is a potent GHG, with approximately 25

[7] DEA&DP letter to the Organics Recycling Association of South Africa. RE: Diversion targets for organic waste in the Western Cape (2018).

times the global warming potential of carbon dioxide ($CO_2$), making landfills a significant contributor to GHG emissions[8].
- Organic waste disposal to landfill is also associated with health risks such as smells and vectors.

The diversion of organic waste from landfill would assist with[9]:
- Extension of the lifespan of landfill sites within the Western Cape.
- Financial savings associated with infrastructure elements for leachate and landfill gas (LFG) management.
- Reduction in methane gas generation, which will assist with meeting the national GHG reduction targets and obligations.
- Converting organic waste into beneficial products will contribute towards the green economy and therefore helping to create direct and indirect employment opportunities.

National Norms and Standards for Disposal of Waste to Landfill (GN 636 of 2013)

The National Norms and Standards for Disposal of Waste to Landfill (GN 636 of 2013) require a 25% reduction of garden waste to landfill by 2018 and a 50% diversion by 2023.

National Medium Term Strategic Framework (2019 – 2024)

The National Medium Term Strategic Framework requires a 50% diversion of waste from landfill sites. The interventions identified to meet the targets include the implementation of waste management programmes across all spheres of government and the private sector.

National Waste Management Strategy 2020 (GN 44116 of 2021)

The National Waste Management Strategy 2020 (NWMS) gives effect to the DFFE's national mandate for waste management, which is derived from Section 24 of the National Constitution. The NWMS therefore provides a coherent framework and strategy for the implementation of the Waste Act and outlines government's policy and strategic approach to waste management within the South African government's context and agenda of socio-economic development that is "equitable, inclusive, sustainable and environmentally sound".

The NWMS 2020 also responds to the National Development Plan: Vision 2030 directive of "implementing a waste management system through the rapid expansion of recycling infrastructure and encouraging the composting of organic domestic waste to bolster economic activity in poor urban communities" and to the need to "cut down on solid waste disposal ".

Metropolitan (Metro), district and local municipalities are critical to the implementation of the NWMS as they are responsible for the planning and delivery of waste collection and disposal services and infrastructure. As part of the implementation of the NWMS 2020, local government needs to shift the focus of waste collection services to enable and promote diversion of waste from landfills through reuse, recycling, and recovery.

The State of Waste Report (2018) shows that organic waste contributes to more than 50% of the total of general waste disposed in South Africa and has a comparative recycling rate of 49%. Based on these statistics, the NWMS recognises that the organic waste stream should be prioritised for waste prevention and diversion from landfill.

[8] Environmental Canada, Technical Document on Municipal Solid Waste Organics Processing.

[9] DEA&DP letter to the Organics Recycling Association of South Africa. RE: Diversion targets for organic waste in the Western Cape (2018).

The organic waste priorities of the NWMS are further supported by the fact that the South African government is signatory to the United Nations Sustainable Development Goals (SDG). SDG 12.3 seeks to halve per capita global food waste at the retail and consumer level, including the reduction food losses along production and supply chains, as well as post-harvest losses by 2030. This goal forms the basis of a number of key agreements being discussed in South Africa, as well as internal targets for large and multinational brands.

The NWMS is premised on three pillars which will see a future South Africa with zero waste in landfills; cleaner communities, well managed and financially stable waste services, and a culture of zero tolerance of pollution, litter and illegal dumping. The Government priorities will be achieved through three (3) supporting pillars, namely Waste Minimisation; Effective and Sustainable Waste Services; Compliance, Enforcement and Awareness.

**Table 2** presents the key interventions and actions, specific to organic waste management within municipalities, which are linked to each strategic pillar of the NWMS.

*Table 2: Key interventions and actions of the three strategic pillars of the NWMS*

| Key Intervention/s | Actions/Outcomes |
|---|---|
| **PILLAR 1: WASTE MINIMISATION** | |
| Divert organic waste from landfill through composting and energy recovery | The long term expected outcome is "Zero Waste going to Landfill".<br>• 40% of waste from diverted from landfill within 5 years; 55% within 10 years; and at least 70% within 15 years leading to Zero Waste going to landfill.<br><br>Include and implement organic waste technologies in local government IWMPs. |
| **PILLAR 2: EFFECTIVE AND SUSTAINABLE WASTE SERVICES** | |
| Separate waste at source | Integration of waste pickers into the waste management system. |
| | Public online and annually updated guidelines, case studies and planning tools on separation at source for municipal managers. |
| | National Awareness campaign on recycling and waste management. |
| Effective integrated waste management planning | Development and implementation of 5 -year provincial and municipal IWMPs. |
| | Improve collection, reporting and dissemination of information on SAWIS. |
| | Building capacity in integrated waste management planning and provide revised IWMP guidelines. |
| | Municipalities include provisions for recycling drop-off/by back/storage centres in their IWMPs, supported by fiscal mechanisms/ Extended Producer Responsibility (EPR)[10] schemes. |
| **PILLAR 3: COMPLIANCE ENFORCEMENT AND AWARENESS** | |
| Ensure municipal landfill sites and waste management facilities comply with licensing requirements | Develop financial mechanisms to enforce compliance to license conditions. |

National Organic Waste Composting Strategy (2013)

The Final National Organic Waste Composting Strategy (NOWCS) Report was published by the DEA (now DFFE) in 2013, with the aim to promote the diversion of organic waste from landfill through organic waste composting for soil beneficiation and other uses through composting.

[10] The EPR Regulations define EPR as follows: "*extended producer responsibility"* means that a producer's responsibility for an identified product is extended to the post-consumer stage of an identified product's life cycle.

The NOWCS is based on five goals which seek to drive viable and sustainable change in response to legislation change, responsible waste handling and enhancing the use of organics in a circular system. The five goals and associated objectives are detailed in the NOWCS, including actions to be undertaken in order to realise each of these goals. **Table 3** provides a summary of the five goals and associated objectives of the NOWCS.

*Table 3: Summary of the five goals and associated objectives of the NOWCS*

| | Goals | Objectives |
|---|---|---|
| 1. | **Review legal and regulatory requirements.** | The objective of Goal 1 is to identify legislation and regulations that require modification in order to facilitate the legal registration of composting activities and facilities. |
| 2. | **Understand and facilitate feedstock sources and opportunities.** | Improving the monitoring of organic waste generation, disposal, and treatment, as well as identifying both feedstock and product market opportunities. |
| 3. | **Provide the necessary support structure and functions to implementing composting.** | The objective of Goal 3 is to consider necessary support structures and functions that would assist in the creation of opportunities, promoted and facilitated by legal enabling frameworks, and financial support and incentivisation. Governmental synergies with the private sector and regionalisation are also identified as necessary aspects requiring consideration. |
| 4. | **Undertake education, skills transfer and awareness.** | Enhancing public awareness and education campaigns and programmes regarding certain waste types is required in order to assist with not only separation at source, but diversion of organic waste from landfill, by means of potential home composting in urban / residential areas, as well as possible communal composting within the informal, lower-income areas. |
| 5. | **Incorporate composting into municipal planning, responsibilities and create roles for the private sector.** | This goal is about adapting the existing municipal structures to suit roles and responsibilities, including the use of IWMPs and Integrated Development Plans and identification of private involvement, where necessary. Waste Management Officers will play a key role in planning and achieving the objectives of the NOWCS. |

National Norms and Standards for Organic Waste Composting (GN 44762 of 2021)

On 25 June 2021, the Minister of Forestry, Fisheries and the Environment promulgated the **National Norms and Standards for Organic Waste Composting** under the NEMWA. An objective of the Norms and Standards is that organic waste composting will no longer require a waste management licence under NEMWA.

The Norms and Standards seek to provide a national uniform approach relating to controlling the composting of organic waste at any facility that falls within the threshold, thereby ensuring that best practice is always followed. The Norms and Standards are applicable to compostable organic waste and to organic composting facilities with the capacity to process in excess of 10 tonnes per day.

National Norms and Standards for the treatment of Organic Waste (GN 44340 of 2021)

On 29 March 2021, the Minister of Forestry, Fisheries and the Environment published the **Draft National Norms and Standards for the Treatment of Organic Waste** under the NEMWA for comment. The Norms and Standards were released for a 30-day commenting period on 29 March 2021, which was subsequently extended. These had not been promulgated at the time of writing this plan.

The objective of the Norms and Standards will be to control the processing of organic waste material at any facility that falls within the prescribed thresholds in order to avoid, prevent or minimise potential negative impacts on the biophysical environment.

The Norms and Standards are applicable to the following activities:

1. Recycling of organic waste at a facility that has an operational area in excess of 500m$^2$;

2. Recovery of organic waste including the refining, utilisation or co-processing of organic waste in excess of 10 tons but less than 100 tons per day;
3. Construction and operation of any organic waste treatment facility that has the capacity to process in excess of 10 ton but less than 100 tons of organic waste material per day;
4. Construction of any organic waste facility where the capacity of the facility is able to process in excess of 10 tonnes but less than 100 tonnes of organic material per day;
5. Construction and operation of any organic waste facility processing animal matter not intended for human consumption for installation handling in excess of 1 ton of raw material per day; and
6. Construction and operation of any organic waste facility using applied heat (thermal treatment) in the treatment of general waste exceeding 10kg per day.

Western Cape Provincial Integrated Waste Management Plan (IWMP) (2017 – 2022)

Objective 3 of Goal 3 (Effective and efficient utilisation of resources) of the IWMP is to increase waste diversion through reuse, recovery and recycling. **The targets set to achieve this objective for the organic waste stream are: 50% diversion of organic waste by 2022 and 100% diversion rate by 2027.**

Stellenbosch Municipality: By-law relating to Integrated Waste Management (2021)

In order to give effect to the right contained in Section 24 of the National Constitution, 1996 and to regulate the avoidance, minimisation, generation, collection, cleaning and disposal of waste, Stellenbosch Municipality: Directorate Infrastructure Service drafted the By-law Relating to Integrated Waste Management, which was subsequently published by Provincial Gazette No. 8441 dated 4 June 2021.

The By-law makes the following provisions in relation to organic waste management:

Separation at source

1. A waste generator must:
    a. Separate waste with the aim to:
        i. Minimise its impacts on the environment; and
        ii. Store the recyclable waste separately from non-recyclable waste.

Garden waste

1. Garden waste generated at properties being used mainly for residential purposes may be:
    a. Composted on the property;
    b. Stored in a compost heap or suitable bags as per the Municipality's requirements; and
    c. Kept on the property until collection or taken to a licenced waste disposal facility.
2. The Municipality may, from time to time:
    a. Stipulate maximum quantities of garden waste to be collected in respect for rural and urban areas; and
    b. Impose conditions regarding the disposal of garden waste over a specified mass, and for this purpose call upon a waste generator of garden waste to present a weighbridge ticket as proof of proper disposal of such garden waste.

Organic waste

1. The occupant of premises on which organic waste is generated:
    a. May compost the waste on the premises, provided that the composting does not cause a nuisance or harm to human health or damage the environment;
    b. But not composted, must ensure that the waste is collected and treated or disposed of within a reasonable period after its generation.
2. The Municipal Manager may issue a directive to:
    a. An organic waste generator to:
        i. Develop an integrated refuse management plan indicating measures to minimise and recover such waste; and

ii. Transport the waste to designated facilities for treatment or disposal; and

b. A transporter of garden waste or a person providing garden maintenance services to transport any garden waste to a facility designated by the Municipality for disposal.

3. The Municipality or an accredited services provider may:
   a. Upon written request of the occupant of premises on which organic waste is generated; and on payment of a tariff as per the Municipality's Tariff-By-Law and Tariff Policy, deliver an appropriate receptable for the purposes of storing organic waste, in addition to any receptacle already provided by the Municipality for general waste.

## 5.2 Literature Review

The benefits of diverting organic waste from landfill are well documented and include the following in addition to saving landfill airspace:[11]:

- Organic matter is an essential component of soils and plays a fundamental role in soil conservation, crop production, and fertility maintenance. Treated organic waste can be transformed into valuable products such as compost, soil amendment, and fertilizer. These products can be applied to various commercial activities such as agriculture, landscaping, horticulture, erosion control, topsoil replacement etc.
- The production of compost and other products emanating from the treatment of organic waste could help to reduce the demand and use of chemical fertilisers.
- Compost can also be used for reforestation, wetland restoration and habitat revitalisation to reverse the impacts of urbanisation / industrialisation.
- The anaerobic decomposition of organic waste (i.e. in landfill) results in the generation of methane gas. As an alternative, if decomposition takes place separately in an Anaerobic Digestor (AD), the gas can be collected and transformed into energy. This can be valuable in an energy scarce country like South Africa, where mainly fossil fuels are relied on for electricity generation.
- Plays a key role in circular economy thinking.

The following section presents the opportunities, drivers/enablers, and risks/barriers to organic waste diversion from landfill as presented in the GreenCape Market Waste Market Intelligence Report [12].

Opportunities

In 2019, the Western Cape Province generated approximately 533 745 tonnes of MSW organics, and approximately 326 935 tonnes of commercial and industrial organics in 2019. Combined, the market value of MSW and commercial and industrial organics is estimated between R86 million and R162 million.

The Cape Winelands District Municipality, of which Stellenbosch Municipality is a part of, is estimated to generate ~67 900 tons of MSW organics by 2023.

Drivers

- Due to the opportunities related to organic waste, new and changing national and provincial legislation and regulations are set to unlock a number of key waste streams such as organics. Changes in legislation such as the above-mentioned Western Cape organic waste restrictions and the National Norms and Standards for Composting and Organic Waste Treatment will help to simplify requirements and procedures for alternative waste treatment technologies and activities; as well as unlock funds and feedstocks for, among others, the private sector.

[11] Environmental Canada, Technical Document on Municipal Solid Waste Organics Processing

[12] GreenCape Market Waste Market Intelligence Report (2020 p.16 – 19; p.38 – p.43)

- The initiatives identified by the national government's fast results delivery programme, Operation Phakisa[13], also aims to increase access to feedstock and stimulate growth in market demand. Operation Phakisa resulted in 20 initiatives aimed at job creation potential, potential GDP contribution, and waste diversion potential as calculated in 2017.
- The rising management costs of landfill operations are resulting in an increase in the price of landfilling in the Western Cape. This increases demand from waste generators for alternative waste treatment solutions, which in turn improves the business case for solutions.
- Most of the Western Cape province, including Stellenbosch Municipality, is experiencing a landfill airspace crisis.

Risks

- It is difficult to extract value from municipal solid waste (MSW) due to its complex nature of being a mix of general household articles, which include general and hazardous waste, all of which come in various quantities and ratios, and all of which can be substantially contaminated.
- In order to realise the benefits of producing good quality compost and successful wate to energy, an important aspect of organic waste diversion is ensuring that the organic feedstock/input is of good quality and is not contaminated.
- Organics contaminated by non-organic waste streams such as glass, metal, plastic etc, compromises the quality and value of organic waste treatment by-products and end products.
- **Separation at source** is therefore an important aspect of overcoming the hurdle of contamination of organic waste. However, it is noted that for the most part South Africa, in general does not have a culture of separating waste at source. The risk of low participation rates in separation at source programmes can also make extracting value difficult and costly.
- Although Municipal waste management by-laws, such the Stellenbosch Municipality By-Law Relating to Integrated Waste Management (2021), require mandatory separation at source, municipalities do not always have the capacity to enforce this.

**Table 4** presents a summary of the opportunities, drivers, enablers and risks related to organic waste beneficiation in South Africa.

*Table 4: Summary of the opportunities, drivers and enablers for organic waste beneficiation as per the GreenCape Market Intelligence Report (2020 p.33 - 34)*

| Opportunities | Drivers | Enablers | Barrier/Risk | Macro-Environment |
|---|---|---|---|---|
| Value-add to cleaner / pre-processed organics Stellenbosch local municipality | • Organic waste 2027 landfill restrictions<br>• Decreasing municipal landfill airspace<br>• Increasing cost of landfilling<br>• Market demand for clean dry recyclable feedstocks | • Easing of composting regulations<br>• Increasing cost of electricity | • Inadequate source separation<br>• Composting registration<br>• regulations<br>• Difficult procurement / tender process<br>• Sensitive / lack of market for by-products<br>• Lack of electricity grid feed-in | • Operation Phakisa focus on organic waste<br>• Greenhouse gas reduction commitments / ambitions<br>• Consumer awareness of food waste and its impact on the environment |

[13] The Department of Environmental Affairs together with the Department of Planning, Monitoring and Evaluation initiated a Chemicals and Waste Phakisa programme from 24 July to 24 August 2017. Chemicals and Waste Phakisa was aimed at engaging on opportunities that call lead to reduction of impact on the environment, while growing the GDP contribution and creating jobs.

Other drivers to be considered are as follows:

The 'Circular Economy' sees waste as a resource as follows:

- Organics are materials which can be reclaimed and reused or recycled as secondary raw materials for new products i.e. compost.
- Organic waste converted to compost is a source of soil nutrients.

Legislative and infrastructural drivers:

- The zero-meat production waste to landfill by 2023 Operation Phakisa initiative, which will focus on driving the diversion of the meat production waste to value-add solutions.
- The 50% household organic separation at source by 2023 Operation Phakisa initiative will focus on enforcing separation at source requirements on municipalities.
- As previously mentioned, since August 2019 the SM have made use of the Vissershok Private Landfill (Vissershok Waste Management Facility (Pty) Ltd) in Cape Town owing to loss of airspace at the Stellenbosch Municipal Landfill Site. The loss of landfill airspace, in conjunction with provincial policy directives, is a driving factor for SM to diversify their waste management models.

Financial drivers:

- Availability and cost of landfill
    - Reducing waste results in avoided costs/savings in landfill cost.
    - Future avoided costs which are the long-term savings that are realised when the life of an existing landfill is extended or a new landfill can be designed and constructed on a smaller scale or with a longer lifespan.
- Cost of transport of waste to a landfill site outside the municipality's boundaries.

Barriers:

- Green and garden waste collection and processing is most effective when combined with bylaws prohibiting this waste to be mixed or disposed of with normal household waste.
- Composting garden and green waste is easier to control and produces a cleaner more uniform product with fewer contaminants, and the final product can be certified as organic compost. Compost derived from general mixed waste can be more difficult to control.
- Costs associated with waste transport are high.
- There is a perception that the diversion of waste from landfill should be cheaper than a landfill gate fee as this does not take into account the life-cycle costs of a landfill site.
- Treatment or processing of organics results in by-products and end products that require disposal or further management e.g. digestate from AD is not regarded as a revenue generating by-product from AD operations but usually attracts a "disposal" cost although it can be used as a soil enhancer and composting requires the sale of the final product.
- Compost needs to meet certain quality requirements to be registered with the Department of Agriculture, Land Reform and Rural Development (DALRRD) in terms of the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (No. 972 of 2017).
- AD as an energy generation solution for municipalities can be complicated by the requirement in terms of the Constitution that Municipalities are obliged by to buy electricity from the most reliable and inexpensive source.

## 5.3 Motivation for Separation at Source and Waste Diversion

Municipal solid waste management in South Africa is typically one dimensional, with waste being collected and disposed of at landfills, as illustrated in **Figure 6**. Municipalities have however been encouraged to adopt an integrated multi-dimensional approach to their waste management by applying the principles of the waste management hierarchy, as shown in **Figure 6** along with the desirability. As waste is not being separated at

source in most municipalities it results in a reduced market value as the extracted recyclable and organics from a mixed municipal waste stream are highly contaminated.

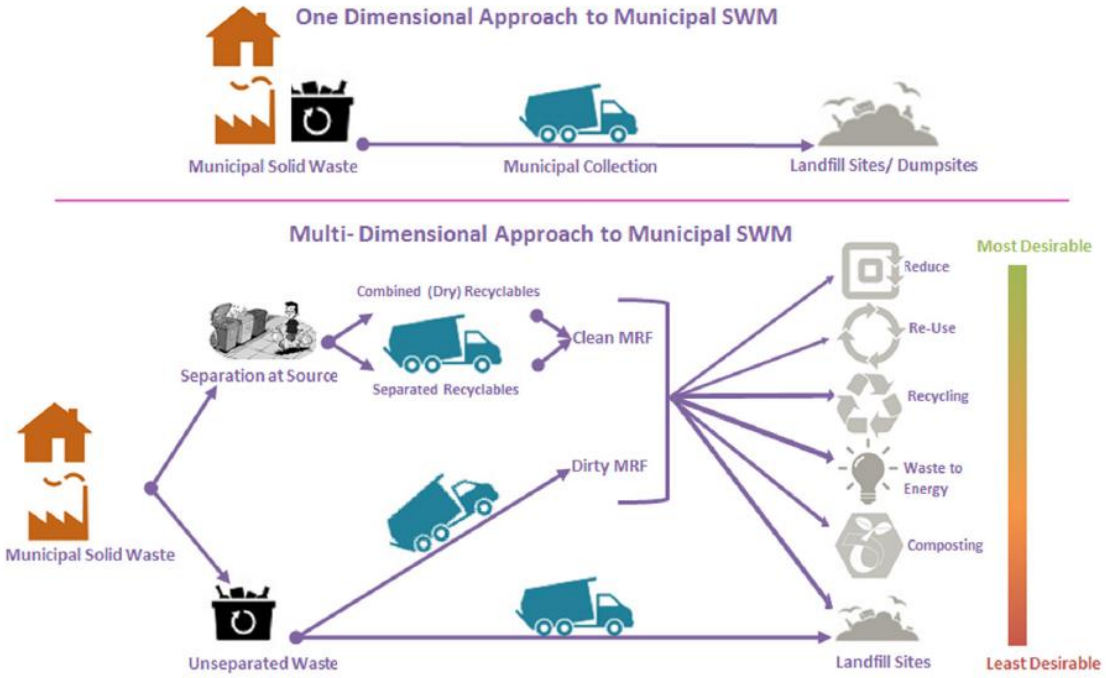



*Figure 6: One-dimensional vs multi-dimensional approach to municipal waste management*[14]

The South African government in partnership with the German Development Cooperation embarked upon the implementation of an advanced integrated solid waste management (AISWM) Programme for the Republic of South Africa. AISWM is a term is used to describe integrated solid waste management (ISWM) making use of systems and technologies, within a framework of policies, legislation and practices, that reduce dependency on landfill for disposal of waste. The Programme defines AISWM as "the coherent and sustainable application of approaches and solutions that have the effect of reducing the amount of waste that needs to be landfilled."

AISWM aims to advance waste management practices up the hierarchy away from landfill and towards creating energy, recycling, composting, reuse and reduction. This does not necessarily require the use of sophisticated and expensive technology; but a blend of management systems and multi-dimensional use of appropriate technologies that succeed in sustainably diverting waste away from landfill.

AISWM is generally more expensive than landfilling when only considering the financial costs. However, when considering the wider economic costs and benefits from a societal standpoint and the long terms cost savings, advanced treatment options become more favourable than landfilling.

When comparing financial performance, costs and revenues of one-dimensional systems against multi-dimensional systems it can only be undertaken with a view of the long-term economic implications. It is however important to note that in order for multi-dimensional and AISWM systems to be effective, separation at source is a key component.

[14] Source: Knowledge Product 4: Financial Implications of Advanced Waste Treatment. https://www.dffe.gov.za/sites/default/files/reports/advancedwastetreatment_chapter1.pdf

## 5.4 International Case Studies and Examples of Organic Waste Diversion

This section provides a brief summary and overview of various and selected international organic waste diversion strategies and drivers. The Report, *Bio-waste generation in the EU: Current capture levels and future potential,* published in 2020 and commissioned by the Bio-based Industries Consortium (BIC) provides more specific details in terms of collection rates and tonnages as well as systems in each EU Member State, the UK and Norway.

### *5.4.1 European Union Directives*

According to the Directive 1999/31/EC on landfill of waste, Member States must reduce the amount of biodegradable municipal waste going to landfill

- to 75 % of the total amount of biodegradable municipal waste generated in 1995 by 2006;
- to 50 % of 1995 levels by 2009; and
- to 35 % of 1995 levels by 2016.

European Directive (EU) 2018/851, commonly known as the New Waste Framework Directive (WFD), included in the 'Circular Economy Package', mandates the introduction of separate collection of bio-waste as of 1 Jan 2024. Updating art. 22 of the WFD, it stipulates an obligation at the EU level to implement bio-waste collection.

### *5.4.2 United Nations' Sustainable Development Goal 12.3*

The United Nations (UN) Sustainable Development Goal (SDG) 12 seeks to "ensure sustainable consumption and production patterns." The third target under this goal (Target 12.3) calls for cutting in half per capita global food waste at the retail and consumer level, and reducing food losses along production and supply chains (including post-harvest losses) by 2030.

### *5.4.3 Milan [15]*

The City of Milan, Italy started a door-to-door collection of organic waste in 2012. By June of 2014, the program reached 100% citywide participation and has one of the highest organic waste collection rates in Europe and has surpassed the European Union target of diverting 50% of food waste by 2020.

The high participation rates by citizens is said to be one of the main reasons for the rapid success of this programme. The residents of Milan were already accustomed to waste separation at household level and therefore there was little resistance to the organic waste separation programme.

The municipality provides a countertop caddy, compostable bags and a 120 litre wheelie bins on loan to its citizens for free, for kerbside for collection twice a week from households and daily from businesses (e.g. bars and restaurants).

The bags are made of biodegradable, compostable plastic which are waterproof, hygienic, breathable and can be processed by composting and anaerobic digestion plants. The use of compostable bags has been said to be crucial to the success of separate organic waste collection system. Novamont provided the bags to AMSA (the Milanese environmental services company) who manages the city's waste collection. AMSA gave each resident of Milan (and ten surrounding municipalities) a starter kit with 25 bags for free. In addition, Novamont supported AMSA and Milan with information outreach campaigns aimed at encouraging consumers to use their compostable grocery bags to collect organic waste at home.

[15] https://pocacito.eu/sites/default/files/FoodWasteRecycling_Milan.pdf

### *5.4.4 Sweden*

In Sweden approximately 73 % of municipalities offer some form of collection system for food waste and in most municipalities, it is voluntary for households to source separate food waste. Most of the food waste is treated by means of anaerobic digestion.

### *5.4.5 Sao Paulo, Brazil*

São Paulo's strategy for organic waste diversion, including collection treatment and recycling and their challenges for São Paulo. It builds on an assessment of São Paulo's waste management by the City Assistance Project under the Climate and Clean Air Coalition Municipal Solid Waste Initiative, and a 2014-2033 Action Plan for organic waste in line with the city's goals for integrated solid waste management.
The Action Plan sets out a target to divert 70% of organic waste from landfill by:

- Reducing it at source (for instance through home composting).
- Separate collection from large producers and households.
- Treatment of separated organic waste using composting and anaerobic digestion.
- Pre-treatment of residual waste through mechanical biological treatment (MBT).

This strategy sets out the roadmap to achieve the goals and targets. It begins by outlining the relevant targets and inputs relating to waste production, collection, treatment, composting and climate policy. The strategy is broken into four components:

- **Separate collection and transport of organic waste**. This sets out the advantages of separate collection compared to mechanical sorting, in terms of contamination and impurities, and how São Paulo can begin and optimise organic waste collection.
- **Treatment and recycling of organic waste**. This explains the different treatment options and strategy for gradually increasing treatment capacity.
- **Communication on organic waste.** This recommends that an annual budget and permanent working is created for communication activities.
- **Economic instruments.** This looks at approaches for incentivising diversion and treatment through landfill disposal fees, and local revenue raising options such as a household waste fee.

### *5.4.6 The Courtauld Commitment 2030*

The Courtauld Commitment 2030 is a voluntary agreement that enables collaborative action across the entire food chain in the United Kingdom (UK) to deliver farm-to-fork reductions in food waste, greenhouse gas (GHG) emissions and water stress that will help the UK food and drink sector achieve global environmental goals.

The target for Food Waste is to deliver against UN SDG Goal 12.3 with a 50% per capita reduction in food waste by 2030 vs the UK 2007 baseline (which includes manufacture, retail, hospitality and food service, and household).
The Commitment include a target for GHG emission reduction to deliver a 50% absolute reduction in GHG emissions associated with food and drink consumed in the UK by 2030 (against a 2015 baseline).

### *5.4.7 Pacific Coast Collaborative*

The Pacific Coast of North America West Coast Voluntary Agreement is an ambitious public-private partnership that aims to reduce food waste in the region across the supply chain. The aims of the voluntary agreement are to reduce food waste in the region by at least 50% by 2030.

### *5.4.8 Tacloban, Philippines*

Tacloban, a large city in the Philippines has a population of 242,089 (2015) and a waste generation rate of 175 tonnes per day. The city has a decentralised collection system for household waste in 64 *barangays* or communities.

The diversion rate for 64 *barangays* rose from 10 per cent in 2017, to 55 per cent by the end of 2018. This was possible due to the joint collaboration between city authorities with Mother Earth Foundation (MEF) and took on a multi-pronged approach, using policy instruments; information, education and communication campaign, as well as enforcement mechanisms for the city.

In October 2016, the city launched phase 1 of the Ecological Solid Waste Management (ESWM) Programme for the city. This was followed by the ordinance on Integrated Ecological Solid Waste Management in 2017; which mandates residents to segregate waste at source and sets out *barangay*-specific mechanics of waste collection, segregation, and Materials Recovery Facilities (MRFs). It also authorises *barangays* to levy user fees to cover the costs of collection and MRF operations.

The City distributed 52 pedicabs (bicycles with a sidecar attached) and plastic drums and provided cash assistance to *barangays* to help with the initial set-up and construction of their MRFs. Committees monitored whether households were sorting their waste properly while newly trained environmental police enforced the ordinances. *Barangay tanods* (village officials) vigilantly patrolled their areas of jurisdiction and had the power to fine residents who refused to sort their waste.

By 2019, the City recovered 384 tonnes of organic waste and 23 tonnes of recyclables annually from 64 *barangays* as a result of implementing the decentralised collection model. The compliance rate of waste segregation by households in participating *barangays* also rose to 63%.


*Figure 7: Pedicabs used for waste collection on Tacloban.*

### *5.4.9 UN-Habitat Waste Wise Cities*

The UN-Habitat "Waste Wise Cities" programme was launched to address the increasing global waste management crisis. It allows cities to deal with their waste management issues in their context, while also learning from the experience of other cities. UN-Habitat invites cities to become Waste Wise by promoting and incorporating the following 12 key principles in their solid waste management strategy:

- Assess quantity and type of waste generated - Assess quantity and type of waste generated by residents, establishments and businesses.
- Improve collection and transportation of waste. - Improve collection and transportation of waste.
- Ensure environmentally safe disposal of waste.
- Promote the 5 Rs –Rethink, Reduce, Reuse, Recycle and Refuse the use of single-use items, to derive maximum value from waste.
- Empower and work with all waste stakeholders and work with civil society, NGOs, private and informal sectors.
- Establish better working conditions for waste workers, whether in formal or informal employment.
- Implement innovative technological alternatives, while carefully evaluating and implementing innovative technological alternatives, e.g. waste-to-energy schemes, and learn from other cities.

- Make long-term urban strategic plans considering waste, for urbanisation, which fully consider solid waste generation and treatment.
- Design incentives promoting a circular economy, considering financial and other incentives, promoting a transition to a more circular economy and reducing waste.
- Encourage "Rethinking on waste" through public education and awareness efforts to change public attitudes towards waste.
- Regularly review progress on Municipal Solid Waste Management in the city and provide achievements and success stories annually on the Waste Wise Cities website.
- Strive towards achieving the Sustainable Development Goals, as well as the goals of the Paris Agreement and the New Urban Agenda.

UN-Habitat will support cities that want to become Waste Wise in the following action areas:

- Waste Data & Monitoring (e.g. feedback on available data, support in collection of data with Waste Wise Cities Tool)
- Knowledge & Good Practices Sharing (e.g.Newsletter, City-to-city Partnerships, Waste Wise Academy)
- Advocacy & Education (e.g. educational toolkit, awareness raising material)
- Project Finance & Bankability Support (e.g. for drafting project proposals, marketplace)

Any city that is committed to its key principles can join. A city official or representative is required to submit a "letter of intent" addressed to the Executive Director of UN-Habitat (WasteWiseCities@un.org). A sample letter is provided on the website (https://unhabitat.org/waste-wise-cities).

The programme provides a tool, the Waste Wise Cities Tool (WaCT) which provides guidance through 7 steps to collect data on municipal solid waste (MSW) generated, collected, and managed in controlled facilities. The tool also provides household survey guide for total MSW generation, a questionnaire to identify the MSW recovery chain and criteria to check the environmental control level of waste management facilities in a city.

## 5.5 Examples of South African organic waste diversion programmes

### *5.5.1 Witzenberg Zero Waste to Landfill Pilot project*

JG Afrika and Circular-Vision were approached by the Wellington Association Against the Incinerator (WAAI) to assist in the undertaking of a Zero Waste Pilot to Landfill Strategy Pilot Project in Tulbagh, Witzenberg Municipality (WM).

Households in Tulbagh were selected by the WM to participate in the pilot project which entailed household at-source separation of waste into the four categories of food waste, garden waste, recyclables and landfill waste. The Zero Waste Pilot Project ran from 2 October 2019 to 4 December 2019. The aim of the pilot project was to test the at-source separation and collection method for food, garden and recyclable waste for future replication within the Municipality.

Participating households were requested to separate their waste according to the following:

- Educational leaflets on how to separate waste at source
- Clear Bag for recyclables
- Compostable bags with a countertop caddy for food waste
- Green Bag for garden clippings (in accordance with the existing system in WM)
- Black bag for other waste (to be landfilled / dumped) (in accordance with the existing system in WM)

Once weighed, the bags were collected with the compostable and garden waste and taken to a compost facility, the recyclables were taken to an existing recycler, operating from the landfill site and black bags were disposed of at the landfill.

The following are the project learnings related to participation and separation of waste:

- Initially participation levels were low as residents were not showing interest in the pilot. Participation increased as the pilot progressed. Residents were more enthusiastic about the recycling aspect than the organic/food waste component.
- Some residents did not separate waste into different colour bags as per the pilot project instructions and information provided. Continuous education and awareness is critical in ensuring that separation at source is undertaken correctly.
- Several residents stated that they were already composting food waste at home and therefore only put recyclable bags out for collection. Home composting should be encouraged by municipalities as the first choice and solution to diverting organic waste from landfill.

It should be noted that this project won a special mention at the "The AfriSam Innovation Award for Sustainable Construction" at the 2021 Construction World Best Projects competition and was placed third 3 at the IMESA/CESA Excellence Awards.

### *5.5.2 City of Cape Town organic waste drop-off pilot project*

The current food waste diversion project operating from four CCT drop-off sites and four additional pop-up sites that have been created in various Central Business Districts (CBD) in Cape Town, including the City Centre, Claremont, Durbanville and Somerset West.

The food waste that is collected at the sites is taken to a CCT solid waste facility where it is weighed and composted.

How the trial works:

- Participants are issued with a 5L bucket (with an explanatory leaflet), which they take home to fill with their food waste, temporarily storing it in the fridge.
- When the bucket is full, they are then required to return it to their designated site at which they received the bucket.
- The bucket will be decanted, cleaned and reissued to the participant.
- The project duration is 15 February 2021 until the 30 June 2021.
- The trial is limited to 200 residential participants per site and is taking place at the eight sites identified below.
- The CCT drop-offs are established sites, already visited by residents to drop off recyclables, garden waste or garage waste and the CBD sites were chosen as convenient drop-off points for residents working in or frequenting these areas.

Acceptable organic waste to be put into buckets:

- Fruit and vegetable scraps and peels
- Egg shells, egg trays and tea bags
- All food scraps such as starch (rice, pasta, pap), sauce, meat, bones
- Paper plates and serviettes
- Compostable food containers

### *5.5.3 City of Cape Town home composting (green genie) project*

In April 2016, the CCT embarked on a phased initiative to provide free home composting containers to residents. In the first phase of the programme the CCT issued more than 5 000 free home composting containers. The second phase, from February 2017 to June 2017, ensured that around 5 100 more residents received a free composting container. The CCT has rolled out home composters to over 22 000 households.

### 5.5.4 *Oranjezicht City Farm organic waste drop-off initiative*

The OZCF provides an easily accessible eco-system where households and local business can bring their kitchen waste, layered with Bokashi (available for purchase from the Farm), to the Farm to be used as fertiliser for the soil. Bokashi composting uses a selected group of micro-organisms to anaerobically ferment organic waste. The OZCF provides its customers the option to purchase Bokashi bran produced by the OZCF. To recover costs associated with brand manufacturing, OZCF charges R110 per 1kg bag. Each bag lasts a family of four a month.

Initially the service of receiving food waste was offered for free. However, to recover labour costs associated with composting, the OZCF introduced a clip card payment system. Each clip of a ten-clip-card equates to a single 20L bucket of food waste. Households are charged R100 per clip card (R10 per clip/bucket) whilst businesses are charged R200 per clip card (R20 per clip/bucket).

The Oranjezicht City Farm (OZCF) receives an estimated 100 buckets per week of food waste. At 15 to 20kgs per bucket, this equates to roughly 1.5 – 2 tonnes week or 78-100 tonnes per annum. The OZCF generates between 11.7 – 15 tonnes of nutrient rich compost per year at its onsite composting operation. This compost is subsequently bagged and sold to its community members at R30/10kg. These funds are fed back into the operation of the garden.

### 5.5.5 *The Ladles of Love **Feed The Soil** Sustainability programme*

The Ladles of Love **Feed The Soil** Sustainability programme was launched on 16 October 2021, and is partnering with ZTL (Zero To Landfill) Organics to help develop urban farming in Cape Town while diverting organic waste. ZTL are experts in and passionate about recycling organic waste and will assist by turning the waste from suburban households into nutrient-rich compost. This organic compost will then be delivered to a network of urban farmers around Cape Town.


*Figure 8: Feed the Soil Organic Waste Tool Kit and project pictogram*

Residents purchase a Feed The Soil Organic Waste Tool Kit for R200 which will includes:

- 1 x 5 litre Organic Waste Bin
- 1 x 25 litre Storage Bin
- 1 x bag of Sawdust
- 1 x bag of Bokashi

The bucket is then taken to a drop off and swopped for a clean bucket on a weekly basis. ZTL collect full buckets from the drop-off and take the organic waste for composting. Initially the drop-off point is planned to be a pop-up exchange which is planned to become a more permanent location/facility with an adjoining veggie shop to be added. There is a weekly cost of R25 for this service which is payable by card or SnapScan.

### *5.5.6 The Compost Kitchen*

The Compost Kitchen charge R190/month to collect organic kitchen waste on a weekly basis. Each client is provided with an organic waste bin and the waste is treated by means of a vermicomposting process. The household receives 2kg of high quality vermicompost back on a monthly basis.

The compost kitchen provide training and sell various organic and food waste composting products/solutions, such as the Doggy Doo Doo bin.

The Doggy Doo Doo bin is a safe, neat, hygienic and sustainable way to dispose of pet waste and consists of a box which is buried in the ground and open to the soil at the bottom. Pet waste is dropped inside, and a microorganism treatment, which is used in the Waste Water Treatment industry, is added to break down the waste naturally along with composting earthworms which help to break down the waste.


*Figure 9: The Compost Kitchen's Doggy Doo Doo bins*

## 5.6 Organic Waste Treatment Options

In broad terms, the technology options for the treatment of municipal organic waste include the following types of processes:

- Composting
- Anaerobic Digestion (AD)
- Mechanical Biological Treatment (MBT)

It is important to note these technologies are generally regarded as intermediate processes and markets are required for the end-products. This section provides brief high-level summary of these options.

### *5.6.1 Composting*

There are a number of different composting technologies that are used for organic waste treatment:

- Open Windrow Composting - takes place in the open air in large, elongated, uniform prism shaped 'piles' of organic waste known as windrows. The waste feedstock is usually mechanically shredded or chipped and placed into windrows on an impermeable surface. Water is added, depending on the moisture content of the waste. Windrows are turned regularly, either with a loader or by a specialist windrow turner machine or can be turned by hand, several times during the compost process, which takes approximately twelve to sixteen weeks.
- In-vessel composting - In-vessel composting (IVC) is an accelerated composting process in an enclosed and controlled environment. Waste is screened and oversize items removed, then waste is shredded or chipped to increase the surface area and reduce the average material size. The composting process can take place in a building (bays, beds) or in composting vessels (tunnels, drums, towers).

Composting can take place on a small scale, and in a localised manner at household level for example or on an industrial or agricultural scale. It can also take place as a static or dynamic systems where dynamic refers to the periodic mixing or turning as the main way of aerating the compost where systems which rely on forced or passive ventilation of the piles are known as static systems.

Composting is regarded as a promising technology (i.e. relatively inexpensive, accessible with market demand and labour intensive) that can be implemented in the short-term at municipal level and is regarded as comparative to the cost of landfill[16].

### *5.6.2 Anaerobic digestion*

Anaerobic digestion (AD) is a biological process that takes place in an anaerobic environment (without oxygen) and produces a gas which is mainly composed of methane and carbon dioxide, otherwise known as biogas. The broad ranges of organic feedstock have resulted in different AD technologies with the main distinction in the process types to deal with dry matter content of the substrate, temperature profile of the fermentation process, Loading system for the substrate (continuous vs batch), the number of reactors and type of reactor (i.e. vertical vs horizontal with different mixing technologies).

The cost for AD is above the full cost of landfill, but where there is a secure and stable local demand for the outputs, the business case over the long term may be viable.

### *5.6.3 Mechanical Biological Treatment*

Mechanical biological treatment (MBT) combines mechanical treatment with a biological treatment method (i.e. open windrow composting, materials recycling facilities, anaerobic digestion and in-vessel composting). An MBT plant would contain a mechanical section focusing on the "dry" fractions (sorting, homogenizing, shredding, pressing, etc.) and a biological section focusing on the fraction containing and richer in organic matter, aiming at reducing and stabilising the putrescible organic fraction. It is usually supported by a combination of pre-treatment and sorting techniques at the beginning of the process, and a selection of emissions control and quality control techniques at the end of the process. Typical mechanical treatments will include a range of sorting technologies, from simple sieve / trommel separation techniques to more advanced positive selection techniques like near infrared segregation.

MBT is generally used for mixed municipal waste and not separated organics.

[16] https://www.dffe.gov.za/sites/default/files/reports/advancedwastetreatment_chapter8.pdf

There are various options for the each of these aspects and these will depend on the source of the waste (household vs business/commercial), the quality and the volumes (i.e. economies of scale) as well as whether there are off-take opportunities.

### *5.6.4 Technology Comparison*

**Table 5** provides a high-level summary and comparison of the various technologies listing a summary of the advantages, disadvantages and risk that SM will need to consider when selecting possible solutions.

*Table 5: Organic Waste Treatment Technology Comparison*

| Treatment/ Technology | Advantages | Disadvantages and/or Risks for SM |
|---|---|---|
| **Home composting** | • No collection or separation costs or considerations for the municipality<br>• Sufficient for treatment of food waste<br>• Cost of providing a compost bin to a resident is considerably less than regular collections<br>• Good option to include in an overall waste diversion strategy | • Limited to willing households and households with gardens or space to use their own compost<br>• Cannot ensure 0% organic waste in waste stream<br>• Costs associated with provision of a composting bin<br>• Perception that it attracts pests and odours<br>• May be problematic for animal waste products<br>• Diversion rate not as easy to measure externally |
| **Open-windrow composting of garden waste** | • Relatively low capital waste treatment process<br>• Produces a saleable product<br>• Not technology intensive<br>• Can be scaled up easily and quickly provided the land/space is available<br>• Norms and Standards apply to composting and therefore a waste management licence may not be required | • Requires chipping of garden waste.<br>• Food waste needs to be carefully managed and mixed with garden waste so that it does not present a health risk, cause odour and cannot be scavenged or attract pests.<br>• Weather conditions can impact duration of process<br>• Collection infrastructure must be designed to accommodate waste types to be collected/received<br>• Bio aerosols can be created by turning of compost, and some odour issues can arise<br>• High use of water<br>• Stricter controls and better management required when including food waste and not only garden waste |
| **In-Vessel Composting Plant** | • Faster process than open windrows, resulting in product stabilisation / sanitation in 3 to 4 days<br>• Relatively small footprint allows entire process to take place in a controlled environment (inside a building)<br>• Maintain a rapid decomposition process year-round regardless of external ambient conditions | • Requires a curing process<br>• Requires active management to ensure a good mix of materials is processed,<br>• Potential for odour issues<br>• High use of water<br>• More capital intensive in terms of equipment than open windrow systems |
| **Small scale anaerobic digestion facility (gas to electricity).** | • AD has potential for treating a variety of organic waste streams<br>• Greenhouse gas and harmful gases are captured for use<br>• AD has the potential for energy production | • Capital intensive<br>• Requires on-going management<br>• Requires an intensive monitoring and control over conditions to maintain the digestion process<br>• Can be sensitive to imbalances in feedstock (e.g. high quantities of food versus garden waste or vice versa)<br>• Produces digestate as a by-product<br>• Health and safety issues can arise at AD plants<br>• Significant odour issues |

| Treatment/ Technology | Advantages | Disadvantages and/or Risks for SM |
|---|---|---|
| | | • Quality is often insufficient for the digestate to be used as soil enhancer |
| **Mechanical biological treatment**<br><br>Note -this is not an ideal process to divert organics from landfill | • Does not require implementation of separation at source<br>• Reduces volume of waste landfilled<br>• Can be used to remove hazardous contaminants and prevent them from reaching landfill due to sorting of prior to treatment | • Potential for odour issues<br>• A variety of occupational health and safety issues<br>• Dry recyclables separated out during the process will be of poor quality<br>• Demand fixed tonnages of waste<br>• **Large volume of tailings and contamination of recyclables compared to separation at source systems** |

The DFFE Alternative Waste Treatment Guide provides a table (**Table 6**)[17] which gives an indication of waste volumes needed in order to pursue specific technology options with the organic waste treatment options discussed in this report highlighted in red.

*Table 6: Waste volumes required to pursue specific technology options*

| | Short term | | | Medium term | | | | Long term | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Volumes: tonnes per annum | Open Windrow Composting | Clean MRF | Dirty MRF | Incineration | Aerobic Digestion | In-Vessel Composting | Mechanical Biological Treatment | Gasification | Plasma Gasification | Pyrolysis | Mechanical Heat Treatment |
| - to 10 000 | X | X | X | X | X | X | X | X | X | X | X |
| 10 000 to 50 000 | X | X | X | X | X | X | X | X | X | X | X |
| 50 000 to 70 000 | X | X | X | X | X | X | X | X | X | X | X |
| 70 000 to 90 000 | X | X | X | X | X | X | X | X | X | X | X |
| 90 000 to 130 000 | X | X | X | X | X | X | X | X | X | X | X |
| 130 000 to 170 000 | X | X | X | X | X | X | X | X | X | X | X |
| 170 000 to 190 000 | X | X | X | X | X | X | X | X | X | X | X |
| 190 000 to 230 000 | X | X | X | X | X | X | X | X | X | X | X |
| 230 000 to 290 000 | X | X | X | X | X | X | X | X | X | X | X |
| 290 000 to 490 000 | X | X | X | X | X | X | X | X | X | X | X |
| Inputs | A | B | C | D | A | D | E | D | F | D | G |

Key: X Yes X Maybe X No

## 5.7 Organic waste separation at source

In addition to the type of technology for organic waste treatment or processing, the diversion system/strategy will require a number of other components/aspects that the SM need to consider, these are:

1. Access to the organic waste i.e. separating it from the general waste stream.
2. Collection and transport of organic waste, this would include containers/bags, etc., as well as frequency.
3. Possible pre-treatment technologies/options
4. Markets for by and end-products.

As discussed in the Waste Roadmap, various separation at source systems are used internationally, these vary as follows:

[17] http://awtguide.environment.gov.za/content/technologies-required-waste-volumes

- The number of fractions being separated and this ranges from simple 2-bin (dry recyclables and residual waste) to 3-bin system (dry recyclables, organics and residuals) to more sophisticated and complex systems with multiple separate fractions (such as separate containers for paper, glass, metal, plastics, organics and residual waste)
- The type of collection system being used i.e. multiple vehicles, split-compartment vehicles, or integration of the informal sector (using trolleys or bicycles);
- The type of sorting and treatment facilities used to deal with the various separated fractions.

The Waste Roadmap also notes that in a number of European countries, the focus of S@S systems is on organic waste, rather than on dry recyclables (European Bioplastics, 2016). The argument for this approach is three-fold:

- Organic waste tends to make up a large proportion of total waste generation and therefore the diversion of organic waste is critical to achieving overall targets for diversion of waste from landfill.
- The bulk of the waste sector's contribution to climate change arises from the decomposition of organic waste at landfill.
- The waste (including recyclables) remaining after organic waste has been separated is cleaner and less contaminated, facilitating recovery and recycling. Separation of organic waste at source is therefore essential to enable a 'win-win-win' solution.

The ideal approach to divert organic waste from landfill would be a three-bag household separation at source programme for organics (excluding garden waste), packaging and general waste which should be aimed at minimising the packaging included with the organic waste and reducing the amount of organic waste in the general and residual waste stream.

The advantages of separate collection of organics compared to mechanical sorting is that the quality of feedstock is not compromised in terms of impurities and contamination. Quality "feedstock" is required for producing products to be marketed and used[18]. Poor quality feedstock i.e. contaminated feedstock makes it more expensive to process the material, due to the increased need for sorting and the increase in the amount of rejects generated.

Household separation of food waste should be convenient and manageable. This can be achieved by equipping households with a small kitchen-caddy and a set of compostable bags to be used as a liner.

The small bin size helps to prevent the delivery of impurities (e.g. bottles, cans). The use of the bags makes it possible to collect even meat and fish scraps along with vegetables and fruit residues, avoiding nuisance generally related to delivery of "loose" material inside the bin.

In addition, it prevents pest attraction (insects) and production of leachate, whilst keeping the bins as clean as possible. A minimum set of bags for the kitchen-caddies should be provided to each household, at least in the starting phase of the new collection scheme. This will support the participation of households in the source separation of all organic kitchen waste. Newspaper and paper bags may also be used to collect food waste. Wheeled bins (240 litres) can be used where the type of dwelling is mainly of flats in multi-storey buildings.

See **Plate 1** – **Plate 6** for examples of organic waste separation receptacles and customer guidelines.

[18] Ricci et al. Technical guidance on the operation of organic waste treatment plants (2016)


*Plate 1: Examples of 3-bin household collection programmes*


*Plate 2: Examples of countertop organic waste collection bins with compostable bag liners*


*Plate 3: Municipal organic fraction household collection guideline*


*Plate 4: Examples of organic fraction collection bags*


*Plate 5: Example of brochure used to provide residents with separation at source guidelines (WAAI, 2019)*

*Plate 6: Example of organic waste countertop caddy used with compostable bags as liners (WAAI, 2019)*

### *5.7.1 Collection systems[19]*

Waste collection systems are an important aspect of achieving waste diversion. The following are collection schemes which can be utilised:

#### *5.7.1.1 Drop-offs or bringing schemes*

The waste-producers (i.e. families and others) deliver the organic waste to communal containers located in public areas spaces or to an ORTS.

Bringing schemes usually use bigger containers available for a large number of waste producers. Garden waste drop-off sites can be located at other existing municipal facilities.

Bringing schemes might work well for complexes and estates and as a phased approach to allow participation for residents from areas which do not have kerbside collection.

Drop-off facilities should be mintored to ensure that they remain in compliance with the Norms and Standards in terms of NEM:WA.

#### *5.7.1.2 Kerbside collection (or door-to-door) schemes*

The waste-producers place their organic waste on their kerb where the collection is provided according to a fixed calendar.

Door-to-door schemes may require a specialised container/bin and usually adapt the volume of each bin or container to the production volumes for each specific waste producers (i.e. household vs business vs hospitality establishment). Depending on the container/bin being used, these schemes may allow for a basic quality inspection before the collection and transportation to the recycling facilities.

As food waste is highly putrescible and has a high moisture content, specific collection tools must be provided to the households to ensure that the system is clean, convenient and user-friendly. Once households feel comfortable with a system, the overall participation is enhanced.
A combination of a bringing scheme/drop-off and kerbside collection may be beneficial, as both options have their advantages and disadvantages as summarised in **Table 7**.

*Table 7: Advantages and disadvantages of bringing schemes and kerbside collection schemes*

| | Advantages | Disadvantages |
|---|---|---|
| **Drop-off** | • Least costly alternative as it does not require collection resources such as vehicles, collection staff etc.<br>• Provides for optimised collection and transport<br>• -Suitable for oversize materials<br>• Suitable to combine with the collection and temporary storage of other separately collected materials, like green waste, recyclables; household hazardous waste, bulky waste, etc) | • Potential for low diversion rate due to low participation due to potential distance to residents Not as convenient as kerbside collection schemes and may therefore result in low participation rates. |
| **Kerbside collection** | • Suitable for green waste and food waste.<br>• Facilitates higher participation rates as it is more convenient. | • Substantially higher cost than maintaining and operating a network of drop-off sites.<br>• Costly to acquire non-compactor trucks for organic waste collection. |

[19] Ricci et al. Strategy for organic waste diversion – collection, treatment, recycling and their challenges and opportunities for the City of Sao Paulo (2016)

| | Advantages | Disadvantages |
|---|---|---|
| | • Collection services could be sub-contracted to avoid the purchase of collection vehicles and paying of collection staff etc.<br>• Convenient for households.<br>• May results in higher participation rate.<br>• May result in less contamination and therefore higher value recyclable stream.<br>• If organics are separated at source, the cleaner recyclable fraction could be collected every-two weeks. | • Frequency of collection may need to change / increase according to seasonality.<br>• Difficult to verify the quality of the waste collected.<br>• Public concern due to perception that it will attract nuisances/pests and be a health risk to the neighbourhood.<br>• Health risk if salvaging of organic waste takes place.<br>• Garden waste should be placed in a reusable container (e.g. drum) or in a bag (compostable).<br>• Necessitates weekly scheduled collection service. |

### *5.7.2 Collection infrastructure*[20]

Collection vehicles for food waste

Food waste is a moist and low volume material with a bulk density (0,45 to 0,65 kg/l) that enables the use of much simpler vehicles such as trucks with skips / containers, since there is no need for a compaction mechanism.

Standard compactors used to collect mixed MSW are normally not water-tight and hence are likely to leach if loaded with food waste. The separate collection of food waste necessitates for an appropriate fleet of vehicles to perform separate collection of food waste correctly. These vehicles need to be water-tight to avoid leaching during collection and transport.

Collection vehicles for garden waste

Green waste is bulky and rich in structure due to bush and tree cuttings and thus has a very low bulk density (0,15 to 0,25 kg/l). For efficient collection, it is suggested to make use of compacting vehicles or bush and tree cuttings to be shredded directly at the site of collection and then transported with container vehicles.

#### *5.7.2.1 Frequency of collection*

The different types of organic waste have different properties and therefore require the adoption of different management, including collection frequency.

**Food waste** is highly putrescible and has a high moisture content; hence fermentation processes, when stored in a bin, starts rapidly. This requires the adoption of specific frequencies in order to ensure the system performs as cleanly, conveniently as possible in a user-friendly manner.

**Green waste** has a lower moisture content, a lower density due to large amounts of wood or bulky, or dry organics, and hence does not require such intensive collection patterns as food waste because it does not smell, does not lead to rapid production of leachate and it does not attract flies and other worms.

According to experiences in hot and humid climate, that can be found in Mediterranean countries such as Italy, Spain or others similar to Stellenbosch, the following frequencies are recommended for food waste collection[21]:

- Kerbside collection for households should have a minimum of one to two collections per week.

[20] Ricci et al. Strategy for organic waste diversion – collection, treatment, recycling and their challenges and opportunities for the City of Sao Paulo (2016)

[21] Ricci et al. Technical guidance on the operation of organic waste treatment plants (2016 p.27)

- Kerbside collection for commercial activities should have a minimum three collections per week or more.

## 5.8 Examples of Organic Waste Pre-Treatment Technology

Pre-treatment methods or systems for organic waste can be used to stabilise organic waste during temporary storage as well as to reduce the volume prior to transport. Organic waste can consist of up to 60% moisture.

Some mechanical pre-treatments may also include actions such as:

- Bag opening or de-packaging of waste – emptying of organic waste from collection containers as well as de-packaging condemned or expired food waste.
- Shredding of waste – garden waste as well as items such as compostable paper cups, bagasse food containers, egg boxes.

These would take place at the processing or treatment facility or newly constructed ORTS.

Examples of biological pre-treatment technologies are provided below. These systems that could be placed at shopping malls or large buildings/complexes where large volumes of organic waste are generated and the bin could reduce collection frequency as well as volumes to be transported. These systems are modular and could also be placed at drop-off points or the ORTS to reduce volumes prior to transport to the selected treatment facility.

### *5.8.1 Biobin*

The Biobin is a compost vessel that is used for organics recycling. It is a patented technology which provides an aeration system which initiates the composting process and reduces odours, bacteria and other pathogens.

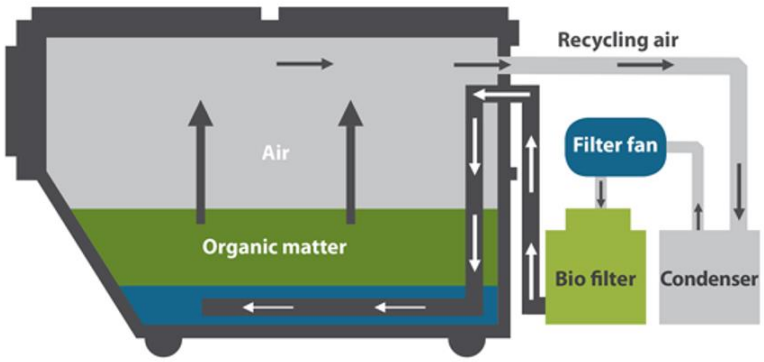



*Figure 10: Image of how the Biobin works.*

### *5.8.2 The Heron In-Vessel Composter*

The Heron IVC took over three years to develop and is produced in South Africa. It is capable of processing over 1 000kg of food waste per day and is targeted at industrial food manufactures, large malls and produce markets. The Heron IVC employs mechanical aeration to ensure the food waste receives adequate oxygen and the mechanical system also mixes the waste as it composts and moves through the vessel.


*Figure 11: The Heron IVC*

The Heron IVC has been tested at Tshwane Fresh Produce market on a trial basis and the project was independently assessed by GCS Environmental Engineers (Pty) Ltd[22]. During the test the Heron IVC processed an average of 826kg of food and waste cardboard per day. GCS's analysis indicated that on a larger roll out, the economic benefit accruing to the Tshwane Municipality of R271 000 excluding CO2e saving and potential compost sales. The compost produced was tested by the Agricultural Research Council and indicated high potential for the compost produced.

The GreenCape 2021 Waste Market Intelligence Report states that Canal Walk shopping centre has installed a 40 tonnes per month Heron IVC composter at its newly constructed waste recovery yard and that in-vessel composters are gaining traction for onsite treatment for large facilities. Largely to reduce the organic waste volume and transport logistics.

## 5.9 Lessons learnt and pitfalls to be avoided

Municipalities in South Africa regularly receive offers from waste treatment technology suppliers and it is crucial that appropriate due diligence is undertaken on any alternative waste management system and technologies prior to making a decision to implement. Deciding which approach fits the particular situation, and what the best method is to divert organic waste from landfill, requires a holistic approach and study to guide the waste diversion decision. The following are some general lessons that have been learnt and pitfalls that can be avoided[23] by undertaking holistic analysis and an informed approach to the whole waste management system:

- Failure to properly understand the waste flows – quality and quantity
- Failure to recognise that the waste is variable and will change significantly over time
- Failure to match waste feedstock (including variability) with technology
- Failure to select technology that is proven - and therefore 'bankable'
- Failure to understand the character of the process outputs
- Failure to have established, sustainable and commercially viable markets for all process outputs
- Failure to recognise that market demands can, and will change over time

[22] https://greenhome.co.za/blog/industrial-composting/

[23] The Role of Anaerobic Digestion Technology in Treating Organic Waste – UK Experience Presentation to GreenCape Networking event, 23rd August 2016. Andrew Street Director, SLR Consulting

Other key factors that are critical lessons to be understood for a successful system according to the research undertaken by the JG Afrika project team and documented in the Market Study are [24]:

- **Source separation is key**: physical availability of feedstock is rarely an issue for a facility, however, access to feedstock could be prevented by lack of participation, contractual arrangements or inability to reach agreement about gate fees and quality requirements. Therefore, the key issue is achieving clean and accessible material streams through source separation.
- **Awareness raising in the communities:** General public awareness and their willingness to cooperate are key factors for a successful separation at source strategy.
- **Feedstock is a local issue and needs to be checked for each facility**: The transport cost for organic material is high (as it is for all waste material) and imposes a financial limitation on the feasible distance for transport to a treatment facility of roughly 40 to 60 kms. To be economically feasible, compost or compost-like outputs from organic waste treatment processes should only be transported an equal distance from generation point. Therefore, not only feedstock availability must be considered but a local market for final products needs to be confirmed locally for each facility. This applies to municipalities who need to consider the distance between towns in the municipal area, and where treatment or collection facilities should be located.
- **Competition for feedstock must be considered**: As treatment facilities grow in number it is likely that competition between the different treatment options may arise. Awareness of these market forces must be kept in mind in ongoing planning and management of facilities to ensure feedstock security.
- **Contracts must be screened for potential conflict of interest**: projects implemented in joint venture arrangements, which include feedstock providers and off-takers may not lead to the desired outcomes if the main interests could jeopardise the viability of a treatment facility and diversion from landfill targets.
- **Foster relationships in the value chains:** fostering good relationships between feedstock providers and off-takers of outputs is central to the ongoing success of organic waste treatment, especially as a result of the limitations imposed by the costs of transport for feedstock, by and end-products as well as digestate for example.
- **Consistency and variability of feedstock supply and composition must be considered:** for example, green/garden waste generation follows seasonal trends as does organic waste generated by the hospitality industry, particularly in towns such as Stellenbosch with a distinct tourism season.
- **Contamination/quality of feedstock must be considered:** Quality "feedstock" is required for producing products to be marketed and used[25]. Poor quality feedstock i.e. contaminated feedstock makes it more expensive to process the material, due to the increased need for sorting and the increase in the amount of rejects generated. The better quality and leaner the feedstock the better the quality of the end product will be.

The *Bio-waste generation in the EU Report, 2020* states that all separate collection systems aim to maximise collection of materials but practically will never achieve or reflect 100% of the targeted material as it depends on:

- **Errors/confusion in behaviour of households and waste producers**: this should be continuously targeted with information and communication, building on and expanding knowledge by providing feedback to inform participants what materials are most often wrongly sorted (e.g. bones or shells, meat, food still attached to packaging, dog faeces).

[24] Waste Management Flagship Programme. Development of a Funding Proposal to the GCF for the MSW Programme including, a Feasibility Study, ESIA, GIA and Detailed Designs for the Target Municipalities. Market Research Study. June 2020. JG Afrika Project Team.

[25] Ricci et al. Technical guidance on the operation of organic waste treatment plants (2016)

- **Collection scheme timing**: some households may be on holiday or temporary residents and cannot wait until the next collection round. This can be addressed by actions such as providing and communicating effectively about drop-off sites etc.
- **Adoption of practices such as home composting:** Although this will still result in the targets being met but cannot be measured by a Municipality, a more sensible goal would be to define a targeted 'operational potential' in line with best practices, based on existing data and studies. It is estimated that this could be set at approximately 85% of the theoretical potential. This kitchen waste cannot be taken care of completely through home composting schemes, especially in urban areas, which is why we set the 85% collection target

The basic assumption is that if households generate garden waste, at least some of it can be managed in their own gardens by home composting, which should be encouraged by specific campaigns. Meanwhile,

# 6 STELLENBOSCH MUNICIPALITY'S ORGANIC WASTE TONNAGES

## 6.1 Organic Waste Tonnages

The SM is currently diverting a large proportion of organic waste in the form of the garden waste (greens) which is chipped on site at Devon Valley Landfill Site and removed for composting. This is provided in **Table 8** along with the waste being generated and disposed of to Landfill (excluding construction waste/builder's rubble) from 2018 to 2020. Although overall waste tonnages have dropped the green waste have remained reasonably consistent over these three years.

*Table 8: Waste disposed to landfill and green waste diverted from 2018 to 2020*

| | 2018 | 2019 | 2020 |
|---|---|---|---|
| **Waste disposed to Landfill (excl builder's rubble) (tonnes)** | 78 964 | 56 426 | 47 767 |
| **Green Waste diverted (tonnes)** | 5 571 | 5 272 | 6 937 |

Note: The accuracy of the green waste diverted is dependent on the accuracy of the information provided by SM and there are a number of months where the garden waste tonnages were extremely high and have been questioned. In 2020, the SM switched to the use of weighbridge data rather than manually captured data which could account for discrepancies.

Based on the Waste Characterisation, the fraction of organic waste produced at household and business (excluding industrial waste) is 24% for organic/food waste and 6% for garden waste. This waste is being disposed of to landfill and is where organic waste diversion opportunities lie for Stellenbosch Municipality. **Table 9** provides the green and organic waste tonnages calculated using the percentages from the waste characterisation data for 2018 to 2020.

*Table 9: Green and organic waste tonnages calculated using the waste characterisation data.*

| | 2018 | 2019 | 2020 |
|---|---|---|---|
| **Waste disposed to Landfill (excl builder's rubble) (tonnes)** | 78 964 | 56 426 | 47 767 |
| **Estimated Organic Waste tonnes (based on 24%)** | 18 951 | 13 542 | 11 654 |
| **Green Waste tonnes (based on 6%)** | 4 738 | 3 386 | 2 866 |
| **Total Organic waste (30%)** | **23 689** | **16 928** | **14 330** |
| | | | |
| **Existing Organic Waste Diversion %** | **24%** | **31%** | **48%** |

The Devon Valley Landfill Site's waste management licence requires a 50% reduction in the amount of organic waste that is disposed of to municipal WDFs by 2022, followed by a complete ban of organics to WDFs by the year 2027.

## 6.2 Organic Waste Diversion Limitations

It should be noted that a 100% organic waste diversion target is practically not possible to meet and the residual fraction may always contain some organic waste. SM will endeavour to make organic waste diversion opportunities available to all residents in the municipal area.

It should be noted that the Devon Valley landfill site is currently not operational and only expected to begin accepting waste in a new cell during the course of 2024. As SM dispose of their municipal waste at a private landfill site and not a municipal facility, it is unclear how the targets can be applied or enforced, however SM endeavour to take the necessary steps to meet the diversion targets in the spirit of the requirements and are working towards meeting the targets when disposal commences at the municipal landfill site once again.

## 6.3 Conclusion and Recommendations

Based on the calculated tonnages of organic waste produced per annum (**Table 9**) compared against the information presented in
**Table** 6 it appears that the most feasible organic waste diversion and treatment strategy is open windrow composting. However various investigations and studies will be required to confirm the best approach and these are recommended and detailed in the organic waste diversion Implementation Plan to confirm this.

Consideration of the inclusion of food waste with garden waste for composting will need to be taken into account when selecting a treatment technology. The outsourcing of organic waste treatment is therefore recommended while the Municipality put the systems to support treatment in place i.e., separation at source, collection mechanisms etc.

The Organic Waste Diversion Implementation Plan provides a phased approach until 2027 to fully understand the existing system with various feasibility studies and plans to be developed in parallel. This will allow SM to plan a system on a step-by-step basis that aims to meets the set diversion targets.

# 7 ORGANIC WASTE DIVERSION PLAN

It is recommended that the SM pursue a multi-pronged approach to organic waste diversion which favours and encourages separation at source, identifies a treatment option and creates an enabling environment. Certain activities will need to run in parallel as a number of studies are required to inform decision-making and planning before the final Organic Waste Diversion System is put in place. The recommended approach is detailed in this section.

## 7.1 Separation at source roll out Strategy for a phased 3-bag separation at source programme

### *7.1.1 Separation at Source Strategy*

The phased implementation of a three- bag separation system in selected households/areas, with continued roll out of the programme until 2027 to include all residential areas.

The Strategy should include a pipeline plan with the plan of which areas to follow on from the existing two bag collection areas and rolling out to a set plan of new areas on an annual basis (see **Annexure B** which indicates the Organic Waste percentage of waste in the two-bag system areas, providing an indication of diversion that can be achieved). It is recommended that the three-bag collection system is piloted in the existing two-bag collection areas to inform pipeline planning.

The Strategy needs to take into consideration the different needs of residential vs business/commercial customers as well as how the logistics and volumes collected will impact on the collection, transport and treatment required. The identification of Organic Waste Drop-off areas/points to service areas not included in 3-bag system to be included in the strategy. These should be developed on a small scale and below any legislative triggers for a WML and should be in compliance with the Norms and Standards.

The establishment of drop-offs can also be undertaken in a phased approach:

- Allow food waste to be collected at existing drop-offs.
  - Collection receptacles to be made available at drop-offs.
  - Contractor collecting from households and businesses to collect from drop-offs on a daily basis.
- Establish additional new drop-off areas on an ongoing basis.
- Drop-offs may include pre-treatment facilities, if appropriate as per the feasibility studies.

<u>Residential Areas</u>

In residential areas where kerbside collection will take place, the following is recommended:

- Black bag (landfill waste) – weekly
- Clear bag (recyclables) – every 2nd week
- Food waste container & green waste bag– weekly (to be collected separately)

A food waste container accompanying bags should be provided at organic waste drop-offs with a replacement bag being provided with each drop-off.

Ultimately, all residential areas to be covered by either participating in a three-bin/bag collection system or have easy and close access to a drop-off facility by June 2027. Participation should not be voluntary, it should be mandatory, however, the tariff should be less than black bag collection to incentivise participation.

Residents to be signed up with a visit from Municipality and accompanying explanatory brochure. The Municipality to provide ongoing support and communication as part of the Communication and Awareness strategy.

In addition to the three-bag system, the provision of home composting bins to all households willing to participate should be rolled out based on lessons learnt from current pilot project.

Commercial/Business Areas

All commercial and business areas should be required to participate as follows:

- Black bag (landfill waste) – daily or every 3 days
- Clear bag (recyclables) – weekly or every 3 days
- Food waste – daily or every 3 days

Commercial/Business Areas producing large volumes of organic waste should be identified and targeted as the first step in initiating separation at source in these areas. All business and commercial areas to be participating in a three-bag system with all areas covered to commence from 1 July 2026 with ongoing maintenance of existing systems.

In some Commercial/Business Areas, e.g., malls and the university, pre-treatment facilities may be considered. This will be informed by the feasibility study. These may also be considered for use as drop-off areas for residents, depending on the outcome of the study.

SM should consider alignment with other programmes in the municipal areas, such as the reuse strategy, 3-bin system and zero waste to landfill targets being implemented by SU for roll-out in the municipal commercial and business areas. These discussions and investigations should take place as part of developing the strategy.

### *7.1.2 Implement Mandatory Separation at Source*

Included in the Separation at Source Strategy should be the steps needed to implement mandatory separation at source in terms of the by-law. The Strategy should include communication and awareness raising to obtain buy-in and incentivised cooperation rather than enforcement. This should also include the mandatory separation of green/garden waste.

### *7.1.3 Collection*

A feasibility study for collection fleet upgrade / diversification / replacement should be undertaken should waste collection be undertaken by SM. The outcomes of the feasibility study should feed into the three-bag household collection plan. Consideration should be given to whether food waste and garden waste can or should be collected with the same vehicle or trip or if these should remain separate. The decision around bags, caddies and drums vs bags for food vs garden waste will also need to be a consideration.

It should be noted that once separation at source commences, this will need to include kerbside collection at participating households and businesses, etc., and removal for treatment. The following should be noted:

- Once the ORTS becomes operational[26] the off-take contract may shift to the collection from the ORTS.
- For collection from the organic waste transfer station as an initial step in the phased 3-bag separation at source programme.
- This could ultimately be undertaken by the SM or an external party/contractor and would be informed by the various feasibility studies that will be conducted.

These waste collection/transportation options to be guided by the Fleet Upgrade Feasibility Study to be undertaken in parallel to the Separation at Source Strategy as these are interlinked.

[26] In terms of the ORTS construction, an Environmental Authorisation (EA) was issued on 28 April 2021 and construction is planned to commence in July 2022 with completion in 2023.

The aim would be to collect organic waste and transport to the ORTS in the long term, although the feasibility of this from areas such as Franschhoek will need to be determined and included in the study. As part of the initial phase, SM to appoint collection service providers for food waste to transport to their own RTS facility or who can take it directly to a treatment facility. This contract should end on 31 June 2023 and updated/renewed to allow food waste to be taken to ORTS (when construction is completed). The collection contract could allow for the inclusion of the removal of the organic waste for treatment, however this would be informed by the feasibility studies.

## 7.2 Green/Garden Waste

SM should implement and encourage/incentivise separation of green (garden) waste along with enforcement of the by-law as a last resort. Aspects for consideration include:

- Communication and awareness for residents.
- Monitor and evaluate uptake amongst residents.
- Target areas where volumes are more significant than individual residents e.g., complexes, estates.
- Roll out to continue into all residential areas.
- Implement by-law and enforce mandatory garden waste separation.

SM to continue with green waste chipping as per the current system, as it is successful and runs well on an outsourced basis. However:

- Increase scope to include chipping in Franschhoek and at the Klapmuts RTS.
- Aim to divert the remaining 6% of garden waste that is disposed of with municipal waste (as per the Waste Characterisation) to separate all garden waste from waste being disposed of to landfill.

## 7.3 Treatment of the Organic Waste

It is recommended that SM undertake a Waste Characterisation Study to update existing information and feed into feasibility studies. The Request for Quotation (RFQ) for a Waste Characterisation study should be advertised to update the 2017 data/information. The Waste Characterisation Study should focus specifically on organic waste fraction as well as calorific values. (It is, however, also recommended to include the characterisation into specific recyclable fractions to provide additional information for MRF operations).

SM is currently undertaking a Feasibility Study for Landfill Gas Capture and generation of electricity. It is therefore recommended that this study is followed by a Feasibility Study for the construction of an AD to treat organic waste and generate biogas as follows:

- If the LFG feasibility determines LFG capture is a feasible option.
    - Supplementing the LFG being captured with biogas to generate electricity if LFG feasibility determines LFG capture is feasible.
- Alternatively, if the LFG feasibility determines LFG capture is not a feasible option -
    - a feasibility study could be undertaken to determine if AD is feasible for only treating municipal organic waste.
    - Identification of other AD facilities in the municipal area that have capacity/willingness to accept municipal food waste and determine what the contractual arrangements would be to foster this as an option which should be included in the study.
    - Identification of other organic waste treatment facilities within the SM should be identified with capacity to accept municipal organic waste i.e., leveraging existing infrastructure. This may require a public-private partnership agreement which should be included in the study.
    - Alternative off-take or treatment options could be investigated.
        - Consider pre-treatment of organics at organic waste transfer station.
        - Consider partnering and providing pre-treatment facilities or infrastructure for organics at various facilities/areas not within close proximity to the ORTS or where the volumes would justify it e.g. malls, university, schools, etc.

- Potential to combine organic waste with other waste types in the municipal area, leveraging existing treatment infrastructure.
- To be determined by the outcome of feasibility studies and decision of treatment options.

The final destination/treatment for organic waste to be determined by 30 June 2023 and budget made available to proceed with selected option from 1 July 2023 (construction of ORTS should be nearing completion).

### 7.4 Off-take for Organic waste

A phased approach to the off-take and treatment of organic waste will be required as follows:

- Identify an off-take for food waste:
  - External contractor that collects to remove for treatment at a licenced facility (if applicable).
  - External contractor with expanded collection footprint to remove for treatment at a licenced facility (if applicable).
  - External contractor to collect with temporary storage at the ORTS.
  - Final destination to be determined by outcome of feasibility studies and decision for treatment.

### 7.5 Tariff update

- Incentivise commercial/business organic waste separation, provide bags or bins and collect daily or 3 days per week as a minimum, in business areas, CBD areas including the University with enforcement of the by-law as a last resort.
- Update the municipal tariffs with a Separation at Source tariff that is lower than the black bag collection tariff as a financial incentive to participants.
  - Combined Tariff for three-bag collection to be less than black bag collection for residential and commercial/businesses.
  - Include separate tariff for food waste only collection for businesses.

### 7.6 Training, Education and Awareness Campaign

SM will need to develop a training system for collection crews and waste staff with regard to the collection of organics and changes to the existing system. This should be ongoing as the various phases are implemented. Feedback from staff should also be included in decision making and evaluating the roll-out.

In terms of Education and Awareness, as SM introduces changes to municipal areas this should be accompanied by the development of a general communication and awareness campaign as well as specific targeted campaigns for areas where programmes will commence. This should include:

- Direct communication to residents and businesses in Separation-at-Source areas.
- Education and awareness around home composting bin roll-out.
- Ongoing communication and awareness to be undertaken.

The education and awareness plan to be updated as roll out continues according to feedback from participants, staff and any changes resulting from studies etc.

### 7.7 Monitoring and Measuring

SM should develop and implement an improved monitoring and measuring system for all waste data and interrogate information on a regular basis. The system will need to include all waste as well as organic waste that is:

- Collected
- Home composted as part of Municipal trials/projects
- Treated

This data is critical as it will allow SM to communicate progress against targets to DEA&DP. The development of an online system or mobile app to allow participation should be investigated, with an incentive built in for residents/business to report their data.

This information can also be used to report on the municipal carbon footprint.

## 7.8 Summary of Expected Outcomes

The outcome of the implementation of the Organic Waste Diversion Plan is expected to include:

- Organic Waste Drop-off sites;
- Three bag separation at source in all residential areas within the Stellenbosch Municipal area;
- Organic Waste separation and collection for all business and commercial areas;
- Partnership with Stellenbosch University to ensure the waste management systems are aligned;
- Transport system to collect organic waste and transport to the ORTS;
- A long term off-take solution for organic waste;
- Improved waste data capturing and reporting; and
- Communication and awareness strategy focussed on Separation at Source and organic waste.

## 7.9 Waste Diversion Targets

The estimated waste tonnages that will be produced in the Municipality have been calculated from 2022 (the first year with a target of 50% diversion which needs to be met) using an annual 2.2% increase in tonnages based on a 2.2% population growth rate and is presented in **Table 10**. The tonnages to be diverted have been calculated using the waste characterisation percentages for organic and green waste.

*Table 10: Estimated waste tonnages for the period 2022 to 2027 with estimated diversion tonnage targets*

| | Estimated Tonnages | | | | | |
|---|---|---|---|---|---|---|
| | **2022** | **2023** | **2024** | **2025** | **2026** | **2027** |
| **Waste generated for disposal to Landfill (excl builder's rubble) (tonnes)** | 57 667 | 58 936 | 60 233 | 61 558 | 62 912 | 64 296 |
| **Estimated Organic Waste tonnages (24%) (tonnes)** | 13840 | 14145 | 14456 | 14774 | 15099 | 15431 |
| **Estimated Green Waste tonnages (6%) (tonnes)** | 3460 | 3536 | 3614 | 3693 | 3775 | 3858 |
| **TOTAL Organic waste (30% of waste generated) (tonnes)** | **17 300** | **17 681** | **18 070** | **18 467** | **18 874** | **19 289** |
| Target (% diversion of organic waste) | 50% | 60% | 70% | 80% | 90% | 100% |
| **Diversion Target (tonnes) per year** | **8 650** | **10 608** | **12 649** | **14 774** | **16 986** | **19 289** |

*Assumptions*:

- The tonnages provided by SM are accurate and without error.
- 2.2% population growth rate has been used and applied to 2019's annual waste disposed to Landfill (as per the IWMP). 2019 is regarded as a better representation of typical waste volumes generated due to the Covid-19 Pandemic in 2020.
- Waste disposed of to landfill has been estimated using an average of 2018-2020 tonnages to obtain tonnages for 2022.
- Subsequent total tonnages have been calculated using the same average less the volume of organic waste diverted the previous year, with a 2.2 % growth rate.
- Waste character remains the same i.e.
    - Estimated Organic Waste volume (24%) of waste disposed of to landfill.
    - Green Waste (6%) of Waste disposed of to landfill.

- Recyclables diversion from landfill is expected to increase from 5 November 2021 with the implementation of the EPR Regulations.
- Achievable interim targets for 2023 to 2026 and are not legislated.
- Targets of 50% organic waste diversion for Western Cape municipalities by 2022 and 100% organic waste diversion by 2027 are legislated.

The information provided in **Table 10** is graphically illustrated in **Figure 12.**

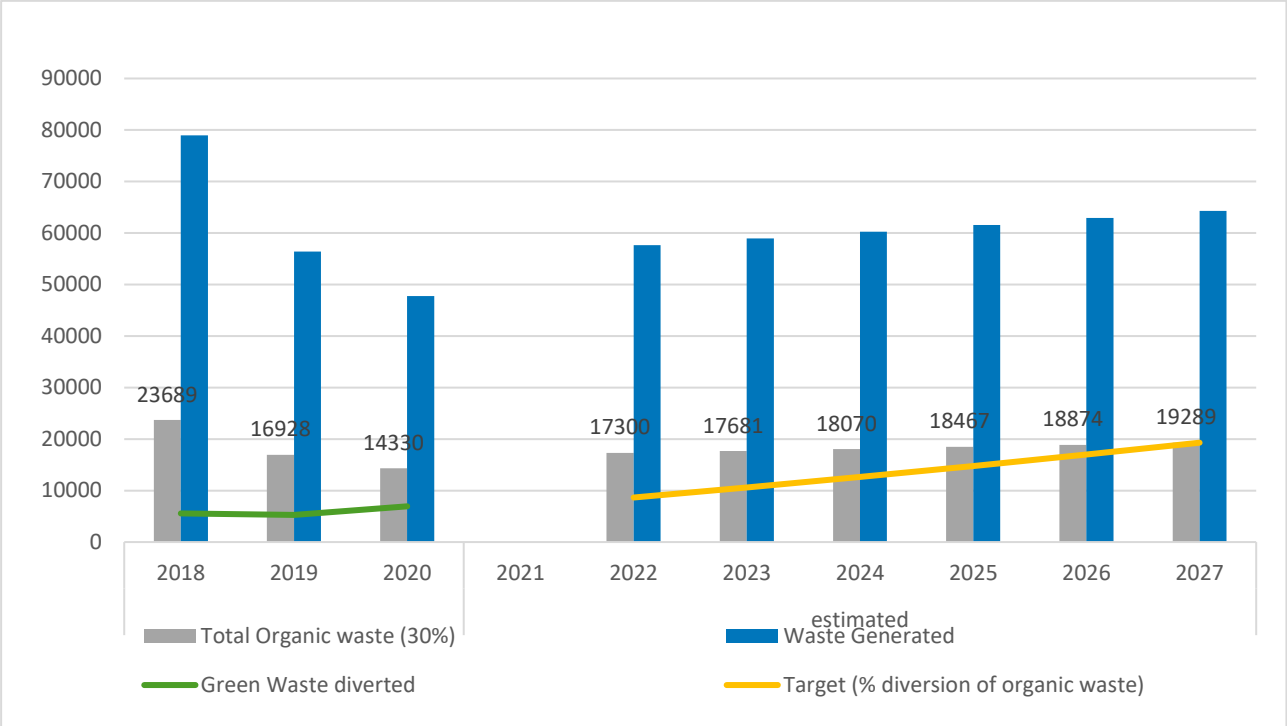



*Figure 12: Estimated waste generation and organic waste diversion targets.*

**The estimated tonnages indicate that the SM need to maintain their current diversion of organic (green) waste volumes of 2020 to meet their 2022 target of 50%, however, it is important to note that this is just an estimate and may change depending on the actual volume of waste disposed of to landfill.**

Planning for waste diversion will need to take place in 2021 and 2022 as well as implementation of diversion measures by the end of 2022 to ensure increased diversion percentages are reached by 2023. The steps to be taken to ensure waste diversion targets are met are set out in the Implementation Plan.

The timeframes of the Implementation Plan have been set in 6-month intervals and aligned with the municipal financial year and are set out as follows:

- **Phase 1:** 2021/22 Financial Year
  - Jan 2022 – June 2022
- **Phase 2**: 2022/23 Financial Year
  - a - July 2022 – Dec 2022
  - b – Jan 2023 – June 2023
- **Phase 3**: 2023/24 Financial Year
  - a - July 2023 – Dec 2023
  - b – Jan 2024 – June 2024
- **Phase 4**: 2024/25 Financial Year
  - a - July 2024 – Dec 2024
  - b – Jan 2025 – June 2025

- **Phase 5**: 2025/26 Financial Year
    - a - July 2025 – Dec 2025
    - b – Jan 2026 – June 2026
- **Phase 6**: 2026/27 Financial Year
    - a - July 2026 – Dec 2026
    - b – Jan 2027 – June 2027

## 7.10 Implementation Plan

**Table 11** provides a summary of the proposed implementation plan with the associated timeframes.

*Table 11: Summary table of the Implementation plan with proposed timeframes*

| Aspect | Actions | Timeframe | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Jan 2022 – June 2022 | July 2022 - Dec 2022 | Jan 2023 - June 2023 | July 2023 - Dec 2023 | Jan 2024 - June 2024 | July 2024 - Dec 2024 | Jan 2025 - June 2025 | July 2025 - Dec 2025 | Jan 2026 - June 2026 | July 2026 - Dec 2026 | Jan 2027 - June 2027 |
| | | **Phase 1** | **Phase 2 a** | **Phase 2 b** | **Phase 3 a** | **Phase 3 b** | **Phase 4 a** | **Phase 4 b** | **Phase 5 a** | **Phase 5 b** | **Phase 6 a** | **Phase 6 b** |
| **1.Separation at Source Strategy** | | | | | | | | | | | | |
| **Develop Strategy:** | Pipeline plan for areas to follow on from the existing two bag collection areas, with roll out to new areas on an annual basis | x | x | | | | | | | | | |
| **Implement Strategy:** | | | | | | | | | | | | |
| <u>Residential Areas:</u> | Start in existing Two Bag Areas | | | x | | | | | | | | |
| | Continue to expand into other areas as per plan | | | | x | x | x | x | x | x | x | x |
| | Identify & establish Organic Waste Drop-off Areas | | | | x | | x | | x | | x | |
| | Home Composting Bins Roll-out | | x | | x | | x | | x | | x | |
| | Mandatory Garden Waste separation implemented | | | | x | | | | | | | |
| | Additional Garden Waste drop-off areas | | | | x | | x | | x | | x | |
| <u>Commercial/Business Areas</u> | Identify target areas = large volume producers | x | | | | | | | | | | |
| | Implement 3-bag system or separate organic waste | | x | | x | | x | | x | | x | |
| | Identify possible Collection points & areas for Pre-treatment technology placement e.g. Malls, University | | | | x | | | | x | | | |
| **Mandatory Separation at Source:** | Communication Awareness campaigns | | x | x | x | x | x | x | x | x | x | x |
| | Tie in with Communication Strategy | | | x | x | x | x | x | x | x | x | x |
| **Collection Fleet Feasibility Study:** | Outcomes to feed into the Separation at Source Strategy | x | x | | | | | | | | | |

| Aspect | Actions | Timeframe | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Jan 2022 – June 2022 | July 2022 - Dec 2022 | Jan 2023 - June 2023 | July 2023 - Dec 2023 | Jan 2024 - June 2024 | July 2024 - Dec 2024 | Jan 2025 - June 2025 | July 2025 - Dec 2025 | Jan 2026 - June 2026 | July 2026 - Dec 2026 | Jan 2027 - June 2027 |
| | | **Phase 1** | **Phase 2 a** | **Phase 2 b** | **Phase 3 a** | **Phase 3 b** | **Phase 4 a** | **Phase 4 b** | **Phase 5 a** | **Phase 5 b** | **Phase 6 a** | **Phase 6 b** |
| **2.Treatment of the Organic Waste** | | | | | | | | | | | | |
| | Feasibility Study for Landfill Gas Capture (completed) | x | | | | | | | | | | |
| | Waste Characterisation (to inform all studies) | x | | | | | | | | | | |
| *If LFG **is feasible*** | Feasibility Study to include Organic Waste only | x | x | | | | | | | | | |
| | **OR** | | | | | | | | | | | |
| *If LFG capture is **not feasible*** | Feasibility Study for AD for Organic Waste only | | x | x | | | | | | | | |
| | Identification of other AD facilities in the municipal area | | x | x | | | | | | | | |
| | Identification of other organic waste treatment facilities | | x | x | | | | | | | | |
| | Alternative off-take or treatment options | | x | x | | | | | | | | |
| | **ORTS Construction Completed & Treatment Solution confirmed** | | | | | **X** | | | | | | |
| **3.Collection & Off-take for Organics** | | | | | | | | | | | | |
| | External contractor to collect & remove for treatment | | x | | | | | | | | | |
| | External contractor to continue, expanded collection footprint | | | x | x | x | | | | | | |
| | External contractor to collect; transport to ORTS | | | | | x | x | x | x | | | |
| | Collection, transport & treatment (as per outcome of feasibility studies) | | | | | | | | x | x | x | x |
| **4.Tariff update** | | | | | | | | | | | | |
| Residential Areas & Commercial/Business areas | Combined Tariff for 3-bag collection less than black bag | | | x | | | | | | | | |
| Commercial/Business Areas only | Separate tariff for food waste only collection for businesses | | | x | | | | | | | | |

| Aspect | Actions | Timeframe | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Jan 2022 – June 2022 | July 2022 - Dec 2022 | Jan 2023 - June 2023 | July 2023 - Dec 2023 | Jan 2024 - June 2024 | July 2024 - Dec 2024 | Jan 2025 - June 2025 | July 2025 - Dec 2025 | Jan 2026 - June 2026 | July 2026 - Dec 2026 | Jan 2027 - June 2027 |
| | | **Phase 1** | **Phase 2 a** | **Phase 2 b** | **Phase 3 a** | **Phase 3 b** | **Phase 4 a** | **Phase 4 b** | **Phase 5 a** | **Phase 5 b** | **Phase 6 a** | **Phase 6 b** |
| **5.Training, Education and Awareness Campaign** | | | | | | | | | | | | |
| **Training** | Training system for collection crews and waste staff | | | x | | | x | | | x | | |
| **Develop communication & awareness campaign** | General communication and awareness campaign | | x | x | | | x | | | x | | |
| | Direct communication to Separation-at-Source areas | | x | x | x | x | x | x | x | x | x | x |
| | Provide feedback to community (ongoing) | | | x | x | x | x | x | x | x | x | x |
| | Education and awareness around home composting bin roll-out | | x | | x | | x | | x | | x | |
| **Engage with stakeholders/partners to align** | Identify stakeholders or partnership e.g. University | | | | x | | | | | | | |
| | Engage and align strategies & solutions | | | | | x | | | | | | |
| **6.Monitoring and Measuring** | | | | | | | | | | | | |
| **Develop monitoring and measuring system** | Waste *Collected* | | x | | | | | | | | | |
| | Home *composted* waste as part of Municipal trials/projects | | x | | | | | | | | | |
| | Waste *Diverted* | | x | | | | | | | | | |
| | Waste *Treated* | | x | | | | | | | | | |
| **Revise & update accordingly** | Informed by studies and final strategies/solutions/decisions | | | | | x | | | | | | x |

## 7.11 Indicative costs

Indicative investment costs for some of the technologies and implementation of the OWDP are provided in **Table 12** and **Table 11**. This information is based on research undertaken by JG Afrika and is not site specific and excludes operational costs as well as transports costs.

*Table 12: Approximate costs for interventions*

| Technology/Aspect | Estimated Investment Cost/ Approximate Cost |
|---|---|
| AD – 2 500 tonne per annum system | R 22 500 000 |
| AD – 20 000 tonne per annum system | R 190 000 000 |
| Open Windrow Composting 5 000t/yr | R 9 000 0000 |
| Open Windrow Composting 10 000t/yr | R12 000 000 |
| Open Windrow Composting 10 000t/yr | R 18 000 000 |
| In Vessel Composting 5 000t/yr pre-treatment system | R16 400 000 |
| In Vessel Composting 15 000t/yr pre-treatment system | R19 100 000 |
| Modular containerised composting system 10 000t/yr | R34 960 000 |
| | |
| High level costs to collect co-mingled recyclables (Metro) | R15.00 per household per month |
| Estimated Transport cost of Waste | Average of R700/ton |
| S@S Cost model - implementation cost of separation at source | R9.64 – R59.65/household/month |
| Separate collection cost[27]- over and above normal "black bag" collection | R350 to R500 per tonne |
| Municipality pays contractor to collect and recover recyclables and calculated cost | R840 per tonne |

*Table 13: Approximate costs for implementation of the OWDP*

| Aspect | Actions | Approximate Cost | Notes |
|---|---|---|---|
| **1.Separation at Source Strategy** | | | |
| **Develop Strategy:**<br><br>**Implement Strategy:** | Pipeline plan for areas to follow on from the existing two bag collection areas, with roll out to new areas on an annual basis | R 180 000 | Outsourced – in parallel with feasibility studies |
| Residential Areas: | Start in existing Two Bag Areas<br>Continue to expand into other areas as per plan<br>Identify & establish Organic Waste Drop-off Areas<br>Home Composting Bins Roll-out<br>Mandatory Garden Waste separation implemented<br>Additional Garden Waste drop-off areas | Costs in line with existing collection services.<br><br>Savings to be determined in development of the strategy. | Inhouse implementation based on Strategy |
| Commercial/Business Areas | Identify target areas = large volume producers<br>Implement 3-bag system or separate organic waste<br>Identify possible Collection points & areas for Pre-treatment technology placement e.g. Malls, University | -<br><br>- | Outsourced (part of strategy development)<br>Inhouse<br>Outsourced (part of strategy development) |

[27] https://iwmsa.co.za/sites/all/themes/corporateclean/Landfill%20Conference%20Papers/Day%201%20-%20LAWTIG%20-%20R%20Pienaar_JPCE%20Read-Only.pdf

| Aspect | Actions | Approximate Cost | Notes |
|---|---|---|---|
| **Mandatory Separation at Source** | Communication Awareness campaigns | R80 000 | Outsourced – once-off development of material/content |
| | Tie in with Communication Strategy | - | Inhouse |
| **Collection Fleet Feasibility Study** | Outcomes to feed into the Separation at Source Strategy | R 180 000 | Outsourced |
| **2.Treatment of the Organic Waste** | | | |
| | Feasibility Study for Landfill Gas Capture | n/a (completed) | Outsourced |
| | Waste Characterisation (to inform all studies) | R 85 000 | Outsourced |
| *If LFG **is feasible*** | Feasibility Study to include Organic Waste only | R 200 000 | Outsourced |
| | **OR** | | |
| *If LFG capture is **not feasible*** | **Feasibility Study for AD for Organic Waste only** | R 200 000 | Outsourced |
| | Identification of other AD facilities in the municipal area | Included within above | |
| | Identification of other organic waste treatment facilities | | |
| | Alternative off-take or treatment options | | |
| | **ORTS Construction Completed & Treatment Solution confirmed** | | |
| **3.Collection & Off-take for Organics** | | | |
| | External contractor to collect & remove for treatment | ±R125 per household per month | Outsourced – includes treatment and clear bag collection for recyclables |
| | External contractor to continue, expanded collection footprint | ±R90 per household per month | Outsourced – lower cost per household due to economy of scale |
| | External contractor to collect; transport to ORTS | TBC | Depends on selected treatment technology |
| | Collection, transport & treatment (as per outcome of feasibility studies) | TBC | Depends on selected treatment technology |
| **4.Tariff update** | | | |
| Residential Areas & Commercial/Business areas | Combined Tariff for 3-bag collection less than black bag | - | Inhouse |
| Commercial/Business Areas only | Separate tariff for food waste only collection for businesses | - | Inhouse |
| **5.Training, Education and Awareness Campaign** | | | |
| **Training** | Training system for collection crews and waste staff | - | Inhouse (Training material to be included in studies/outsourced aspects) |
| **Develop communication & awareness campaign** | General communication and awareness campaign | R120 000 | Outsourced |
| | Direct communication to Separation-at-Source areas | - | Inhouse |
| | Provide feedback to community (ongoing) | - | Inhouse |

| Aspect | Actions | Approximate Cost | Notes |
|---|---|---|---|
| | Education and awareness around home composting bin roll-out | - | Inhouse |
| **Engage with stakeholders/partners to align** | Identify stakeholders or partnership e.g. University | - | Inhouse |
| | Engage and align strategies & solutions | - | Inhouse |
| **6.Monitoring and Measuring** | | | |
| **Develop monitoring and measuring system** | Waste *Collected*<br>Home *composted* waste as part of Municipal trials/projects<br>Waste *Diverted*<br>Waste *Treated* | Cost included in projects above | Inhouse/outsourced-systems developed as part of projects with an inhouse implementation component |
| **Revise & update accordingly** | Informed by studies and final strategies/solutions/decisions | - | Inhouse |

For comparison purposes it is worth noting that the cost for disposal and transport of 43 636.03 tons of waste from SM for the year from September 2020 to September 2021 was R32 465 615.38 excluding VAT. This is approximately R744/ton of waste. This excludes the operating costs of the Landfill site or Klapmuts RTS.

## 8 STAKEHOLDER ENGAGEMENT

In terms of DEA&DP's guideline for organic waste diversion plans the following stakeholder engagement is required:

- Obtain internal approval for draft plan
- Workshop plan with key stakeholders and role-players
- Get public buy-in to these systems
- Get buy-in from the Council & budget approval
- Review and finalise plan against public participation process

## 9 REVIEW OF THE ORGANIC WASTE DIVERSION PLAN AND IMPLEMENTATION PLAN

An annual review of the OWDP is required. This will need to commence at least 3 months prior to the annual submission to DEA&DP.

The review needs to include an update of the waste volumes, an assessment of targets and if they are being met to ascertain the system and projects being implemented are effective and where areas for improvement may lie.

If new projects, technology or systems are implemented they need to be evaluated to ensure the system stays efficient and targets will be met.

It is important to note that only reasonable changes to the proposed project should be granted approval for amendment. Risks in the form of contractual matters, financial implications, institutional, market, and Human Resources must be identified, and remedial actions put in place and included in the OWDP.

The Waste Management Officer and/or the Municipal Manager will jointly grant final approval for major adjustments that were not foreseen.

The OWDP should be regarded as an annexure to the IWMP, and IWMP's are required to be integrated into Integrated Development Plans (IDPs), as stipulated by the National Waste Act. This is to ensure that the waste related needs, as identified in the IWMP and OWDP), are integrated in the municipal planning and that budget is allocated.

## 10 REFERENCES


1. City of Cape Town home composting (green genie) project. https://www.capetown.gov.za/Family%20and%20home/greener-living/green-gardening-and-eating/start-composting-at-home. (Accessed 2021)
2. City of Cape Town organic waste drop-off plot project. https://www.capetown.gov.za/Media-and-news/City%20trials%20innovative%20food%20waste%20project. (Accessed 2021)
3. DEA&DP letter to the Organics Recycling Association of South Africa. RE: Diversion targets for organic waste in the Western Cape (2018).
4. DFFE Alternative Waste Treatment Guide: http://awtguide.environment.gov.za/content/technologies-required-waste-volumes (Accessed 2021)
5. Environmental Canada, Technical Document on Municipal Solid Waste Organics Processing
6. GreenCape Waste Economy–2017 Market Intelligence Report
7. http://www.moreno-valley.ca.us/resident_services/waste/bus-multi.shtml?tab=2#Tab-mv. (Accessed 2021)
8. https://beyondfoodwaste.com/milan-achieves-world-class-separate-food-waste-collection/. (Accessed 2021)
9. http://awtguide.environment.gov.za/content/technologies-overview-open-windrow-composting (Accessed 2021)
10. https://stellenbosch.gov.za/2021/03/25/stellenbosch-launches-new-waste-material-recovery-facility/ (Accessed 2021)
11. Milan, Italy organic waste collection: https://pocacito.eu/sites/default/files/FoodWasteRecycling_Milan.pdf (Accessed 2021)
12. Oranjezicht City Farm organic waste drop-off initiative. https://ozcf.co.za/shop/voucher/bokashi-10-bucket-card/ (Accessed 2021)
13. Ricci et al. Strategy for organic waste diversion – collection, treatment, recycling and their challenges and opportunities for the City of Sao Paulo (2016)
14. Ricci et al. Technical guidance on the operation of organic waste treatment plants (2016)
15. Witzenberg Zero Waste to Landfill Pilot Project (WAAI, 2019)
16. The Role of Anaerobic Digestion Technology in Treating Organic Waste – UK Experience Presentation to GreenCape Networking event, 23rd August 2016. Andrew Street Director, SLR Consulting
17. Waste Management Flagship Programme. Development of a Funding Proposal to the GCF for the MSW Programme including, a Feasibility Study, ESIA, GIA and Detailed Designs for the Target Municipalities. Market Research Study. June 2020. JG Afrika Project Team.
18. https://wasteroadmap.co.za/wp-content/uploads/2021/05/20-CSIR-Final_Technical-report.pdf+
19. https://www.c40knowledgehub.org/s/article/Strategy-for-organic-waste-diversion-for-the-city-of-Sao-Paulo?language=en_US
20. *Bio-waste generation in the EU: Current capture levels and future potential,* published in 2020 and commissioned by the Bio-based Industries Consortium (BIC). Enzo Favoino & Michele Giavini, Scuola Agraria del Parco di Monza, 2020 https://zero. wasteeurope.eu/wp-content/uploads/2020/07/2020_07_06_bic_zwe_report_bio_waste.pdf
21. https://www.downtoearth.org.in/news/waste/ten-zero-waste-cities-how-tacloban-in-the-philippines-managed-to-spruce-itself-up-68613
22. GreenCape 2021 Waste Market Intelligence Report. https://www.greencape.co.za/assets/WASTE_MIR_20200331.pdf (Accessed 2021)
23. https://iwmsa.co.za/sites/all/themes/corporateclean/Landfill%20Conference%20Papers/Day%201%20-%20LAWTIG%20-%20R%20Pienaar_JPCE%20Read-Only.pdf (Accessed 2021)
24. Recognising the Informal Waste Sector in Advanced Waste Treatment. DFFE. https://www.dffe.gov.za/sites/default/files/docs/publications/recognisingtheinformalwastesector.pdf. (Accessed 2021)

25. Knowledge Product 4: Financial Implications of Advanced Waste Treatment. DFFE. https://www.dffe.gov.za/sites/default/files/reports/advancedwastetreatment_chapter8.pdf. (Accessed 2021)

# ANNEXURE A: ORGANIC WASTE DIVERSION CORRESPONDENCE

Extract from Stellenbosch Waste Disposal Facility WML, Ref 19/2/5/1/B4/46/WL0118/14, dated 13/09/2018.

15.7. The Licence Holder must submit an Organic Waste Diversion Plan to the Director 90 (ninety) days after the signature of this Licence and annually thereafter.

15.8. The information within the Organic Waste Diversion Plan must:

15.8.1. provide a status quo of current organic waste sources and volumes disposed at municipal WDFs, and current rates and procedures of organic waste diversion from WDFs; and

15.8.2. set annual targets and identify procedures from 2018 that will be implemented to meet these targets for the diversion of organic waste from municipal WDFs, in order to reach a 50% diversion by the year 2022 and 100% diversion by the year 2027.

## ANNEXURE B: ORGANIC WASTE PERCENTAGE OF WASTE - EXISTING 2-BAG AREAS

| Two Bag System Area | | Organic Waste % |
|---|---|---|
| - | Uniepark, Karindal, Aanhou Wen, Rozendal | 55.1 |
| - | Mostertsdrift | 41.4 |
| - | Simonswyk | 47.1 |
| - | Universiteits Oord | - |
| - | Technopark | 33.8 |
| - | Die Boord, Fairways, Die Wingerd, Harringtons Place | 40.3 |
| - | Paradyskloof, Schuilplaats, Lieberheim, Anesta, Eden, La Pastorale | 37.1 |
| - | Brandwacht | 46.6 |
| - | Dalsig, Bo-Dalsig | - |
| - | Krigeville | - |
| Onder Papegaaiberg | | 22.2 |
| Devon Vallei, Devon Park, Kleinvallei | | 18.7 |
| - | La Colline/Die Rand | 34.8 |
| - | Die Laan | - |
| - | Dorp/Stasie street | - |
| - | Franschhoek | 31.6 |
| - | Idas Valley, Lindida, Arbeidslus | 31.6 |
| - | Raithby | 25.3 |
| - | Agape Retirement Village | - |
| - | Blaauwklippen Road | - |
| - | Jamestown | 36.2 |
| - | Cloetesville | 34.5 |
| - | Brandwacht-aan-rivier | - |
| - | Parmalat | - |
| - | Jonkershoek | 17.3 |
| - | Welgevonden | 27.1 |