Waste
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2019
Market Intelligence Report
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GreenCape

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This report is dedicated to South Africa's former Minister of Environmental Affairs, Edna Molewa, who passed away recently. Ms Molewa made a significant contribution to a democratic and sustainable South Africa. A progressive and passionate minister, her vision, especially around waste management in the country, will remain an inspiration to all.

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List of abbreviations and acronyms

AD	Anaerobic digestion
AWT	Alternative waste treatment
CCA	Customs-controlled area
C&DW	Construction and demolition waste
C&I	Commercial and industrial
CoCT	City of Cape Town
DEA	Department of Environmental Affairs
DEA&DP	Western Cape Department of Environmental Affairs and Development Planning
DEDAT	Western Cape Department of Economic Development and Tourism
DoE	Department of Energy
DST	Department of Science and Technology
dti	Department of Trade and Industry
EAP	Environmental Assessment Practitioner
EAPASA	Environmental Assessment Practitioners Association of South Africa
EIA	Environmental impact assessment
EPR	Extended producer responsibility
ETI	Employment tax incentive
eWASA	e-Waste Association of South Africa
GDP	Gross domestic product
GFCF	Gross fixed capital formation
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GN	Government Notice
GRI	Gestamp Renewable Industries
GVA	Gross value added
GW	Gigawatt
GWIS	Gauteng waste information system
HCRW	Health care risk waste
ICT	Information and Communications Technology
IDC	Industrial Development Corporation
IT	Information technology
ITAC	International Trade Administration Commission of South Africa
IPP	Independent power producer
ISO	International Organization for Standardization
IIWTMP	Integrated Industry Waste Tyre Management Plan
IndWMP	Industry Waste Management Plan
IWMP	Integrated Waste Management Plan
KfW	Kreditanstalt für Wiederaufbau (Reconstruction Credit Institute)
KfW Entwicklungsbank	KfW Development Bank
kWh	Kilowatt hour(s)
LDPE	Low-density polyethylene
MFMA	Municipal Finance Management Act, No. 56 of 2003
MIG	Municipal Infrastructure Grant
MIR	Market intelligence report
MRF	Material recovery facility
MSA	Municipal Systems Act, No. 32 of 2000
MSW	Municipal solid waste
MW	Megawatt(s)
NDP	National Development Plan
NEMA	National Environmental Management Act, No. 107 of 1998
NEMAQA	National Environmental Management Air Quality Act, No. 39 of 2004

NEMWA	National Environmental Management: Waste Act, No. 59 of 2008
NPSWM	National Pricing Strategy for Waste Management
NWIB	National Waste Information Baseline
NWMS	National Waste Management Strategy
ORASA	Organic Recyclers Association of South Africa
PCB	Printed Circuit Boards
PE-HD	High-density polyethylene
PE-LD	Low-density polyethylene
PE-LLD	Linear low-density polyethylene
PET	Polyethylene terephthalate
PETCO	PET Recycling Company of South Africa
Polyco	Polyolefin Recycling Company
PP	Polypropylene
PPP	Public-private partnership
PRASA	Paper Recycling Association of South Africa
PRO	Producer responsibility organisation
PS	Polystyrene
PS-E	Polystyrene expanded
PSPC	Polystyrene Packaging Council
PVC	Polyvinyl chloride
R&D	Research and development
RDF	Refuse delivered fuels
RDI	Waste Research, Development and Innovation Roadmap
REDISA	Recycling and Economic Development Initiative of South Africa
REEEP	Renewable Energy and Energy Efficiency Partnership
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
rPET	Recycled polyethylene terephthalate
SABIA	Southern African Biogas Industry Association
SAEWA	South African e-Waste Alliance
SALGA	South African Local Government Association
SANEDI	South African National Energy Development Institute
SAVA	Southern African Vinyls Association
SAWIS	South African Waste Information System
SEZ	Special economic zone
SMEs	Small and medium-sized enterprises
SMMEs	Small, medium and micro-sized enterprises
SoWR	State of Waste Report
StEP	Solving the e-waste problem
SuRF	Sustainable Roads Forum
TA	Transactional Advisor
TGRC	The Glass Recycling Company
UNIDO	United Nations Industrial Development Organization
VAT	Value-added tax
WCG	Western Cape Government

Executive summary

The South African waste management landscape is set to experience a raft of legislative and regulatory changes that will advance the country toward a more resource-efficient economy. This will create opportunities for business and investors in the waste sector who focus on plastics, organics, e-waste, and construction and demolition waste.

Disposal continues to dominate the South Africa waste landscape. According to the outdated 2011 national waste information baseline (NWIB), South Africa generated ~108 million tonnes of waste in 2011. The 2011 estimate indicates that 10% of the total waste stream is being recycled with the remaining 90% being landfilled. A 2017 update should be available by early to mid-2019 when the national Department of Environmental Affairs (DEA) publishes its first State of Waste Report (SoWR). We expect that the report will show healthy growth in waste diversion in the country.

The Western Cape province generates ~7.7 million tonnes of waste annually, of which 2.4 million tonnes (31%) consist of municipal solid waste, 2.4 million tonnes (31%) of agricultural and forestry waste/residues, 1.7 million tonnes (22%) of construction and demolition waste, and 0.9 million tonnes (11%) of commercial and industrial waste. The remaining 0.4 (5%) consist of other waste streams.

Of the total for the province, the City of Cape Town generates a substantial portion (48%) of the waste, which includes 1.7 million tonnes of municipal solid waste, 1 million tonnes of construction and demolition waste, 0.6 million tonnes of commercial and industrial waste, 0.07 tonnes of agricultural and forestry waste/residues, and 0.3 million tonnes of other waste streams.

Household waste is managed by municipalities and/or by their appointed service providers. Commercial and industrial waste is typically managed by the private sector in larger municipalities, and to some extent the municipalities themselves.

Although private stakeholders also own landfills, municipal landfills are open for private sector disposal. It is more convenient for investors and businesses to partner with the private sector waste generators and waste handlers.

According to DEA (2017), the waste economy contributed ~R24.3 billion to the South African GDP in 2016. It provided 36 000 formal jobs and supported ~80 000 informal jobs/livelihoods. A further R11.5 billion per year could be unlocked by 2023 by diverting up to 20 million tonnes of waste. The anticipated spin-offs could include 45 000 additional formal jobs and 82 000 indirect jobs, as well create of 4 300 SMMEs.

Opportunities within the organic, e-waste, plastics and builders' rubble sectors have the potential to unlock ~R1.2 billion in value. However, to unlock this value, stakeholders must be involved and technologies implemented. A variety of opportunities exist:

- **Organics:** In 2018[1] in the Western Cape there were ~520 650 tonnes of MSW organic and ~318 626 tonnes of commercial and industrial organic waste available for recycling. This total market is valued at an estimated R83 million to R158 million per year, depending on the end product [2]. At the municipal level, the greatest value lies in the CoCT with a market value for organics, depending on product produced, of R59 to R111 million per year.

[1] Excluding agriculture, abattoir and forestry waste

[2] Based on a value of between R100 (R20 per 20kg of compost sold in store which is generated from 200kg of organic waste) and R188, according to Waste Road Map (DST 2014) value for organics per tonne of organic waste.

- **E-waste:** If a conservative range of between R1 309 and R1 636 per tonne of scrap e-waste (excluding higher value materials) is applied, then the low value of e-waste in the Western Cape is between R54.5 and R108.4 million per year, with the CoCT holding the largest value of R34.9 to R75.4 million.

- **Plastics:** If a value of between R1 950 and R2 600 per tonne of plastics is used, the value for the Western Cape's MSW plastics is between R462.2 and R616.2 million per year, with CoCT MSW plastics valued between R321.5 and R428.7 million in 2018.

- **Builder's rubble:** The supply of and demand for builder's rubble as an alternative to virgin material are growing. National government and local municipalities are focusing increasingly on diverting rubble from landfill. The private sector is increasingly applying builder's rubble as a secondary construction material, in the context of rising virgin material costs. The current value of builder's rubble available to the market in South Africa is conservatively estimated at R132 to R309 million, depending in its application.

Key drivers of these opportunities include:

- **Legislation and regulation:** New and changing national and provincial legislation and regulations are set to unlock a number of key waste streams, notably organics. These changes will also help to simplify rules and procedures for alternative waste treatment technologies and activities.

- **Industry waste management plans:** The paper and packaging, e-waste and lighting industries will be legally required to implement mechanisms to ensure extended producer responsibility. This will ensure access to feedstock, and support demand for recovered materials.

- **Government initiatives:** The initiatives identified by the national government's fast results delivery programme, Operation Phakisa, should increase access to feedstock and stimulate growth in market demand.

- **Cost of disposal:** Dwindling landfill space and rising management costs are pushing up the price of landfilling in the Western Cape and the CoCT in particular. This increases demand from waste generators for alternative waste treatment solutions, which in turn improves the financial viability of solutions.

What's new?

For investors and business owners who have read GreenCape's 2018 Waste MIR, the following are new developments discussed in this report:

The 2018 report focused on the waste opportunities opened up by industry changes at the provincial and national level. This year's report provides updates on:

- market trends in organics, plastics, e-waste, and builders' rubble;
- industry developments, in particular on industry waste management plans, the increase in landfill gate fees, and the latest State of Waste Report data (since the 2011 NWIB); and
- new opportunities in the markets for organics, plastics, e-waste and builder's rubble.

1
Introduction and purpose

This report provides insights into the South African and the Western Cape waste sector. It also outlines market opportunities for investors who are active or interested in providing alternative waste treatment and beneficiation solutions.

This MIR has been compiled by GreenCape's Waste Sector Desk. It highlights insights and opportunities gathered from our engagements with stakeholders in, and research on, the waste sector.

Section 2 below provides an overview of the waste sector in South Africa, with a focus on the Western Cape. This is followed by an overview in Section 3 of key policies and regulations that guide and affect the sector. Section 4 provides an overview of market opportunities, drivers, barriers, risks and recent developments in organics, e-waste, plastics and builder's rubble.

In Section 5, we focus on finance and incentives.

The case for the Western Cape as a greentech hub for Africa is covered in Section 6. This is followed by Section 7, which outlines GreenCape's work and the opportunities for investors across the South African and Western Cape green economy.

For queries or to access any of our support services, contact GreenCape's Waste Sector Desk at +27 21 811 0250 or email waste@greencape.co.za.

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2
Sector overview

This section provides investors, businesses and new entrants with an overview of South Africa's waste sector, with a focus on the Western Cape.

The section covers the following:

- the structure of the waste sector;
- key stakeholders, and their roles and responsibilities;
- provincial and national sector sizes;
- drivers, risks and barriers; and
- developments since the publishing of the 2018 MIR.

GreenCape has been producing an annual Waste Economy MIR[3] since 2014. Over the last five years, the momentum in the waste sector has been building, albeit slowly, towards a waste economy increasingly characterised by waste beneficiation. Private sector investments have grown in number and scale, there have been positive regulatory reforms, and the scope and scale of industry organisations have expanded.

The South African waste economy continues to experience positive growth, and there is growing interest in the uptake of alternative waste treatment solutions and associated value chains. This has resulted in continued and increasing diversion of waste from landfill, both within the Western Cape and South Africa.

South Africa generated ~108 million tonnes of waste in 2011. Of this, ~10% was recycled.

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The main drivers of growth in waste beneficiation include:

- increased awareness of the impact of waste on the economy, environment, and society;
- extensive support from producer responsible organisations and industry associations;
- regulatory reforms (national and provincial);
- increased pressure on municipal landfill airspace;
- a growing understanding of the value of waste; and
- recognition by government that the waste economy creates jobs and attract investments.

The latter has resulted in a number of positive developments:

- the proposal of extended producer responsibility through the request for development of industry waste management plans (IndWMP) for specific sectors;
- various regulations to encourage waste diversion from landfill;
- data gathering and updating initiatives;
- a Phakisa[4] for the chemical and waste economy; and
- infrastructure investments by local governments;

2.1. Sector structure

South Africa categorises wastes into hazardous and general waste, which are regulated by the National Waste Regulations (R. 625 of August 2012).

South Africa's waste sector comprises the public and private sectors, and households. Recycling

[3] Previous MIRs can be accessed at www.green-cape.co.za/market-intelligence

[4] Phakisa means "hurry up" in Sesotho. Operation Phakisa is an initiative by national government to fast track the implementation of solutions on critical development issues under the National Development Plan.

industry associations and Producer Responsible Organisations (PRO) support their respective sectors. Figure 1 shows the relationship between sectors, and their legal roles and responsibilities.

		Collection	
		Local municipalities	Private sector
Generation	Household	Local municipalities are constitutionally mandated to ensure that household waste is collected. They can either provide the collection service themselves, or appoint private waste contractors.	Waste management companies can be contracted by local municipalities (through a procurement process) to collect household waste, or to manage drop-off facilities open to households.
	Commercial / Industrial	Local municipalities are not obligated to service commercial/industrial waste generators. However, the latter may ask local municipalities to collect waste, thereby incurring a service fee.	Commercial and industrial waste generators are responsible for the management of their own waste, including safe disposal. This is usually outsourced to private waste management.
Treatment / Disposal		Municipalities are mandated to ensure the availability of disposal facilities (landfills). They can support alternative waste treatment by means of providing material recovery and aggregation infrastructure. Such facilities can be managed by the municipality itself, or contracted to the private sector through a procurement process.	The private sector can either have its own waste treatment and/or disposal facilities; or it can be contracted by local municipalities to manage municipal recovery, aggregation or disposal facilities.

Figure 1: Waste collection and treatment responsibilities in South Africa

Source: GreenCape

2.1.1. Public sector

All spheres of government are legally responsible for the management of waste in South Africa, and in general for upholding the requirements of the Constitution and the National Environmental Management Waste Act (NEMWA), Act 59 of 2008, including related regulations.

National

The national Department of Environmental Affairs (DEA) is the overarching authority for waste management in South Africa, and is the licensing authority for hazardous waste treatment activities. Its Waste Management Bureau has been established to manage and implement the Industry Waste Management Plans (IndWMPs) (see Section 2.5). The role of the bureau includes supporting and advising industry on the development of the plans, and monitoring the implementation of plans. It is expected to include monitoring and managing the disbursement of funds collected through producer-paid levies.

Provincial

Provincial environmental authorities are generally responsible for regulating waste management. Their functions include promulgating provincial legislation, providing municipal support, and monitoring municipal and private sector activities. The Department of Environmental Affairs and Development Planning (DEA&DP) is the Western Cape's provincial authority regulating waste management.

Waste generators and handlers, triggering certain thresholds stipulated in the National Waste Information Regulations (R. 625 of 2012),

must register with and report waste figures to either the national DEA, through the South African Waste Information System (SAWIS)[5]; or a provincial waste information system. In the Western Cape, this is the Integrated Pollutant and Waste Information System (IPWIS) managed by DEA&DP, whilst in Gauteng their waste information system (GWIS) is managed by the Department of Agriculture and Rural Development.

Investors and businesses developing or expanding waste initiatives that require a waste management licence (see Section 3.1) must apply for the licence through a provincial environmental authority if general waste is handled. If they handle hazardous waste, then applications must go through the national DEA, with the provincial environmental authorities as a commenting authority. Engagement with provincial authorities should be undertaken before initiating the waste licence applications to ensure clarity in the process, or to confirm whether it is needed.

Local municipalities

Municipalities are constitutionally mandated to provide waste collection, removal, storage, and disposal of waste generated by households within their boundaries. Collection can be done by local municipalities or be outsourced to the private sector. Local municipalities are not required to provide the private sector with waste collection services.

Municipalities are also expected to provide waste collection and disposal infrastructure. Although alternative waste treatment is not explicitly required by the Municipal Systems Act (MSA) (32 of 2000), it is considered in the Act to be a municipal support activity (National Treasury 2008).

Section 76 to Section 78 of the Municipal Systems Act (32 of 2000) outline the key steps needed before municipalities are able to partner with the private sector

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However, the NEMWA and the 2011 National Waste Management Strategy (NWMS) require local municipalities to implement alternative waste treatment in order to divert waste from landfill and to minimise environmental degradation. In some cases, municipalities provide infrastructure for aggregation (drop-offs) and the separation (material recovery facilities), rather than providing the actual recycling infrastructure. These facilities are either operated by the municipality or outsourced to the private sector.

2.1.2. Private sector

The commercial and industrial sector is responsible for the management of their own wastes. They are bound by various regulatory requirements, whether they are waste generators, and/or waste handlers:

Waste generators

Waste generators are responsible for the management of their own waste. This can either be outsourced to private service providers, or to the local municipality on request. Both options will incur a service fee. Private service providers are incentivised to explore alternative waste treatment as the cost of landfilling increases. Also, municipalities do not, in general, involve themselves with hazardous waste collection from the private sector.

Waste handlers

Waste management service providers are responsible for the provision of responsible waste management services to their clients, or as contracted to do so by local municipalities.

Investors seeking access to waste streams find it more convenient to work with the private sector and their service providers than with municipalities, as the former have fewer procurement requirements with which to comply.

2.1.3. Households

Households are generally serviced by their local municipalities, or by the private companies contracted by municipalities to collect waste. Some municipalities require households to separate recyclables from non-recyclables, and to ensure that the recyclables are disposed of responsibly. This can be done by contracting the

[5] SAWIS is South Africa's national waste reporting system established in terms of section 60 of the NEMWA

local municipality (unless the municipality has a recycling collection service), contracting an accredited waste service provider, or delivering the recyclables at a licensed facility. Voluntarily contracting in the private sector is becoming more common.

2.1.4. Recycling industry associations

South Africa's recycling sector is driven by industry, and supported by industry-funded associations. Each association promotes the recovery and recycling of materials at different points of the value chain. However, there are no regulated distinctions between the roles and responsibilities of the different industry associations.

South Africa has a number of industry associations that focus on mainstream recyclables, e-waste, and organics. Each of the associations provide varying levels of support to their members along the respective value chains. See Table 2 for a list of active industry associations.

In the past, membership and financial contributions to associations were voluntary. This is expected to change with the implementation of mandatory extended producer responsibility through adherence to IndWMPs. Producers along the paper and packaging, electrical and electronics, and lighting value chains will be legally required to adhere to the requirements of IndWMPs (see Section 3.2), which will be managed by designated PROs.

These PROs will more than likely replace the role of some associations and complement others, but the mission will stay the same – to ensure that waste materials are diverted from landfill (supply) and to ensure market development (demand).

Investors or businesses who intend to enter the paper and packaging, e-waste or the lighting recycling sectors should engage with their relevant PROs (once designated), or in the interim with the industry associations.

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2.1.5. Informal waste collectors

South Africa's informal waste sector plays a principal role in waste diversion (in particular of post-consumer recyclables) from landfill. However, in most cities and towns in South Africa, informal waste pickers are marginalised and operate at the fringe of formal management systems. The full extent of the importance of the informal waste sector is not fully understood, due to the nature of the informality; however, this is currently being actively investigated by the national Department of Science and Technology. There are over 50 000 informal landfill and kerbside waste pickers in the country. It is estimated that the informal sector supply 80% to 90% of packaging waste to recyclers (Plastics|SA, 2015).

2.2. Size of the South African waste sector

At the time of publication, the national DEA was finalising its first State of Waste Report (SoWR) for South Africa. This SoWR should include an update to the 2011 national waste information baseline (NWIB). The SoWR will be the most current source of information for decision makers developing plans and policies concerning waste. There is a range of sources and extrapolated figures for the size of the SA waste sector, on which investors can draw until such time as the SoWR is released.

DEA National Waste Information Baseline and extrapolated figures for 2016

According to the 2011 NWIB, South Africa generated approximately 59 million tonnes of general waste, 48 million tonnes of unclassified waste, and 1 million tonnes of hazardous waste – a total of 108 million tonnes in 2011 (DEA 2012). Only 10% of all waste was recycled, with 90% landfilled[6]. We expect that the 2019 SoWR will show increased diversion and an exponential increase in recycling rates. Figure 2 shows a breakdown of waste types as a percentage of total waste.

[6] This does not take into account leakage, e.g. materials that enter oceans or are exported and are effectively 'lost' from the accounting system.

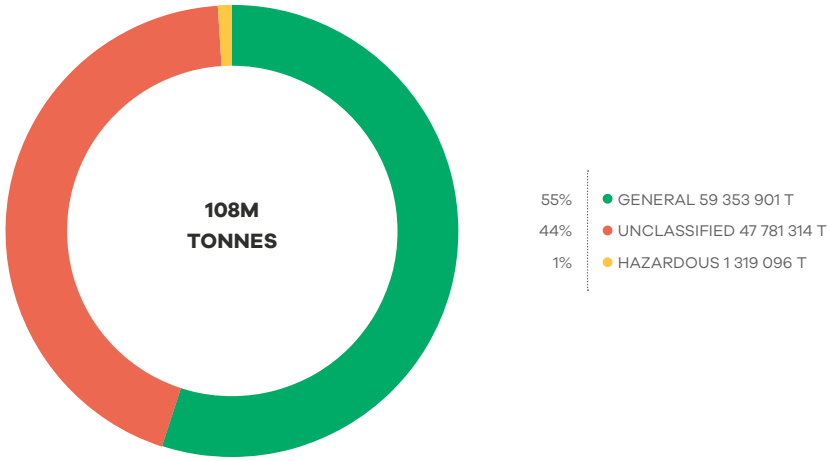


Figure 2: Classification of total waste generated in South Africa in 2011

Source: DEA (2012)

The DEA presented extrapolated waste figures for 2016 as part of the Operation Phakisa for chemicals and waste economy. The estimates indicated that waste generation had increased by 3 million tonnes to 111 million tonnes since 2011. The waste economy contributed R24.3 billion to the South African GDP, provided 36 000 formal jobs and supported an estimated 80 000 informal jobs/livelihoods.

In 2014, the national Department of Science and Technology (DST) Waste Research, Development and Innovation (RDI) Roadmap estimated that an additional R17 billion per year worth of resources could be unlocked if 100% of the 13 identified waste streams[7] could be beneficiated. If the amount of industrial waste were to be reduced by 20%, and domestic waste by 60%, it would unlock R9.2 billion resource value to the economy.

Industry associations data

South Africa's dry recyclable sector is well supported by industry-driven associations. Table 1 shows active industry associations and stream-specific estimates tonnages generated and diverted as reported by industry annual reports and engagements with industry associations. The table also provides estimated tonnages available for each material for the Western Cape[8].

[7] Municipal waste (non-recyclable portion); organic component of municipal waste; biomass waste from industry; construction and demolition waste; paper; plastic; glass; metal; tyres; e-waste; slag; ash; and waste oils.

[8] The two extrapolations based on: the proportion of the population of the Western Cape compared to the other provinces, and the nominal output of the Western Cape compared to the other provinces.

Table 1: Recyclables processed and available in 2017 as reported by associations

Sources: Most recent industry association annual reports, IndWMPs, and direct engagements during 2018

Name of industry association		Industry Association	Material in Circulation (Imported / Manufactured)		Collected / Diverted from Landfill		Available for Recycling (Tonnes)		
					Tonnages	Percentage	Total in SA	Western Cape	
								Pop	Nominal Output
Plastics	PET (Beverage Bottles)	PETCO	143 438	210 939	93 235	65%	50 203	5 783	7 015
	PET (Thermoform/ Edible Oil)	–	67 500		0	0%	67 500	7 775	9 432
	LDPE	POLYCO	341 412	883 999	105 155	31%	236 257	27 213	33 011
	HDPE		227 000		63 333	28%	163 667	18 852	22 869
	PP		315 587		47 338	15%	268 249	30 898	37 481
	PVC	SAVA	157 912		17 844	11%	140 068	16 133	19 571
	PS	PASA	50 318		5 384	11%	44 934	5 176	6 278
Paper		PRASA	1 813 680		1 282 120	71%	531 560	61 227	74 273
Glass		TGRC	770 412		631 738	82%[9]	138 674	15 973	19 376
Metal	Cans	MetPac-SA	162 000	217 000	164 486	76%	52 514	6 049	7 338
	Closures		18 000						
	Drums / Pailes		37 000						
Ewaste		ERA	360 000		45 000	13%	315 000	36 283	44 014
		SAWEEEDA (2015)	322 000		45 000	14%	277 000	31 906	38 704
Organic Recyclers		ORASA	–		–	–	–	–	–

2.2.1. Household separation levels

The availability and quality of waste, particularly post-consumer streams, are dependent on the level of material separation done by households. This in turn is linked to demographics and "recycling culture". Broadly speaking, higher separation levels are more common in provinces with larger urban populations. Figure 3 and Figure 4 respectively show the degree of household material separation per province and metropolitan municipality. The Western Cape (20.3%) and the City of Cape Town (CoCT) (23%) have the highest rates of household separation (StatsSA 2018).

[9] 82% refers to the reuse and recycling (cullet) of glass.

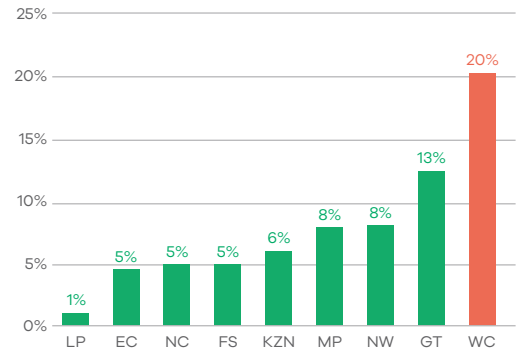


Figure 3: Household separation by province (2015)

Source: StatsSA (2018)

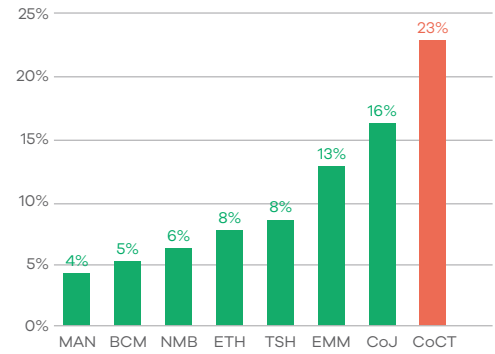


Figure 4: Household separation by metro (2015)

Source: StatsSA (2018)

2.3. Size of the Western Cape waste sector

The Western Cape generated ~7.7 million tonnes of waste in 2015 (DED&T, 2016). The province's waste comprises mostly of municipal solid waste (MSW), and agricultural waste and residues. This is to be expected, as much of the Western Cape's economy is driven by agriculture and tertiary services. As a result, much of the waste generated will be characterised by dirty mixed waste streams and large volumes of organic residues.

Table 2 and Figure 5 show the tonnages generated in the Western Cape. Annex A provides detailed waste distribution figures by metro and district municipality.

Table 2: Total waste tonnages generated per district municipality / metro in 2015

Source: DED&T (2016)

Municipality	Municipal Solid Waste	Agri / Forestry Residues	Construction / Demolition	Commercial / Industrial	Other	Total
City of Cape Town	1 671 146	66 885	1 090 995	637 419	247 248	3 713 693
Cape Winelands	286 482	304 734	272 749	98 976	49 489	1 012 430
Central Karoo	23 874	34 531	17 047	4 308	4 334	84 094
Eden	190 988	501 013	153 421	70 344	34 865	950 631
Overberg	95 495	540 887	85 234	30 540	15 905	768 061
West Coast	119 368	917 734	85 234	39 514	23 544	1 185 394
Western Cape	2 387 353	2 365 784	1 704 680	881 101	375 385	7 714 303

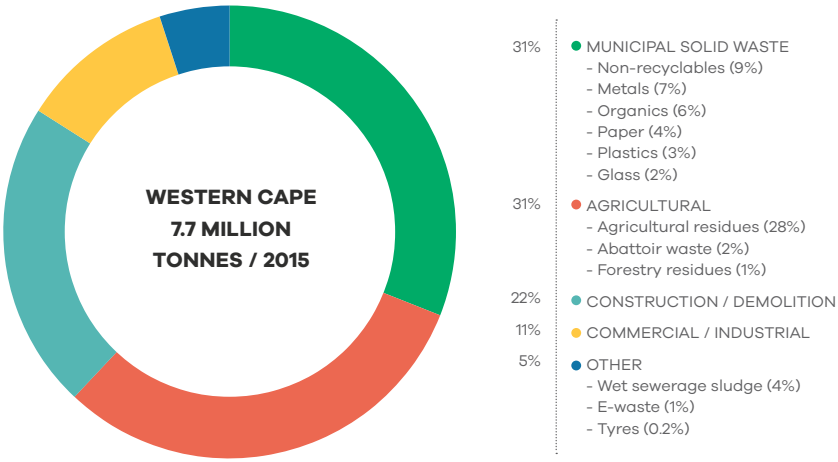


Figure 5: Western Cape waste characterisation in 2015

Source: DEDAT (2016)

Commercial and industrial waste streams are popular with private sector solution providers. Private sector waste is:

- often continuous, homogenous, and found in large volumes;
- less contaminated and easier to separate at points of source;
- easier to access from a contractual perspective; and
- motivating commercial and industrial generators to look for alternative solutions, as it reduces their disposal overheads.

The **agriculture and forestry** sector generates large volumes of clean homogenous waste streams. However, agricultural waste is often misrepresented as waste, and its re-entry into other points of the agricultural value chain, albeit not in the form it was intended for, is often not considered. Nevertheless, it is a sought-after stream that, because of logistical constraints, is often processed in close proximity of generation.

Table 3 shows the breakdown of total **Municipal Solid Waste (MSW)** generated per Western Cape district / metropolitan municipalities for 2015, and the extrapolated tonnages for 2018 and 2021, based on the expected population growth.

Table 3: MSW generated per district municipality/metro in 2015, 2018 and 2021

Source: DED&T (2016) and Quantec (2018)

Municipality	Area (km^2)	Population		MSW (Tonnes)[10]				
				2015 (actual)	2018 (estimated)			2021 (estimated)
		2018 (estimated)	Growth since 2015	Total	Total	Per person	Per km^2	Total
City of Cape Town	2 446	4 254 946	6%	1 671 146	1 767 272	0.415	1 740	1 875 608
Cape Winelands	21 473	930 779	8%	286 482	310 590	0.334	43	334 820
Central Karoo	38 854	76 029	4%	23 874	24 792	0.326	2	26 131
Eden District	23 331	626 547	6%	190 988	202 584	0.323	27	214 559
Overberg	12 239	309 366	9%	95 495	104 242	0.337	25	112 951
West Coast	31 119	452 595	10%	119 368	130 871	0.289	15	142 558
Western Cape	129 462	6 650 261	7%	2 387 353	2 540 351	0.382	51	2 706 628

The CoCT, which is the only metropolitan municipality in the Western Cape, generates more than 70% of the waste in the Western Cape. The most recent waste characterisation study was undertaken in 2018. Figure 6 shows that 31% of all waste was made up of non-recyclables such as textiles, residual, construction, wood, and what is termed "other". See Annex B for a detailed breakdown of CoCT waste as per the waste characterisation study.

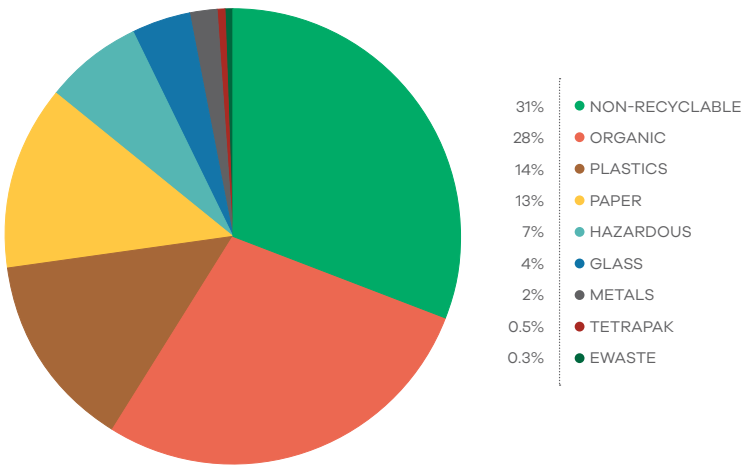


Figure 6: Waste characterisation for the CoCT

Source: CoCT (2018a)

[10] This year's MIR has separated C&D waste from the MSW as this stream has been separated at landfills

2.4. General drivers for waste beneficiation

2.4.1. Increasing cost of landfilling

The cost of landfill disposal (the gate fee charged per tonne) continues to be relatively low in South Africa compared to benchmarks in developed economies. In spite of this, waste generators still regard landfilling as a costly overhead, especially in the Western Cape. Figure 7 shows landfill gate fees for general waste across all of South Africa's eight metros.

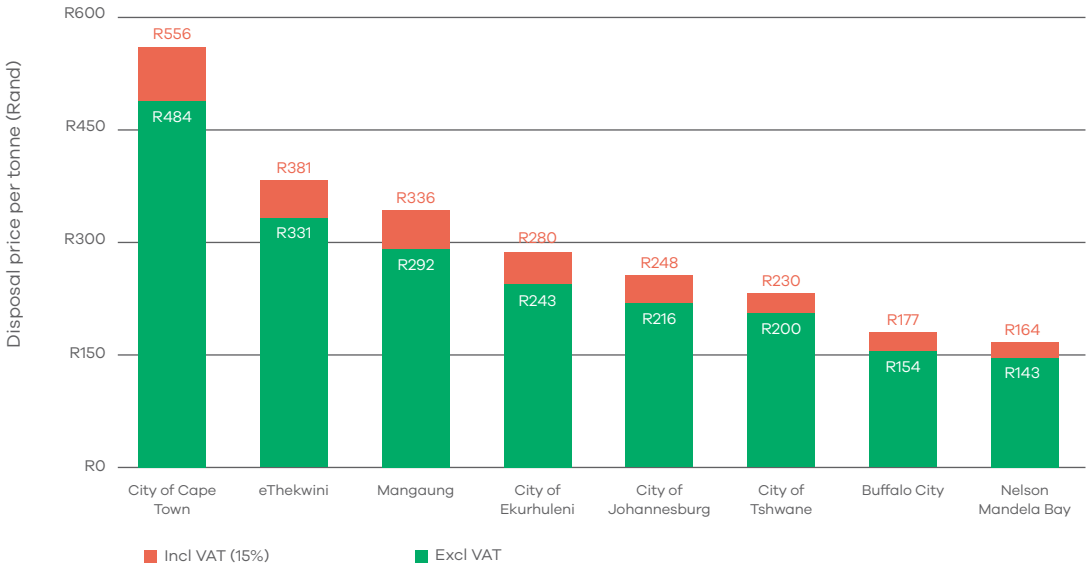


Figure 7: Landfill gate fees for general waste for South Africa's eight metros in 2017/2018

Source: GreenCape

The CoCT has the highest landfill gate fees in the country. Figure 8 shows the rise in gate fees in the Cape Town metro since 2013/14, and expected increases up to 2020/21. As the cost of landfill disposal increases above inflation[11], and with it increasing overheads for waste generators, so too does the demand for alternatives to landfill solutions. This strengthens the business case for investors looking to invest in solutions to provide cheaper alternative services to Cape Town-based businesses.

[11] Inflation was 4.5% on 23 Jan 2019 (www.Tradingeconomics.com)

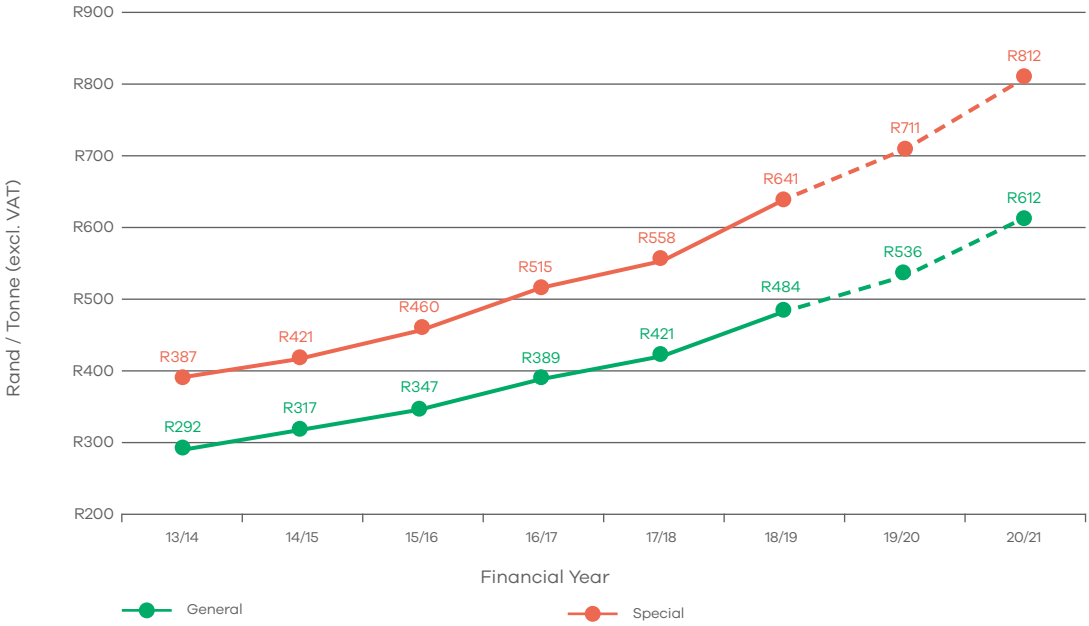


Figure 8: Landfill gate fees (excl. VAT) for the CoCT (2013/14 – 2020/21)

Source: GreenCape and CoCT (2018b)

The national DEA aims to implement mechanisms under its own control to fast track landfill diversion. This includes plans for the implementation of a landfill tax, which will increase overall disposal cost across the country. This is still to be assessed, along with an adequate tax.

2.4.2. Loss of landfill airspace

The Western Cape, like many parts of South Africa, is currently grappling with the availability of suitable landfills for disposal. Old landfills are closing, and the cost and sighting of new landfills have been challenging. However, the Western Cape is not a homogeneous entity. Some municipalities are in more serious situations than others. Municipalities greatly affected by this will be in need of cost-effective alternative waste treatment technologies to assist with waste diversion. Figure 9 shows the estimated lifespan of the Western Cape's municipal landfills as of 2018[12], and the location of intended regional landfills.

[12] Landfill airspace is based on DEA&DP estimations.

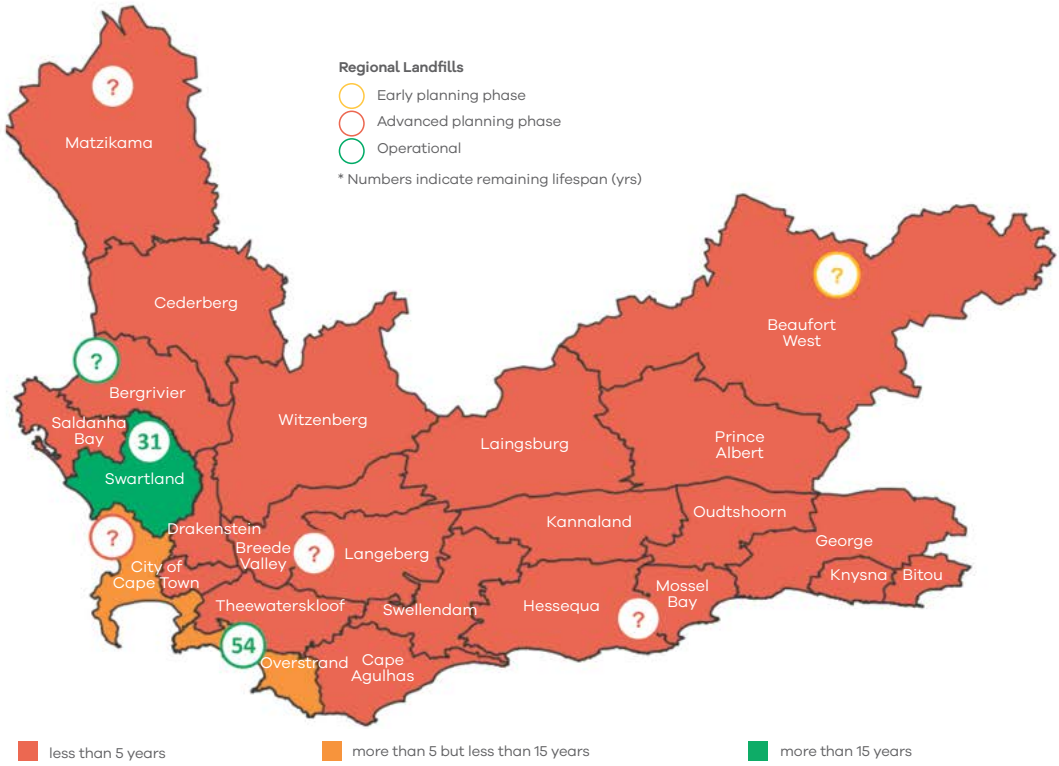


Figure 9: Estimated landfill lifespan for each local municipality in the Western Cape

Source: Extrapolated from DEADP (2019)

The Western Cape does have privately owned and operated landfills. However, only Vissershok private landfill[13] (next to Vissershok Municipal Landfill) operates as a commercial landfill receiving waste from businesses and municipalities. Furthermore, there are three existing and six proposed regional landfills to serve not only one local municipality, but multiple municipalities.

2.4.3. Perceived job creation in waste

In 2017, the national DEA undertook its Operation Phakisa: Chemicals and Waste Economy. During this session, the DEA identified 20 initiatives across four work streams to divert 20 million tonnes of waste from landfill. If realised, these initiatives could unlock an additional R11.5 billion per year to help create 45 000 direct and 82 000 indirect jobs and 4 300 small, medium and micro-sized enterprises (SMMEs). This has resulted in DEA's active role in regulation reform (see Section 3) and industry SMME support.

2.5. General risks and barriers

Extracting value from MSW

It is difficult to extract value from municipal solid waste (MSW) due to its complex nature and depending who the owner of the waste is. Firstly, MSW is constitutionally managed, and thus "owned", by local municipalities. This makes access to the waste onerous due to municipal procurement processes. Secondly, MSW is essentially 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 extremely contaminated. Nevertheless, there is potential to generate value, either once separation at source is implemented, or if a robust technology is implemented.

[13] Vissershok Private landfill is hazardous landfill jointly owned by two waste companies, Averda and Enviroserv.

Low levels of separation at source

Generally speaking, South Africans do not have a culture of separating waste at source. This makes extracting value difficult and costly. Regarding households, there are no incentives/disincentives for households to separate at source. 'Post consumers', namely households, pay for waste management through municipal rates. These rates are required to be paid irrespective of households diverting waste or not. Secondly, apart from the City of Johannesburg (see Section 2 6 below), there are generally no mandatory requirements to separate at source. Even if municipal waste management by-laws require mandatory separation at source, municipalities do not always have the capacity to enforce this. However, it makes financial sense for the private sector to separate and divert waste to reduce landfill disposal overheads.

Promulgation of the National Minimum Wage Act

South Africa's National Minimum Wage Act No. 9 of 2018, published in the Government Gazette of 27 November 2018, came into effect on 01 January 2019. The Act provides for a blanket minimum payment structure for every South African in employment, including those in the waste sector. The proposed minimum wage is to be R20 per hour or R3 500 per month for a 40-hour week, subject to an annual review. The waste sector in South Africa is labour intensive and such minimum requirements are expected to impact many businesses, especially SMMEs.

2.6. Highlights from 2017/2018

City of Johannesburg separation-at-source

As of July 2018, the City of Johannesburg implemented mandatory household separation of dry recyclables. The phased approach makes it compulsory for residents in specific areas to separate dry recyclables for kerbside collection. Collections will be undertaken by Pikitup and its outsourced service providers.

City of Cape Town's landfill gas investment

The CoCT launched its landfill gas extraction systems in March 2018 at Coastal Park and Bellville South landfill sites. These systems were developed as a carbon-offsetting Clean Development Mechanism that will generate carbon credits for the CoCT. Currently, the gas is flared, but the intention is to generate electricity. It is likely that the projects will produce an estimated 1 MW of electricity. A similar system is expected to be installed at the CoCT's Vissershok municipal landfill in 2019.

Closure of Bellville South landfill

Due to licence requirements, September 2018 saw the CoCT closing its Bellville South landfill. This leaves only two operational municipal landfills in the CoCT, these being Vissershok (municipal) and Coastal Park landfills. However, Bellville South's material recovery facility and refuse transfer station will continue to operate as usual.

Drakenstein terminates beneficiation project

Drakenstein local municipality has terminated its proposed integrated waste management facility in the town of Wellington. This came after the national Minister of Finance requested the project to restart the EIA process due to non-compliance. This was a public-private partnership with the prominent waste management company, Interwaste, which would have seen R1 billion invested in material recovery, biogas, and incineration. The facility was designed to process 700 tonnes a day of MSW. Drakenstein has indicated that they will be investigating a new waste beneficiation project.

International bid for Interwaste

French-based Séché Environnement announced its intention to acquire ownership of Interwaste, a large South African waste management company. This bid has been approved by the Interwaste board. This is the second large waste company to be acquired by an international waste company. The other was WasteMan by Averda in 2015.

3
Legislation and regulations

This section provides a brief overview of major legislation and regulations that govern waste management in South Africa. It also highlights draft and anticipated legislation and regulations that are likely to be implemented.

South Africa has a vibrant and progressive regulatory framework for landfill diversion of waste and subsequently waste beneficiation. Over the course of three decades, the regulatory environment has shifted from landfill management to recycling, and recently towards extended producer responsibility.

3.1. The legislative framework for waste management

In terms of Chapter 2 (Bill of Rights) of the South African Constitution, everyone has the right 'to an environment that is not harmful to their health or wellbeing; and to have the environment protected, for the benefit of present and future generations'. These fundamental rights underpin the framework that governs environmental legislation in South Africa, this being the National Environmental Management Act (NEMA).

The National Environmental Management Act (107 of 1998)

The NEMA is guided by a number of key integrated environmental management principles. These aim to ensure that negative environmental impacts are prevented, mitigated, and/or regulated. They also provide an array of instruments to monitor and manage activities that impact the environment.

One of these mechanism is the environmental impact assessment (EIA) regulations. The EIA regulations list a number of activities that may result in substantial negative impacts on the environment. The 'Listed Activities' require either a 'Basic Assessment' process or an 'EIA Scoping' process to be undertaken before an activity can be authorised. Commencement with any of the 'Listed Activities' prior to obtaining authorisation from competent authorities is prohibited in terms of NEMA and is regarded as an offence. The EIA process requires a third party environmental assessment practitioner (EAP) to undertake the application.

The EIA regulations do not apply to general activities only, but include waste activities governed by South Africa's National Environmental Management Waste Act (NEMWA) (Act 59 of 2008), or more colloquially known as 'the Waste Act'.

National Environmental Management Waste Act (Act 59 of 2008)

NEMWA is a waste-specific act that is guided by integrated waste management principles aimed at preventing negative waste-related environmental impacts. Investors and businesses looking to mitigate any risks should take into consideration the NEMWA, its requirements, and the ramifications if it is violated.

Since its promulgation, all spheres of government are bound to the ideals of the waste management hierarchy:

- avoid and minimise the generation of waste;
- reduce, reuse, recycle and recover waste; and
- treat and safely dispose of waste as a last resort.

The NEMWA provides a list[14] of waste management activities[15] that must undergo a waste management licensing process if certain criteria are triggered. These activities are deemed to have, or are likely to have, a detrimental effect on the environment.

Waste management activities are differentiated into three categories that have different approval and licensing requirements:

- 'Category A' activities require a basic EIA;
- 'Category B' activities require a scoping and full EIA process to be undertaken prior to obtaining a waste management licence; and
- 'Category C' activities require adherence to specific norms and standards.

Category C is an attempt to facilitate the uptake of alternative waste treatment. The DEA has downgraded certain triggers from Category A to Category C activities. Thus, instead of undertaking an EIA process, the activities in question only need to adhere to norms and standards.

National Environmental Management Air Quality Act (Act 39 of 2004)

The National Environmental Management Air Quality Act (NEMAQA) is an air quality specific act that aims to prevent negative air quality related environmental impacts. The NEMAQA provides a list of activities, published under Government Notice 893 in Government Gazette 37054 dated 22 November 2013, that trigger the need to undertake an air emission licensing process. The NEMAQA is particularly relevant to waste-to-energy projects. Investors and businesses interested in waste-to-energy activities must consider the NEMAQA, its requirements, and the ramifications if violated.

Municipal waste management by-laws

Local municipalities may choose to regulate how waste is managed within their boundaries through the promulgation of waste specific by-laws. These by-laws often provide obligations for both waste generators and waste handlers. The CoCT's by-law, as amended[16], for example requires that any (juristic) person intending to perform recycling, reuse or recovery activities, or the sorting of waste, must be accredited with CoCT before commencing such activities. To be accredited, the person must also submit an integrated waste management plan to a CoCT waste management officer.

Existing waste businesses not yet registered with their respective municipalities, or investors looking to enter the market, must ensure that they engage with the respective solid waste departments of the municipalities where they conduct or plan to conduct their activities to determine whether they need to be registered and/or accredited.

3.2. New regulatory updates

A number of legislative changes have occurred since the publication of the previous MIR. The following changes are likely to have an impact on the waste sector:

Industry Waste Management Plans

The DEA has published a NEMWA Section 28 notice (Government Notice 1353) on 06 December 2017. The notice requires the paper and packaging, lighting equipment, and electrical and electronic industries to develop and submit an industry waste management plan on how the respective industries will manage its waste. Producers[17] were required to prepare and submit an IndWMP to the Minister for approval by 06 September 2018 or subscribe to a non-profit producer responsibility organisation (PRO) that will develop and implement an IndWMP. Once the IndWMP has been approved by the Minister, producers must comply with the requirements of the IndWMP to which they have subscribed. At the time of publishing this MIR, the plans were to be approved by mid-March 2019 to be implemented in October 2019. However, it is unlikely that this will be the case, and that it is more likely that the IndWMPs will only be implemented in 2020.

Scheduled landfill restrictions (2018/19)

The national norms and standard for the disposal of waste to landfill (R. 636 of 23 August 2013)

[14] Government Notice 921 National Environmental Management: Waste Act (59/2008): List of waste management activities that have, or are likely to have, a detrimental effect on the environment (as amended)

[15] Storage, recycling or recovery, treatment, disposal

[16] Copy of the CoCT's bylaw can be found at https://openbylaws.org.za/za-cpt/act/by-law/2009/integrated-waste-management/resources/eng.pdf

[17] A producer includes any person, or category of person, or a brand owner who is engaged in the commercial conversion or refurbishment of new and/or used: paper and packaging material, lighting equipment, electrical and electronic equipment, or goods wrapped in primary or secondary packing material.

provide directives for the disposal of waste to landfill. Included in these norms and standards is a list of wastes that can and cannot[18] be disposed of at landfill. These may be streams investors would be interested in investigating.

Regulations excluding a waste stream from the definition of waste (Government Notice No. 715 of 2018)

These regulations prescribe the manner in which an application can be made to exclude a waste stream, or portion of waste stream, for beneficial use from the definition of waste. During the drafting of the regulations, a number of waste streams were proposed to be excluded from the definition of waste. However, these streams[19] have since been removed with the promulgation of the regulations. Investors and businesses looking to enter the waste sector should take cognisance of the delisting requirements in the event that they, their industry, or clients are looking to beneficiate particular streams.

Amendment to tariffs for registering fertilizers, farm feeds, agricultural remedies, stock remedies, sterilizing plants and pest control operators, appeals and imports (GN 394 of 2018)

The Department of Agriculture, Forestry and Fisheries (DAFF) published amendments to the regulations relating to the tariffs for the registration of fertilizers, farm feeds, agricultural remedies, sterilizing plants and pest control operators, appeals and imports. These regulations fall under the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act 36 of 1947, as amended. The amended regulations set out the tariffs applicable for the registration of amongst others, fertilizers. These tariffs are relevant for investors and businesses seeking to develop markets for their fertilizers from organic waste processing activities.

Appointment of the Environmental Assessment Practitioners' Association of South Africa (GN 104 of 2018)

The DEA appointed the Environmental Assessment Practitioners Association of South Africa (EAPASA) as the single registration authority for Environmental Assessment Practitioners (EAPs). This requires that all EAPs are required to be registered with EAPASA by no later than February 2020. Investors and businesses looking to establish activities that will require a waste licence and subsequent EIA process, must ensure the appointed EAP is registered with EAPASA.

3.3. Draft regulations

A number of regulations have been drafted and released for public comment.

National Health Care Risk Waste Regulations (GN 463 of 2018)

The draft regulations are intended to regulate the management of health care risk waste (HCRW). These draft regulations provide for general duties that apply to generators, transporters, and managers of HCRW. Furthermore, the draft regulations propose a set of norms and standards (GN 464 of 2018) that prescribe minimum requirements for the efficacy testing and operation of a non-combustion treatment technology used to treat HCRW.

3.4. Anticipated regulations / guidelines

There are several regulations that are in the discussion phase, or that will be promulgated in due course.

Scheduled landfill restrictions (2019-2021)

The national norms and standard for the assessment of waste for landfill disposal (R. 636 of 23 August 2013) under section 7(1)(c) of the National Environmental Management: Waste Act 59 of 2008) provide directives for the disposal of waste to landfill. Included in these norms and standards is a list of wastes that can and cannot[20] be disposed of at landfill. Following its promulgation in 2013, the following specific waste streams will be banned from landfilling as of 23 August 2019:

- liquid waste as defined; and
- hazardous waste with caloric value of >20MJ/kg.

[18] Chapter 5(1) of Regulation 636 of 23 August 2013 stipulates the prohibitions and restrictions on the disposal of waste to landfill that come into effect after the timeframes indicated for each waste from the date of the Regulations coming into operation.

[19] Waste slag from metallurgical process; ash from combustion and gasification; gypsum from pulp, paper and cardboard production, and processing; and biomass of plant, animal, or micro-organism's origin.

[20] Chapter 5(1) of Regulation 636 of 23 August 2013 provides a list of specific waste that is prohibited or restricted from landfill from the date of the regulations coming into effect.

The following waste streams and activities will be banned from landfills as of 23 August 2021:

- persistent organic pollutant pesticides listed under the Stockholm Convention;
- batteries other than lead acid[21];
- H\hazardous e-waste other than lamps[22];
- brine as defined; and
- macro-encapsulation of waste as defined.

Provincial landfill diversion targets for organics

The Western Cape's DEA&DP has implemented an organic waste diversion plan, which aims to divert 50% of organic waste from landfill by 2022, and 100% by 2027. This will require municipalities to set annual targets, and to identify and implement procedures to meet these targets. This should result in an increased demand for organic waste solutions from both the private sector and municipalities.

Norms and standards for composting

With the pressure on diverting organics from landfill, and in light of the restrictive nature of the listed waste management activities, the national DEA is in the process of updating draft norms and standards for organic waste composting. This should reduce the licensing requirements, which include a costly and onerous EIA process, for specifically composting.

Guidelines for registration of digestate used as a soil conditioner or amendment

The market of digestate is a significant barrier to the success of biogas projects. The DAFF is drafting guidelines for the registration of digestate as a soil conditioner or amendment. This could boost market confidence to use digestate and subsequently facilitate growth and confidence in the biogas market.

Guidelines for separation at source

The national DEA is developing voluntary municipal guidelines for separation-at-source of waste, which will likely be finalised in 2019. These may lead to increased demand for collection of recyclables by private sector contractors and feedstocks for the market.

[21] Lead batteries were banned form landfill as of 23 August 2013.

[22] Lamps categorised as hazardous e-waste were banned from landfill as of 23 August 2016.

4
Opportunities

There are opportunities for investors in organics, e-waste, plastics, and builder's rubble, some of which are cross cutting.

These opportunities have been identified through stakeholder engagement and estimates, and projections based on expected growth.

- **Organics:** In 2018[23] in the Western Cape there were ~520 650 tonnes of organic MSW and ~318 626 tonnes of commercial and industrial organic waste available for recycling. This total market is valued at an estimated R83 to R158 million per year, depending on the end product[24]. At municipal level, the greatest value lies in the CoCT with a market value for organics, depending on product produced, of R59 million to R111 million per year.

- **E-waste:** If a conservative range of between R1 309 and R1 636 per tonne of scrap e-waste (excluding higher value materials) is applied, then the low value of e-waste in the Western Cape is between R54.5 million and R108.4 million per year, with the CoCT holding the largest value of between R34.9 and R75.4 million.

- **Plastics:** If a value of between R1 950 and R2 600 per tonne of plastics is used, the value for the Western Cape's MSW plastics is between R462.2 and R616.2 million per year, with CoCT MSW plastics valued between R321.5 and R428.7 million in 2018.

- **Builder's rubble:** The supply of and demand for builder's rubble as an alternative to virgin material are growing. National government and local municipalities are focusing increasingly on diverting rubble from landfill. The private sector is increasingly applying builder's rubble as a secondary construction material, in the context of rising virgin material costs. The current value of builder's rubble available to the market in South Africa is conservatively estimated at R132 to R309 million, depending on the application. Crushing contracts in Stellenbosch and CoCT, green procurement by the private sector, and red tape reduction are further unlocking the reuse potential of builder's rubble.

South Africa's recycling sector is bound to economic principles, and waste processing must make business sense. The viability of solutions hinges on, amongst others: the characteristics (type, volume, level of homogeneity, degree of contamination and effort required to extract non-recyclables) of the waste generated; the locality of point of generation; who has ownership of the waste (municipal or private); and of course the regulatory framework. This may change with the implementation of extended producer responsibility (EPR) through the implementation of IndWMPs for tyres, paper and packaging, e-waste, and lighting.

4.1. Organics

4.1.1. Market overview

Organic waste[25] is a broad waste stream, existing in various forms and volumes, ranging from small inconsistent household volumes that are mixed and highly contaminated, to large industrial and/or agricultural volumes of consistent, homogeneous and uncontaminated streams.

Due to its complexity, organic waste traditionally had little value and continues to be diverted more as a means to reduce business overheads, rather

[23] Excluding agriculture, abattoir and forestry waste

[24] Based on between R100 (R20 per 20kg of compost sold in store which is generated from 200kg of organic waste) and R188 – (according to Waste Road Map (DST 2014) value for organics – per tonne of organic waste.

[25] As per the National Waste Information Regulations, organic waste is categorised as garden waste, food waste and wood waste.

than being purchased as a feedstock for value-add solutions. That said, it is the stream that has the greatest impact on the overall waste system. Separating organic waste has the potential to unlock the quality and quantity of other valuable recyclables that otherwise would have been contaminated.

There is a growing focus on organic waste solutions in South Africa, particularly in the Western Cape. The demand for organic waste is increasing, specifically for clean and homogenous streams, and the market is showing significant potential. The market for alternative waste treatment solutions is becoming more favourable due to:

- rising landfill costs'
- limited landfill airspace; and
- waste generators establishing internal waste diversion targets.

The greatest market driver will be the impending restrictions of organics to Western Cape landfills (see Section 2). This will more than likely only unlock feedstocks in the next four to nine years, but the delay affords solution providers time to investigate opportunities and to navigate the waste regulations.

Figure 10 shows the distribution of organic waste in the Western Cape. Table 4 provides a detailed breakdown of organic waste per district municipality.

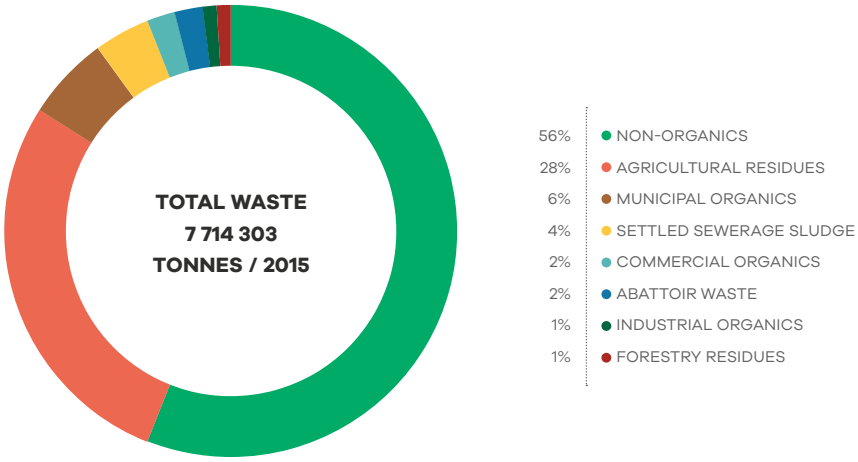


Figure 10: Organic waste relative to total waste generated in the Western Cape in 2015

Source: DEDAT (2016)

Table 4: Organic waste generated in the Western Cape in 2015[26]

Source: DEDAT (2016)

Munic / Metro	MSW Organics	Industrial	Commercial	Agricultural / Abattoir	Forestry Residues	Wet Sewerage	Total
CoCT	342 505	76 490	140 232	57 783	9 102	190 995	817 107
Cape Winelands	58 715	11 877	21 775	300 183	4 551	39 846	436 947
Eden	39 143	8 441	15 476	437 298	63 715	28 436	592 509
West Coast	24 465	4 742	8 693	913 183	4 551	19 525	975 159
Overberg	19 572	3 665	6 719	531 785	9 102	12 691	583 534
Central Karoo	4 893	517	948	34 531	0	3 530	44 419
Total	489 293	105 732	193 842	2 274 763	91 021	295 023	3 449 674

The rest of this section will focus on MSW organic waste, and commercial and industrial organic waste, i.e. excluding agricultural opportunities. This is because much of the inherent value of MSW organics (and subsequent value of other materials) is lost due to co-disposal and landfill. For agricultural opportunities please see the 2018 Waste Economy MIR.

MSW organics

The Western Cape generated ~489 293 tonnes of MSW organics in 2015, which equate to about 20% of the total 2 387 353 tonnes of MSW generated. If projected using an average annual population growth of 2.1% for the province, MSW organic waste generation is estimated to have increased to more than 520 650 tonnes by 2018 and to increase to 554 729 tonnes by 2021. The CoCT will continue to generate the bulk (70%) of MSW organic waste. Table 5 shows the projected distribution of MSW organics across district municipalities for 2018 and 2021.

Table 5: MSW organic waste generated in the Western Cape between 2015 and 2021

Source: Inferred and projected from DEDAT (2016) using population growth Quantec (2018)

Munic / Metro	2015 (t/yr)	2018 (projected)			2021 (projected) (t/yr)
		Generated (t/yr)	Concentration (t/km^2)	Per Capita (kg/p/day)	
CoCT	342 505	362 206	148,1	0,233	384 410
Cape Winelands	58 715	63 656	3,0	0,187	68 622
Eden	39 143	41 520	1,8	0,182	43 974
West Coast	24 465	26 823	0,9	0,162	29 218
Overberg	19 572	21 365	1,7	0,189	23 150
Central Karoo	4 893	5 081	0,1	0,183	5 356
Total	489 293	520 650			554 729

26 The general split between industrial and commercial waste is 60/40 respectively. Of this, the organic fraction for industrial waste is 20% and for commercial waste it is 55% (Jeffares and Green, 2014).

Commercial and industrial organics

The Western Cape generated ~299 574 tonnes of commercial and industrial organics in 2015. If projected using an average annual population growth of 2.1% for the province, the commercial and industrial organic waste generation is estimated to have increased to ~318 626 tonnes by 2018 and to increase to 339 366 tonnes by 2021. The CoCT will continue to generate the bulk (72%) of commercial and industrial organic waste. Table 6 shows the projected distribution of commercial and industrial organics across district municipalities for 2018 and 2021.

Table 6: Commercial and industrial organic waste generated in the Western Cape between 2015 and 2021

Source: Inferred and projected from DEDAT (2016) using population growth Quantec (2018)

Munic / Metro	2015 (actual)		2018 (projected)			2021 (projected)	
	Ind. (t/yr)	Comm. (t/yr)	Ind. (t/yr)	Comm. (t/yr)	Concentration (t/km²)	Ind. (t/yr)	Comm. (t/yr)
CoCT	76 490	140 232	80 890	148 298	94	85 849	157 389
Cape Winelands	11 877	21 775	12 877	23 607	2	13 881	25 449
Eden	8 441	15 476	8 954	16 415	1	9 483	17 386
West Coast	4 742	8 693	5 199	9 531	0	5 663	10 382
Overberg	3 665	6 719	4 000	7 334	1	4 335	7 947
Central Karoo	517	948	537	984	0	566	1 037
Total	105 732	193 842	112 456	206 170		119 776	219 590
	299 574		318 626			339 366	

The commercial and industrial private sector is responsible for the management of their own waste. They pay disposal fees and by diverting organic waste they can save on overheads. Based on the 2018/19 landfill gate fees (see Figure 8) in the CoCT and on 2018 projections, the cost of disposal of commercial and industrial organic waste in the CoCT is ~R111 million (excl. VAT) per year.

In Cape Town and other sizeable cities, large companies outsource collection to one of a handful of large, established waste companies that primarily provide logistics. Companies looking to divert certain streams typically require onsite waste coordinators who manage the waste separation and collection on their clients' behalf. For investors to access private sector organics, it is best to enter into an agreement with waste logistics and coordination companies that manage the waste of multiple clients; this guarantees large volumes. Some small to medium facilities outsource collection, but this is usually to smaller waste companies. It is common for small businesses, such as offices or eateries, to outsource collection to the municipality.

The private organic waste collectors either landfill, or make use of a variety of organic waste solutions. Some solutions are extremely sensitive and require specific feedstocks. Other solutions are robust enough to process feedstocks of various compositions.

In CoCT, there are currently two facilities that are licensed, and have the capacity to process more than ten tonnes a day of mixed organics, including household organics. They are Reliance composting facility and the Athlone integrated waste management facility.

Figure 11 shows the number of existing and future solutions in CoCT that process commercial, industrial and MSW organic waste (agricultural streams excluded).

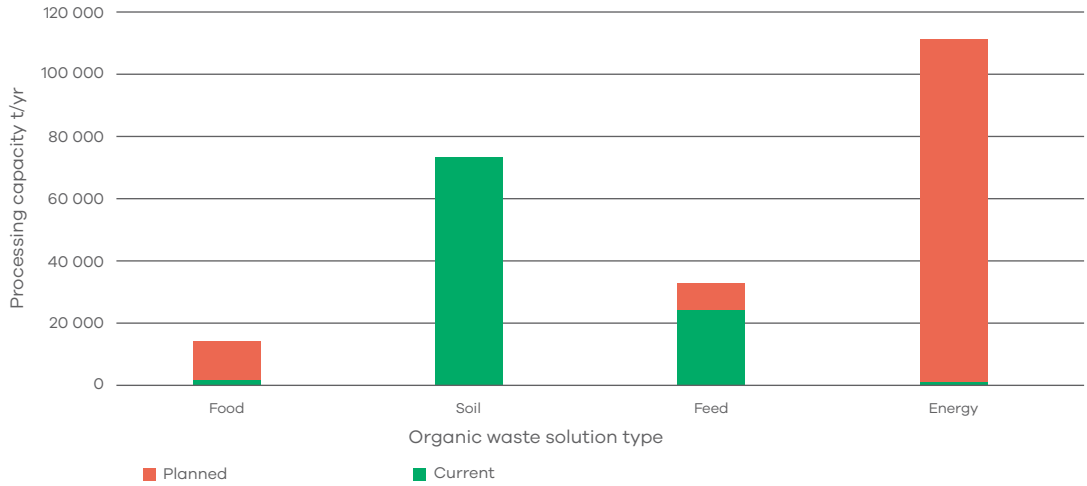


Figure 11: Current and planned (by 2022) MSW, commercial, and industrial organic waste solutions in CoCT

Source: GreenCape engagements

Extracting value depends on the actual material in question and the level of contamination. Commercial streams are generally more contaminated by packaging than industrial organics. As such, commercial streams require infrastructure and/or labour to depackage and prepare for solutions.

4.1.2. Opportunities

In the Western Cape ~520 650 tonnes of MSW organics generated in 2018 and ~318 630 tonnes of commercial and industrial organic waste. With current solutions only absorbing an estimated 215 000 tonnes (25% of MSW, commercial and industrial organics), there is a further 624 280 tonnes of organics available. The total market is valued at an estimated R83 - R158 million per year[27]. At a municipal level, the greatest value lies in the CoCT (70% of the total waste stream) with an estimated market value for organics of R59 - R111 million per year[27]. Opportunities include:

The total potential market for MSW, commercial and industrial organics in the Western Cape in 2018 was R83-R158 million.

Solutions for organic MSW in Cape Town

- **Processing of heavily contaminated feedstocks in Cape Town and surrounds:** The CoCT was projected to generate ~362 200 tonnes of MSW organics in 2018, which is expected to grow to ~384 410 tonnes by 2021. With the Athlone private facility designed to process only 108 000 tonnes per year[28] of organics, the resulting 276 400 tonnes of MSW organics could be made available for solutions that can process heavily contaminated municipal feedstocks. This does not include the MSW organics from surrounding municipalities, most notably Stellenbosch and Drakenstein, which fall within the Cape Winelands district municipality that as a district generated an estimated 63 656 tonnes in 2018.

- **Municipal plan for processing MSW with organics** In light of the need to adjust its cost recovery model (which has relied on landfilling), coupled

[27] Assuming all organics were separated, at a value of between R100 (based on R20 per 20kg of compost sold in store which is generated from 200kg of organic waste) and R188 (based on the Waste Road Map [DST 2014] value for organics) per tonne of organic waste.

[27] Assuming all organics were separated, at a value of between R100 (Based on R20 per 20kg of compost sold in store which is generated from 200kg of organic waste) - R188 (Based in the Waste Road Map (DST 2014) value for organics) per tonne of organic waste.

[28] Based on capacity to process 300 tonnes a day of organics.

with the Western Cape's organic landfill restrictions, the CoCT is investigating the development of its own mechanical biological treatment plant for the processing of MSW, including the embedded organics. The details of these plans are expected to be made public in mid-2019. Until a decision is made by the CoCT, it is still likely that there will be enough MSW organics to complement a CoCT facility and the Athlone private facility.

A new treatment plant should unlock further opportunities elsewhere along the value chain, including opportunities for organic waste generators and waste management companies handling organic waste.

There is an opportunity in Cape Town for expansion or financing of solutions for over 203 900 tonnes per year of commercial and industrial organic waste.

Financing of solutions for commercial and industrial organic waste in CoCT

The CoCT and its direct neighbour municipalities generated ~291 730 tonnes of commercial and industrial organic waste in 2018. This is expected to increase to 310 900 tonnes by 2021. Cape Town hosts a number of organic processors that mostly service the private sector. These processors will be able to absorb ~107 000 tonnes of organics per year by 2021, leaving 203 900 tonnes of commercial and industrial organics available.

As these solutions are already existing and have established clients, it may prove difficult to enter the market depending on the given solution and its value offering. However, with the landfill restrictions, the Western Cape is currently limited in the number of facilities that can process more than 10 tonnes per day of organic waste. The only facilities that could do this are Reliance's Corona facility and the Athlone private facility (not operational and its future unknown at the time of writing this MIR).

Nevertheless, with the number of regulations that are likely to be promulgated, the red tape associated with composting should be reduced. This has resulted in existing solution providers investigating expansion to process above 10 tonnes a day. This may provide investors an opportunity to invest in growing these existing solution providers.

4.1.3. Drivers

In addition to the ones mentioned in Section 2.4, the main market drivers include:

Restrictions on landfilling organics

As noted in Section 3.4, the Western Cape's DEA&DP has implemented an organic waste diversion plan, which aims to divert 50% of organic waste from landfill by 2022, and 100% by 2027. This should result in higher demand for organic waste solutions from both the private sector and municipalities. This will be further facilitated by regulatory change as discussed in Section 3.4.

4.1.4. Risks and barriers

In addition to the ones mentioned in Section 2.5, specific risks and barriers include:

Competition for organics by pig farmers

Organic waste solution providers are competing with livestock farmers, mainly pig farmers, for access to organic waste feedstocks such as food waste. Feeding animals organic waste is not recognised as an organic waste treatment, thus it is not governed by the NEMWA and associated regulations and does not require a waste management licence. However, the practice is governed by the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act 36 of 1947). This act governs the sale of farm feed and stipulates when organics can be fed to livestock. Waste generators are often unaware of the regulations governing farm feed and give or sell waste to animal farmers. It includes those waste generators that are flouting regulations, for example the farmers themselves or a third party logistics entity.

Need for compost certification of post-treated organics

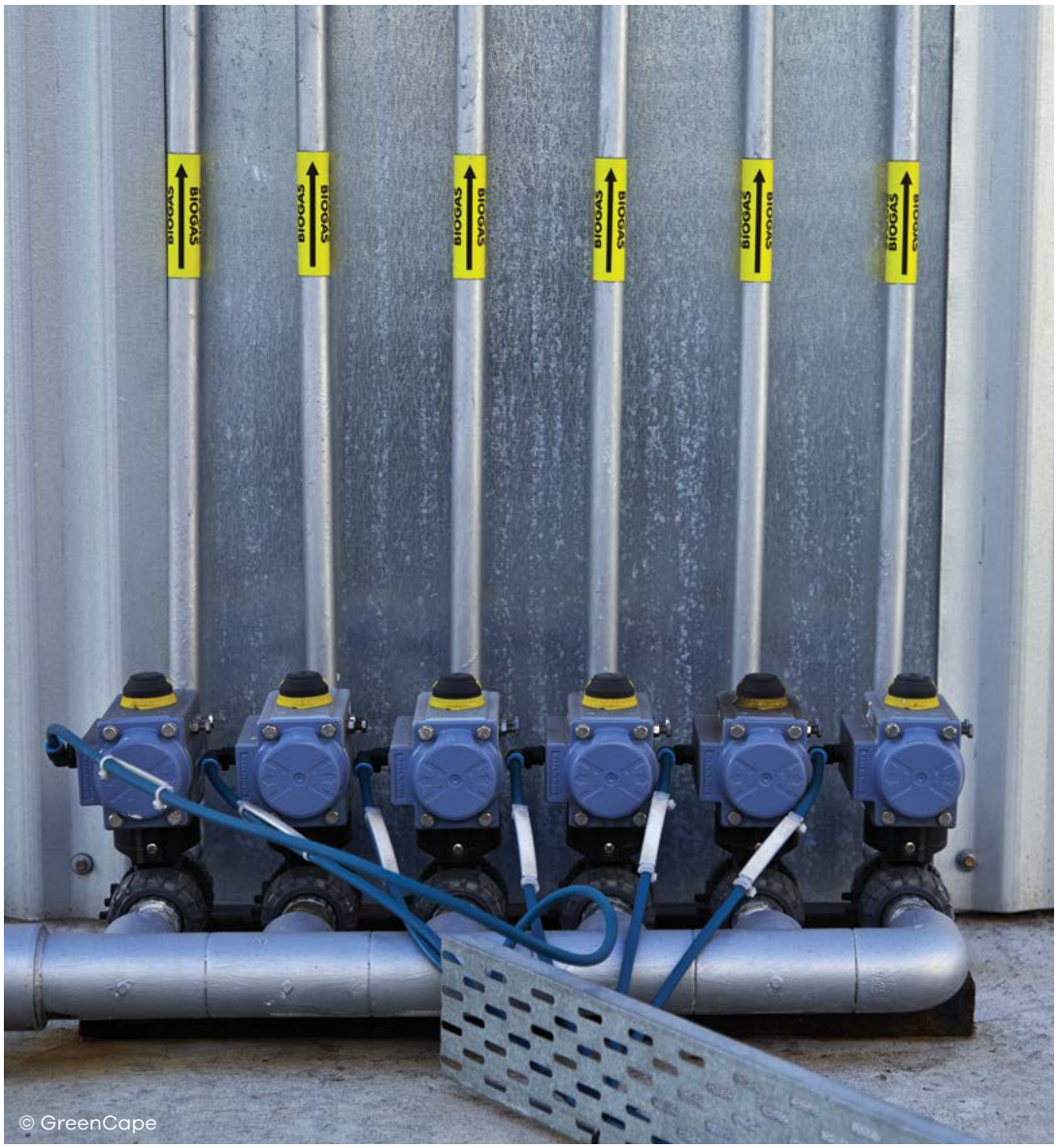
Organics traditionally require a great deal of pre-processing if not separated at source. This is more complex when dealing with MSW organics as contamination is very high, with inconsistencies and variability in volumes and the character of feedstocks. Furthermore, in order to secure viable markets for compost or digestate to be used as fertilizer, the product needs to be certified. This certification is heavily

regulated[29]. Benefits of certification is that the certified by-products can be sold at a higher price than non-certified by-products.

Confidence in bioenergy projects

GreenCape's engagements indicate that some financial institutions and investors are losing confidence in bioenergy projects. Various factors have affected the viability of biogas projects in South Africa, including:

- types and security of feedstock;
- availability of realistic revenue streams;
- the cost of managing digestate;
- the project/stakeholder structure;
- the choice of technology;
- the conditions of contract agreements; and
- most importantly, a lack of skills to operate facilities.



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[29] Through the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act 36 of 1947, as amended.

Success conditions for private biogas projects

To support the biogas sector, the United Nations Industrial Development Organization (UNIDO) commissioned a study to determine success conditions for viable SMME biogas projects in South Africa. This study is part of a scaling-up component of a larger waste-to-energy project to promote market-based adoption of SMME biogas technologies in South Africa[30]. Table 7 provides an outcome of the study that shows two typical project models that are viable in the South African context as of March 2018. Although each project is unique and should be considered on a case-to-case basis, investors could use the models as an indication of the likely financial viability of biogas projects in South Africa.

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[30] For further information on the project development life cycle of biogas please visit: https://unfccc.int/sites/default/files/resource/Biogas%20to%20Energy%20Project%20Development%20Methodology.pdf

Table 7: Viable project models in South Africa as of March 2018

Source: GreenCape (2018) (as commissioned by UNIDO)

Size of Facility	Small	Medium
Type	Private	Project finance or SPV
Value (Rands)	R2 million – R20 million[31]	R20 – R400 million[26]
Project size	< 500kW	> 500kW
Key component	Site / developer collateral[32]	Feedstock guarantee / security with alternative offtake guarantee (gas and/or electricity) wheeling agreement
Rand / kWh[33]	R1.4 – R1.5 / kW	R1.4 – R1.5 / kW R145 – R180 / GJ or CNG
Site conditions	Feedstock on-site Offtake on-site Digestate zero cost to project	Portion of feedstock on-site Portion of offtake on-site Need digestate management process[34]
Site options	Abattoirs, livestock feedlots, chicken farms, malls, piggeries, food processing, fruit/ vegetable processing	Mega farm (single supply) Centralised farm (multiple feedstocks)
Revenue model	Electricity and heat and/or gas offset fees	Premium on electricity sales (banking on green energy premium or Eskom resign above fixed escalations), Gas sales – CNG projects of >1.5MW, combination of on-site use, offset disposal fees and heat use
Financing	Debt to equity ratio: 60:40 Internal rate of return: 18-25% Debt tenor: 7-10 years Rate: 10.5-12% Debt service cover ratio: 1.3 Fund 5 years with option to refinance residual value (debt requires min tail of 3 years)	Debt to equity ratio: 70:30 Internal rate of return: 18-25% Debt tenor: 12 years Debt requires tail of 3 years Debt service cover ratio: 1.3 Debt reserve account 6 months (interest and capital)
Cover	Site owner/developer balance sheet strength (different revenue stream options), land collateral	Cession rights, buy-back options Independent assessment for feedstock Design PR guarantees of plant Continuous feedstock analysis (visual or test insurance options)
Key considerations	No revenue considered during first 6 – 12 month commissioning	No revenue to be considered during 6- to 12-month commissioning 50% buffer on feedstock supply One main feedstock supplier Two secondary feedstock options

[31] For further information on the project development life cycle of biogas please visit: https://unfccc.int/sites/default/files/resource/Biogas%20to%20Energy%20Project%20Development%20Methodology.pdf

[32] An indicative CAPEX cost for a biogas plant is R40 million/MW provided by industry experts.

[33] How a developer would finance a biogas plant would be through their own balance sheet or through an offtake agreement with the site owner.

[34] An indicative value provided by industry experts.

4.1.5. Recent developments

Organic waste association – official launch

The mission of the industry-driven Organic Recycling Association of South Africa (ORASA) is to promote and expand the organics recycling market, support its members, and champion the recycling of organic waste. Since its conception in 2017, the association continues to grow and has expanded its influence to Gauteng. Businesses looking to support organic waste beneficiation would benefit from engaging with ORASA. ORASA will have its official launch of its establishment in Cape Town in early 2019.

Athlone integrated waste management facility

The first attempt in Africa to extract, at scale, value from organics from mixed MSW has been met with a plethora of challenges, including incorrect waste characterisation of MSW, unexpected technical problems, and securing markets for tailings and digestate, resulting in its closure. The Athlone private integrated waste management facility cost R400 million to construct and has the capacity to process 600 tonnes a day of MSW (including 300 tonnes a day of organics). However, since its opening in early 2017, the facility has been forced to suspend operations. It is likely that the current shareholders will seek to sell off the facility to one of several interested parties to seek additional investment.

Stellenbosch's organic waste aggregation

Stellenbosch local municipality is developing the role out of an organic waste collection pilot for its hospitality industry. The pilot includes providing participants with a designated organic waste wheelie bin. It will not only be collected on a more frequent bases but the price to secure the service will be cheaper compared to the current collection fees offered for general waste collection. The private service provider collecting the organics is required to ensure that the organic waste is sent to a value-add solution.

In addition, the municipality is also developing an organic waste transfer and pre-processing facility. Organic waste from commercial, industrial, and MSW sources will be aggregated and pre-processed into a higher quality feedstock for private sector solution. The processing capacity of the facility is still to be finalised. This will be the first such municipal facility in South Africa.

The CoCT's landfill gas extraction

The CoCT has a long-term investment in landfill gas extraction at landfills. Piping and flaring of methane has been taking place at Coastal Park landfill and installed at Bellville landfill, with electricity generation technology put out to tender. An additional tender for the piping and flaring has also gone out for Vissershok municipal landfill. These investments rely on methane production generated through decomposition of organics.

Reliance expands to include waste

Reliance is one of South Africa's largest composters. In the past, the company focused on garden greens only but in 2018 launched its Okran 38 subsidiary at Corona farm, outside Paarl. This expanded solution offering include sewerage sludge, commercial and industrial organics, and MSW organics. The R250 million investment has been designed to process 55 000 tonnes per year of organics[35]. The facility has been licensed for biogas, indoor composting, and open windrow composting. However, at present only open windrow composting is taking place, whilst financing of the biogas is still being determined. The purpose of the facility is not to sell a commercial product, but to improve the overall soil quality of the Corona farm.

Shopping centres invest in organic diversion

A number of shopping centres and precincts are making large investments into organic waste diversion and beneficiation infrastructure.

- South Africa's largest property investment holding company, Growthpoint, has publicised its zero organics to landfill target by 2022. To achieve this, Growthpoint is developing a strategy that includes an organic waste specific beneficiation component.

- The N1 City mall is the second mall in Cape Town to establish a bio-digester to treat in-house streams. The R3.5 million containerised investment takes up only three parking bays and has the capacity to process

[35] At 23 000 m^3 per month

0.6 tonnes of restaurant organic waste per day.

- The V&A Waterfront launched its onsite material recovery facility in January 2018 to separate and divert waste from landfill. The R17 million investment has an average of 75 tonnes a month of organic waste. Key to its success has been the implementation of a green lease system that requires tenants to separate waste at source.

AgriProtein expansion

AgriProtein are in the process of establishing a R500 million industrial fly factory in Wadeville, Gauteng. The facility has the capacity to process 300 tonnes of organic waste per day into 22 tonnes a day of insect protein for the livestock feed industry. This is the second, and larger, such facility to be established in South Africa[36]. This plant should begin operation in mid-2020. It forms part of an ambitious goal to establish 200 factories by 2027.

Biocycle expansion into the Western Cape

The BioCycle, a sister company of Agriprotein, is in the process of expanding its research capacity into the Western Cape. The BioCycle uses human faecal resources as a feedstock for its flies as a sanitary solution in the form of bio-conversion of human faecal waste into valuable products, using Agriprotein's Black Soldier Fly (BSF) larvae processing technology. Current research is also taking place in the Ethekwini metropolitan, KwaZulu-Natal. From 2019 the research programme will be expanded to include research programmes based in Cape Town.

Indirect impact of the separation of recyclables

There is a great deal of emphasis on separation at source of particularly dry recyclables in the coming years. This is evident from municipal infrastructure investments across the Western Cape to recover materials, coupled with the national separation-at-source guidelines, and the expected roll-out of the IndWMPs. The indirect impact of these initiatives should result in an increase in the proportion of organics found in commercial, industrial, and municipal waste streams. Further to this, a transition to the separation of organic waste should prove easier in the long run if and when municipalities implement such separation.

4.2. Electronic waste

4.2.1. Market overview

The term e-waste refers to electrical and electronic equipment[37] that have reached its end of life, or perceived end of life. In South Africa e-waste is classified as hazardous waste as it contains materials (e.g. minerals, plastics, metals, and precious metals) that vary in toxicity and are integrated into equipment in ways that vary in levels of complexity.

The Western Cape province is an important aggregation node for the Eastern Cape and Northern Cape (DST, 2017), and a key source of e-waste for Gauteng's pre-processors and processors. Although the Western Cape hosts formal and informal businesses that refurbish and/or dismantle consolidated e-waste, it lacks formal pre-processing and processing capacity. Dismantled materials and components, and aggregated materials from other provinces are transported to Gauteng for processing, or are exported.

South Africa has a well-developed network of formal and informal collectors and consolidators, with some e-waste reaching pre-processors and refurbishers. However, there is a lack of accurate national data concerning the specific type, rate, and the volume generated, circulated, processed and exported. This will likely change with the implementation of IndWMPs.

[36] The first being in Cape Town. This facility was the first commercial-sized fly farm and has the capacity to process 200 tonnes a day. However, this facility is currently used as a research and development facility, and as a training centre to develop staff for future facilities.

[37] Includes small and large household appliances; office, information and communication technology; consumer electronics and entertainment equipment; lighting equipment; electrical/electronic tools; security and healthcare equipment; and mixed electrical/electronic equipment.

Table 8 provides a summary of the various reported tonnages for South Africa and the Western Cape, with estimated tonnages for 2018 based on population growth as projected by Quantec (2018). For the purpose of this MIR, the tonnages as reported by the Western Cape-specific study by DEDAT (2016), and ERA's (2018) estimated tonnages will be used.

Table 8: Reported tonnages of e-waste: South Africa and the Western Cape

Sources: As shown

Data Source	Data source's reference Year		Per capita (kg/yr)	2018[38]	
	Tonnes generated			Extrapolated Tonnes generated	
	South Africa	Western Cape		South Africa	Western Cape
ERA (2018)	360 000	–	6.27	360 000	41 667
DEDAT (2016)	–	62,251	9.97	572 854	66 321
EWASA (2016)	322 000	–	5.88	337 922	39 112
Lydall et al. (2017)	74 923	–	1.33	76 164	8 815
StEP (2013)	339 310	2	6.63	380 945	44 091
UNU (2018)	321 000	–	5.70	327 510	37 906

Table 9 shows the distribution of e-waste in the Western Cape in relation to South Africa, the estimated values, and the estimated tonnes per square kilometre[39].

Table 9: Distribution of e-waste generation across the Western Cape for 2018

Source: Inferred from DEDAT (2016) and ERA (2018)

Munic / Metro	2018 (projected)			2021 (projected)
	Generated (t/yr)	Concentration (t/km^2)	Value (Rs million)	Generated (t/yr)
CoCT	26 659 – 46 081	10.90 – 18.84	R34.89 – R75.38	28 293 – 48 906
Cape Winelands	5 832 – 8 099	0.27 – 0.38	R7.63 – R13.25	6 287 – 8 730
Eden	3 926 – 5 282	0.17 – 0.23	R5.14 – R8.64	4 158 – 5 595
West Coast	2 836 – 3 413	0.09 – 0.11	R3.71 – R5.58	3 089 – 3 718
Overberg	1 938 – 2 718	0.16 – 0.22	R2.54 – R4.45	2 100 – 2 945
Central Karoo	476 – 647	0.01 – 0.02	R0.62 – R1.06	502 – 682
Total	41 667 – 66 240		R54.53 – R108.36	44 429 – 70 576

[38] Population of South Africa 2018 was projected at 57 457 811 (Quantec 2018)

[39] Minimum figures are inferred from ERA (2018) and maximum are projected and inferred from DEDAT (2016)

Growth of e-waste generation is generally linked to population growth (and to some extent affluence). The Western Cape population is expected to grow by 6.6% between 2018 and 2021, and the CoCT by 6.1% (Quantec, 2018). By 2021, the Western Cape will generate an additional 2 762 to 4 397 tonnes of e-waste per year, a total increase of between 44 429 and 70 576 tonnes.

The e-waste value chain

South Africa has over 100 formally registered e-waste businesses and service providers along the value chain (Lydall et al. 2017). These companies are mostly involved in the early stages of the value chain, with a few companies acting as points for consolidation or processing for export. Figure 12 illustrates the typical e-waste value chain.

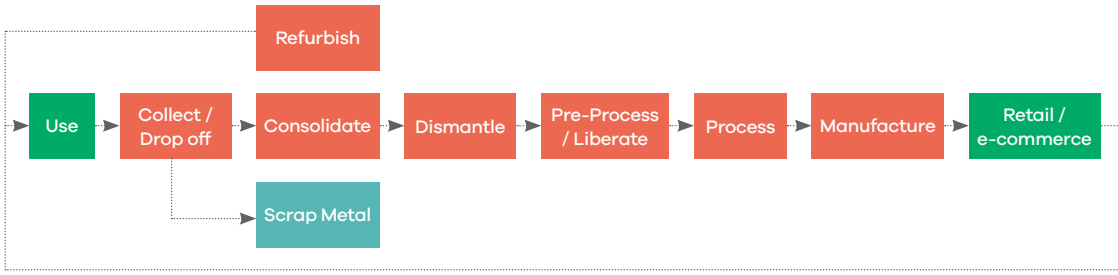


Figure 12: Typical e-waste value chain

- **Informal collection:** In South Africa, there are over 10 000 informal pickers engaged in e-waste collection, 2 000 of which are regular collectors. They collect a total of ~11,250 tonnes per year (ERA 2018), about 25% of all e-waste collected (Lydall et al. 2017). This e-waste is sold to either formal and informal scrap dealers, and/or buy-back centres.

- **Formal collection:** There are ~25 formal small- to medium-sized businesses engaged in e-waste collection. Each on average collects between 80 and 200 tonnes per year, amounting to a total of between 2 000 and 5 000 tonnes per year (ERA 2018).

- **Consolidation:** Consolidated e-waste is either refurbished[40] and/or dismantled and sold to larger pre-processors for liberating or export. In addition to collectors, there are ~600 drop-off sites and buy-back centres (formal and informal) across South Africa. Collectively, they consolidate an estimated 3 600 tonnes per year (ERA 2018).

- **Pre-processing:** There are currently seven known large-scale pre-processors in South Africa handling an estimated combined total of 17 500 tonnes per year of e-waste (ERA 2018). These companies function as e-waste consolidators, collectors and dismantlers, but are primarily concerned with liberating specific material[41] from e-waste components. The liberated streams are subsequently either exported or sent to processors. These companies include the Gauteng based Desco, SA Precious Metals, Sindawonye, the Universal Recycling Company, and the KwaZulu-Natal based Javco, Sibanye Recycling, and Sims Recycling.

- **Processing:** South Africa hosts two local processors in Gauteng, which focus on PCBs: SA Precious Metals and Rand Refinery. These companies currently have a combined process capacity of 2 730 tonnes per year, and a total future capacity of 7 460 tonnes per year (Lydall et al. 2017). They export recovered materials from the pre-processed components to offshore electronic manufactures.

[40] 60% of revenue

[41] Streams can include iron and steel, copper, aluminium, plastic, PCBs, glass

4.2.2. Opportunities

If a conservative range of between R1 309 and R1 636 per tonne of scrap e-waste (excluding higher value materials) is applied, then the low value of e-waste in the Western Cape is between R54.5 and R108.4 million per year, with the CoCT holding the largest value of between R34.9 and R75.4 million. Opportunities include:

Nationally, there are nearly 335 000 tonnes of unprocessed e-waste available for collection and processing.

Intercepting e-waste before it reaches landfills

Of the ~425 000 tonnes of electrical and electronic equipment entering South Africa annually, ~360 000 tonnes are discarded as e-waste. Of this, only ~25 100 tonnes[42] (7%) are intercepted before landfill.

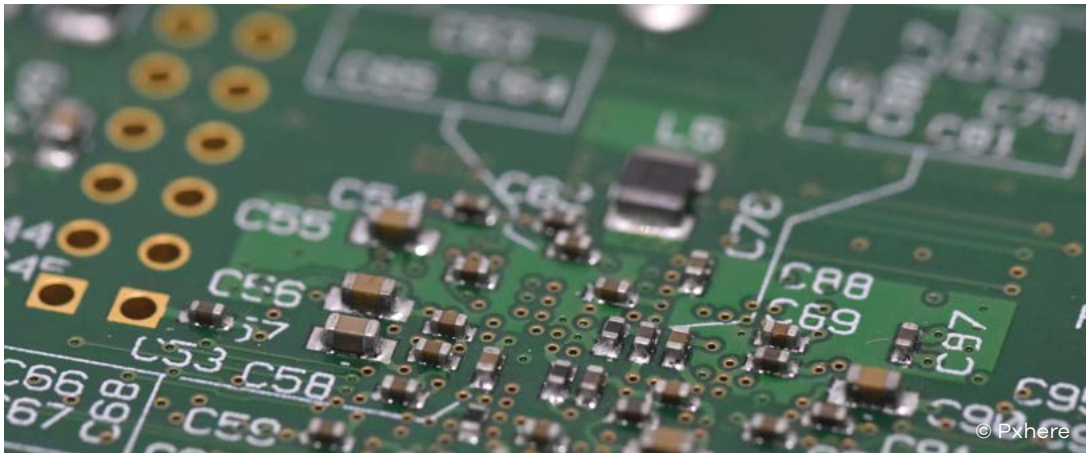
- Nationally, this leaves 334 900 tonnes of e-waste (at a value of ~R438 to R548 million) that can be collected, collated and processed.
- The five largest handlers of Western Cape e-waste source a total of 1 024 tonnes per year[43]. Of this, 823 tonnes (80%) are information and communications technology (ICT) and consumer electronics, whilst the remaining 200 tonnes (20%) are small and large appliances. This equates to only 2.3% to 2.5% of the total e-waste generated in the Western Cape. The amount reaching scrap metal dealers is unknown, so too is the amount collected by the informal sector.

National pre-processing and processing

Of the ~25 100 tonnes of e-waste intercepted in South Africa, only 2 730 tonnes are processed. With the planned expansion capacity to reach only 7 460 tonnes a year, this leaves 22 370 tonnes that are presumably exported (notably to Germany, China and India), creating an opportunity for local pre-processing and processing, if materials can be accessed and unlocked. The City of Cape Town is well placed to host a processor for three reasons:

The value of low-value e-waste in the Western Cape is between R55 and R110 million per year.

- It already acts as an aggregator hub for e-waste from the Western Cape and other provinces.
- It generates 64% (26 659 to 46 081 tonnes) of the Western Cape's annual e-waste, which equates to 10.9 to 18.8 tonnes per square kilometre in 2018.
- It is host to the Atlantis SEZ for Green Technologies (see Section 6).



[42] This excludes what is intercepted by the scrap metal industry

[43] This excludes what is intercepted by the scrap metal industry

A licensed pre-processing / processing facility for the Western Cape

The Western Cape does not host a licensed pre-processing/processing facility. The reluctance of existing players (consolidators and dismantlers) to diversify and expand in this sector (primarily due to regulatory requirements) restricts their own legal growth. It will affect them when the IndWMPs are implemented, and subsequent volumes enter into the network, as only licensed facilities will be able to recycle/recover more than 500 kg a day.

New and existing players have an opportunity to capitalize on the void and to apply for a waste licence. This will provide them with a head start of 8 to 18 months, depending on daily tonnages. Once they have waste licences, they will be able to accept large volumes of e-waste, in time for the implementation of IndWMPs. With between 26 659 and 46 081 tonnes of e-waste generated per year, which equates to 10.9 to 18.8 tonnes per square kilometre, the CoCT would be would also act as a hub for surrounding areas and other provinces.

Processing of SADC feedstocks

South Africa is surrounded by a number of e-waste generating countries and potential sources of e-waste for processing. According to the United Nations University (2018), South African Development Community (SADC) countries collectively generated 569 100 tonnes of e-waste in 2016, of which 67 500 tonnes were generated by South Africa's immediate neighbours. Table 10 shows per capita generation and total estimated tonnages of e-waste generated per SADC countries and South African neighbours.

Table 10: SADC e-waste generated in 2016

Source: UNU (2018)

Country	Generated in 2016		
	Per Capita (kg/person)	Total (Tonnes)	
Angola	3.3	92 000	Non-Neighbours 180 600
Madagascar	0.5	14 000	
Malawi	0.5	9 500	
Mauritius	8.6	11 000	
Seychelles	11.5	1 100	
Tanzania	0.8	38 000	
Zambia	0.9	15 000	
Botswana	7.6	16 000	SA's neighbours 67 500
Eswatini	5.1	5 700	
Lesotho	0.9	1 800	
Mozambique	0.6	17 000	
Namibia	6.0	14 000	
Zimbabwe	0.9	13 000	
South Africa	5.7	321 000	
Total SADC		569 100	

4.2.3. Drivers

In addition to general drivers mentioned in Section 2.4, there are a number of market drivers specific to e-waste:

E-waste Industry Waste Management Plans

The IndWMPs create opportunities for investors and businesses along the e-waste value chain to access financial and infrastructural support, and feedstock. The electrical and electronics IndWMPs (see Section 3.2) are expected to inject investment into public education and awareness, and into the establishment of collectors, consolidators, liberators, pre-processers, and processors. The IndWMPs will also facilitate the development of local end markets for liberated material.

E-waste landfill bans

Following the introduction of norms and standards for disposal of waste to landfill (R. 636 of 2013), lighting e-waste was prohibited from landfilling in 2016. From August 2021, all other e-waste will be prohibited from landfill. Lead acid batteries have been banned from landfill since 2013; however, as of 2021 all other batteries will also be banned, including lithium ion batteries.

4.2.4. Risks and barriers

In addition to general risks and barriers mentioned in Section 2.5, specific risks and barriers include:

Lack of reliable data

There continues to be a paucity of reliable data on the types, rates and tonnages of e-waste generated in South Africa. E-waste data collection is in its infancy, and is largely based on assumptions and extrapolations. Only until the IndWMPs are implemented and coordinated correctly, will a mature system be available to ensure valid and updated numbers. Further to this, scrap-metal dealers often intercept large e-waste derived materials.

Access to feedstocks

In South Africa there are extensive collection and aggregation networks, as well as the technological means and capacity to process e-waste. Due to the lack of access to feedstock, these facilities are generally not running at capacity. This can be attributed to insufficient drop-off points and accessibility of collection points, no separation of e-waste from other solid waste streams at source, and low public awareness of the need to dispose responsibly. Emotional attachment to equipment and concerns about data safety are also regarded as key factors in the low supply of household and/or office e-waste (Lydall et al. 2017). With the implementation of the IndWMP, coupled with the 2021 national e-waste landfill ban, there will be an increase in supply of e-waste into the market.

Expensive licensing of e-waste recycling / recovery

E-waste is defined as a hazardous waste and is regulated accordingly. These regulations limit recycling and recovery of e-waste to less than 500 kilograms per day, otherwise an EIA process is required to obtain a waste management licence. This process has financial implications (especially in terms of affordability by SMEs) and could lead to time delays, depending on the EIA process (see Section 3.1).

Cherry-picking of high value e-waste

Some e-waste streams cost more to recycle and transport than the income that they can generate. As a result, many collectors focus on only high-value waste streams such as ICT and consumer electronics, and ignore low-value streams. This should change with the introduction of levies envisioned for the upcoming IndWMP, as these low-value streams will more than likely be subsided more than high-value streams, but in the meantime it is an ongoing issue for many collectors.

According to ERA (2018), South Africa generates roughly 7 000 to 10 000 tonnes a year of Printed Circuit Boards (PCBs). With SA Precious Metals and Rand Refinery having a combined future processing capacity of 7 460 tonnes per year for PCBs, it is unlikely that there is space in the market for an additional processor of PCBs.

DEA view of transboundary e-waste movement

There is some concern expressed nationally that South Africa may become a "dumping ground" for e-waste. Thus there is some uncertainty as to what the regulatory response may be. Consequently, it is as yet uncertain what the likelihood is of transboundary movement of electronic waste and hence South Africa's ability to access waste from elsewhere to enable economies of scale.

4.3. Plastics

4.3.1. Market overview

South Africa has a mature plastic recycling market. It had a better input recycling rate[44] (41.8%) than Europe (31.1%) in 2016 (Plastics|SA 2018). South Africa processed 93.7% of recovered recyclables locally, compared to the EU, which only processed 37% within its borders. This is largely due to South African industry associations facilitating the material supply for recycling and market demand for recyclate.

Presently, however, more recyclate is being produced in South Africa than can be absorbed by the local market. This is largely because of:

- **economic stagnation**, which has affected the agriculture, construction and consumer sectors that are key markets for recyclate; and
- **the low virgin-to-recyclate replacement rate**, which continues to rely more on imported virgin resins.

In terms of the latter, South Africa's plastic market is still dominated by virgin polymers with ~1.49 million tonnes consumed in 2017. In the same year, 313 781 tonnes of recyclate were manufactured with an additional 20 947 tonnes exported. To increase the uptake of recyclate, the country needs growth in foreign and local markets for recyclate, and to improve the quality and reputation of recyclate.

Figure 13 illustrates South Africa's dependency on virgin materials by showing the conversion figures from virgin material compared to that of recyclate for the five major polymers.

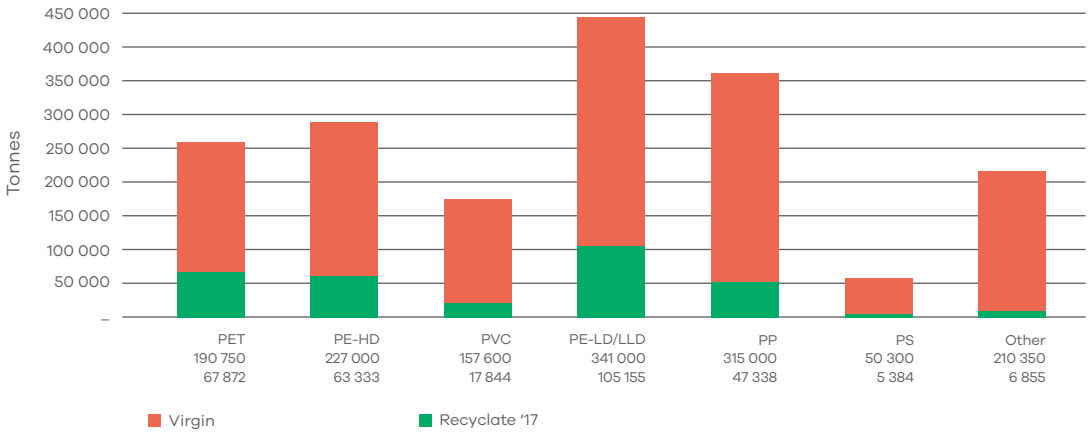


Figure 13: Comparison of the use of virgin plastic versus recyclate plastic in 2017

Source: Plastics|SA 2018

[44] Material entering a recycling facility; does not include the wastage through post processing.

Despite the continued dependence on virgin materials, there has been increased growth in recycling since 2011 as shown in Figure 14, which also shows the types of plastics recycled and proportions recycled versus exported.

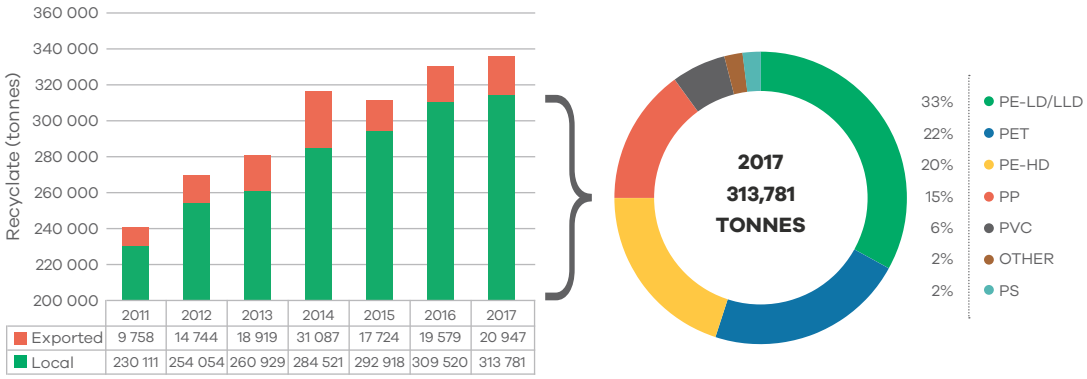


Figure 14: Types and tonnages of plastic recycled and exported in South Africa in 2017

Source: Plastics|SA 2018

The plastics value chain

Figure 15 shows the typical plastics value chain, which applies to the South African context.

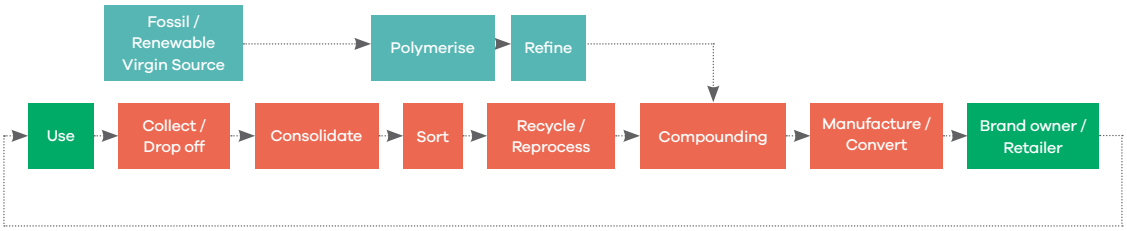


Figure 15: Generic plastics value chain

South Africa's plastic recycling sector has a well-established collection and consolidation network with strong processors and recyclers. The source of feedstocks is predominantly post-consumer (74%)[45]. Gauteng processes the most plastics for recycling, and manufactures 60% of the country's recyclate, compared to the Western Cape which manufactured only 13% (Plastics|SA, 2018).

The Western Cape has a concentrated recycling sector, with a handful of large recyclers processing most of the plastic waste. In 2017, 25 recyclers generated 41 670 tonnes of recyclate about 1 667 tonnes recyclate per recycler. This is the second largest intensity of recyclate-to-recycler in the country. See Figure 19 and Figure 20 for comparisons with other provinces.

[45] Compared to post-industrial (12%), ex-factory (11%), and In-house (3%)

Plastics|SA (2018) reports that 63 South African recyclers manufacture over 80% (251 000 tonnes) of local recyclate, with 20 companies dominating the space at 53% of the total.

South African recyclers source 74% of feedstocks from the post-consumer stage of the value chain, with 26% sourced from the pre-consumer stage (Plastics|SA, 2018). Figure 15 shows the source of feedstocks by value chain used by recyclers, and Figure 16 shows the source by the type of value chain players.

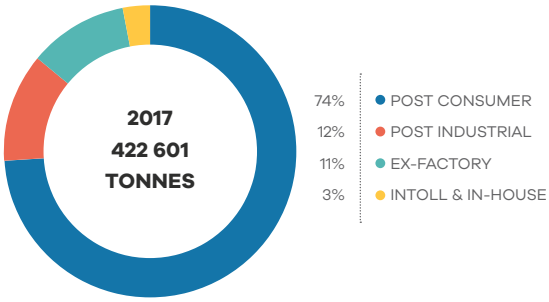


Figure 16: Source of feedstock by value chain in 2017

Source: Plastics|SA

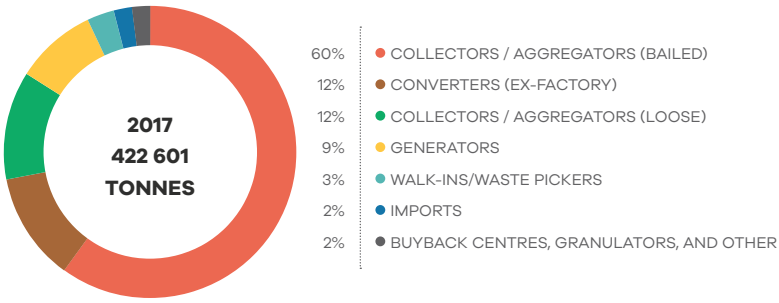


Figure 17: Source of feedstock by stakeholders in 2017

Source: Plastics|SA

However, the many aggregators, including large collectors, are reliant on a large and active informal sector consisting of over 50 000 individuals. It is estimated that the informal sector supplies 80% to 90% of packaging waste to various points of the recycling supply chain (Plastics|SA, 2015).

Figure 18 provides the end market breakdown for recyclate in South Africa. As shown, the end market is dominated by four sectors: 33% of recyclate is used for packaging, with 43% used by the agriculture, building and construction, and clothing and footwear sectors.

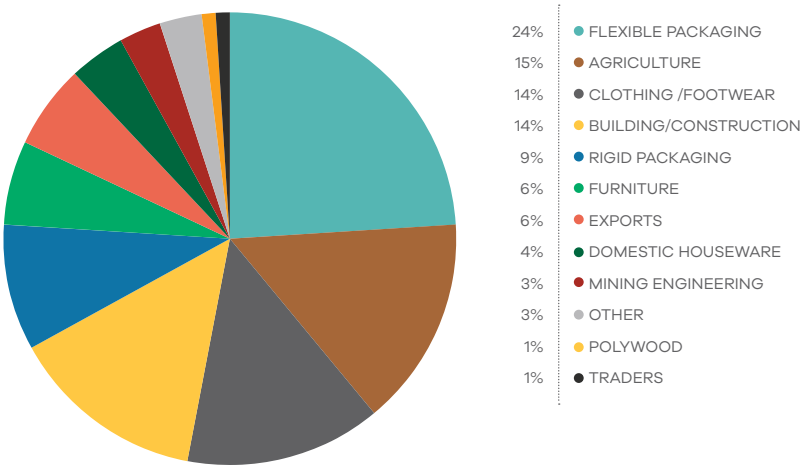


Figure 18: End market of plastic recyclate in 2017

Source: Plastics|SA 2018

Western Cape and City of Cape Town market size

Western Cape is estimated to have generated just over 222 741 tonnes of MSW plastic waste in 2015 (~9% of total MSW) (DEDAT, 2016), growing to 237 016 tonnes in 2018[46]. Given that not all plastics can be recycled, and if a 35% processing loss is applied to input material, then the Western Cape had ~150 710 tonnes and the CoCT 105 087 tonnes of recyclable plastic available for recyclate in 2018.

The Western Cape had ~150 710 tonnes and Cape Town 105 087 tonnes of recyclable plastic available for recyclate in 2018.

The CoCT's more recent 2018 waste characterisation study (see Annex B), found that plastics made up 14.3% of its MSW compared to the estimated 9% from DED&T (2016). More specifically, soft plastics made up 7.2%, with hard plastics accounting for the remaining 7.1%.

Growth of MSW is generally linked to population growth. As a result, the CoCT should be generating an additional 15 514 tonnes of MSW plastics per year by 2021, resulting in a total of 252,530 tonnes. Table 11 shows the plastic waste generated across the Western Cape in 2015, and what is projected for 2018 and 2021.

[46] Figures for 2018 – 2021 extrapolated using a population growth of 2.1% per year. MSW plastics do not include commercial, industrial, and agricultural waste streams.

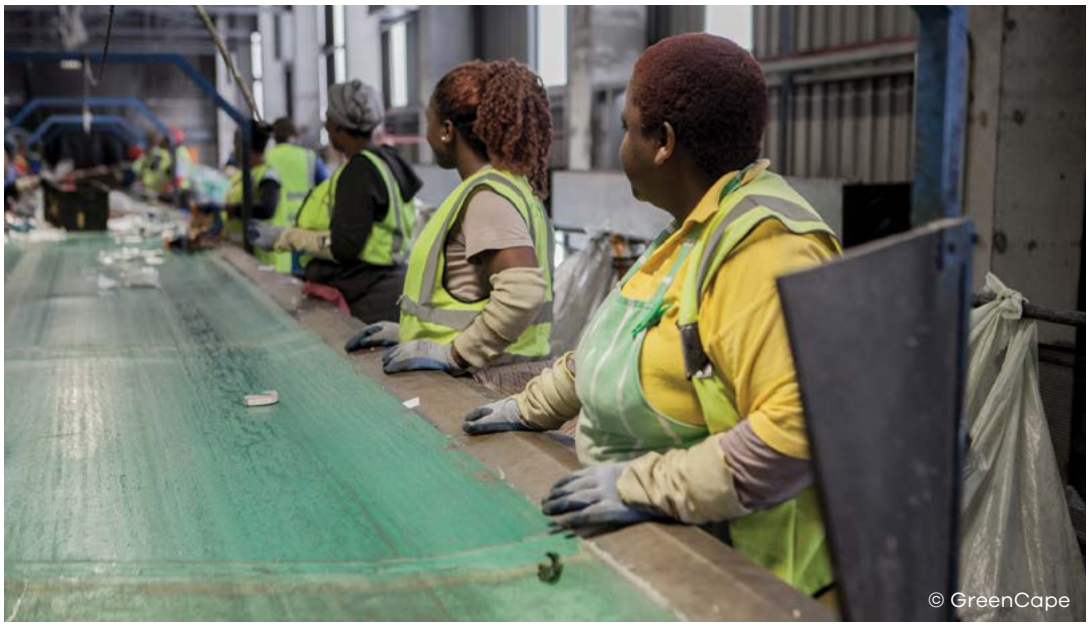
Table 11: Plastics from MSW: Western Cape and Cape Town (2015 – 2021)

Source: Inferred from DEDAT (2016) using population growth Quantec (2018)

Munic / Metro	2015	2018 (projected)				2021 (projected)
	Generated (t/yr)	Generated (t/yr)	Concentration (t/km²)	Per Capita (kg/p/day)	Value (R's million)[47]	Generated (t/yr)
CoCT	155 919	164 888	67.4	38.8	R321.5 – R428.7	174 995
Cape Winelands	26 729	28 978	1.3	31.1	R56.5 – R75.3	31 239
Eden	17 819	18 901	0.8	30.2	R36.9 – R49.1	20 018
West Coast	11 137	12 210	0.4	27.0	R23.8 – R31.7	13 301
Overberg	8 910	9 726	0.8	31.4	R19.0 – R25.3	10 539
Central Karoo	2 227	2 313	0,1	30,4	R4,5 – R6,0	2 438
Total	222 741	237 016			R462.2 – R616.2	252 530

South African recyclate market size

The estimated MSW plastics do not include the commercial, industrial and agricultural streams. However, what is known is the amount of overall virgin material used in the country, coupled with the recyclate produced by recyclers per province (Plastics|SA 2018). Combining the two figures provides an indication of the material available for manufacturing of products. Figure 19 illustrates the extrapolated distribution of these plastics across South Africa[48].



[47] Value is based on the price a large collector pays for low-density polyethylene (LDPE) – R1 950 (low) to R2 600 (high) per tonne.

[48] The geographical distribution range of plastic for each province is estimated based on the population distribution of provinces and the gross value added (GVA) distribution of provinces as they relate to each other.

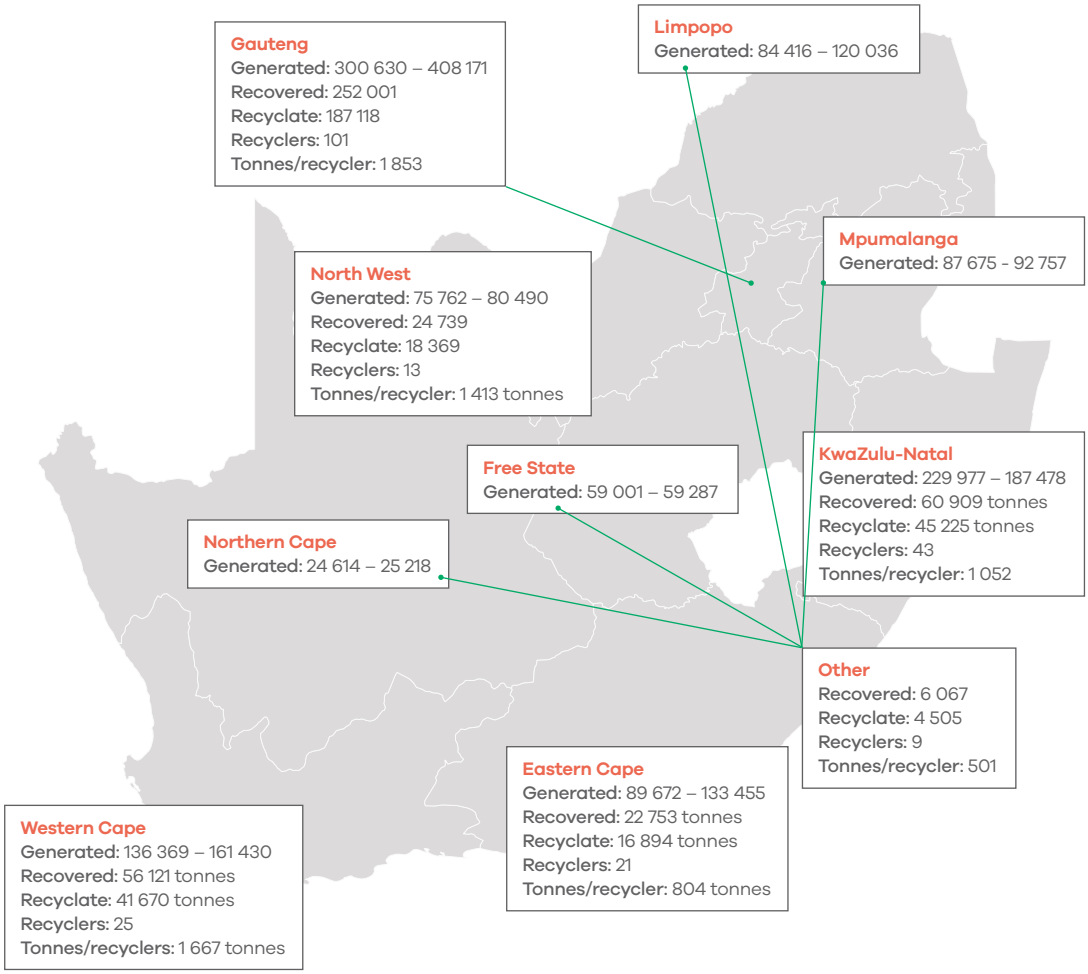


Figure 19: Provincial plastic distribution based on pop and GVA distribution for 2017

Source: Adapted from Plastics|SA (2018)

At the time of writing, South Africa had 212 registered recyclers processing ~422 601 tonnes of plastic into 313 781 tonnes of recyclate. The Western Cape's 25 recyclers generated 41 670 tonnes in 2017, resulting in an average of 1 667 tonnes recyclate per recycler. This is the second largest concentration of recyclate-to-recycler in the country, illustrating that the Western Cape's plastic recycling sector is relatively concentrated with a handful of large recyclers.

Figure 20 shows the number of recyclers per province, aggregated tonnages of recyclate manufactured per province, and average recyclate produced per recycler.

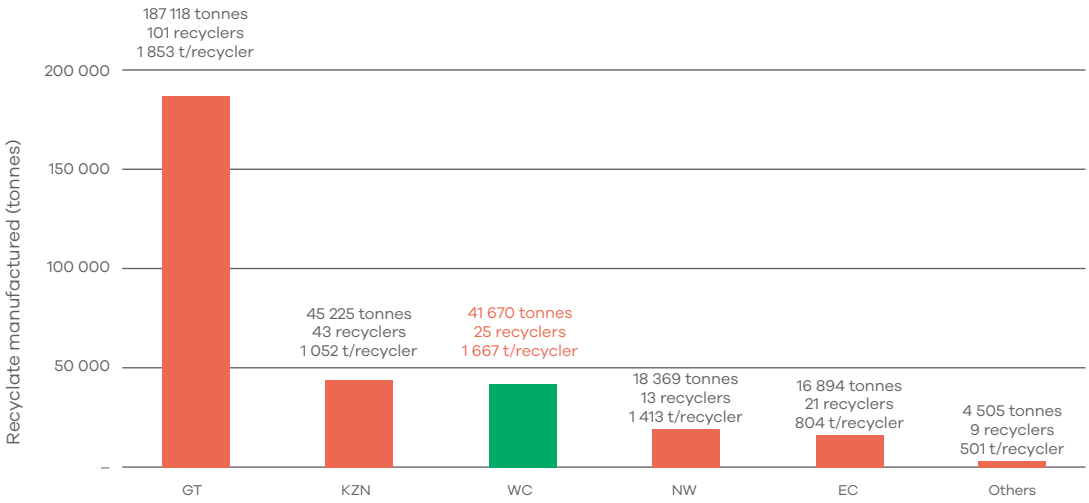


Figure 20: Number of plastic recyclers per province and total recyclate produced in 2017

Source: Plastics|SA (2018)

4.3.2. Opportunities

Replacing virgin materials with recyclate

Almost 1.49 million tonnes of virgin plastic, and 0.31 million tonnes of recyclate enter South Africa every year. This indicates there is a demand for plastics but high dependency on virgin plastics. There is an opportunity to replace virgin material with recyclate. With more investments and certification to ensure the quality of recyclate, coupled with pressure on brand owners to include recyclate into their materials, an increase in demand for recyclate is expected. Furthermore, once the proposed IndWMPs are established, the disincentives to use virgin inputs should drive the demand for recyclate.

Investments in quality assurance of recyclate are paying off. The quality assurance laboratories established in 2016 have resulted in ongoing orders for consistent recyclate with certificates of conformance linked to specific markets (Plastics|SA 2018). Five recyclers have recyclate grades where a specific name or number can be linked to a supplier and to a specified grade with known properties. Three more recyclers have registered names for end products made from their recyclate. This quality control provides assurance to quality demanding markets of consistent quality recyclate.

Technology to increase recyclate quality

Because as much as 74% of recyclables is post-consumer sourced (including landfill) and because South Africa has a low level of separation at source, the quality of the inputs into recycling is poor and highly contaminated. This results in process-related wastage as high as 38% (Plastics|SA 2018); as well as additional overheads along the value chain to ensure clean and separate feedstocks. There is an opportunity to provide plastic recyclers with technologies to increase the quality of recyclate to virgin grade.

4.3.3. Drivers

In addition to the general drivers mentioned in Section 2.4, plastics-specific drivers include industry waste management plans.

Industry waste management plans

Further growth in the sector will more than likely be driven through the implementation of the paper and packaging IndWMPs. These initiatives will support education and awareness, increase collection (supply), increase the market (demand) for recyclate, and will ensure better quality feedstocks and subsequently lower processing overheads.

4.3.4. Risks and barriers

In addition to the general risks and barriers mentioned in Section 2.5, plastics-specific risks and barriers include low end-market growth, public pressure, and compostable materials replacing plastics.

- **Low end-market growth**
  In the past, the recycling sector sustained itself through strong growth in end-markets for recyclate. This resulted in efforts put into increasing supply of material to meet the demand. However, the last couple of years

have experienced sluggish growth in the end-markets of recyclate. This has been due to both slow market development, and slow growth in sectors that absorb recyclate such as the agricultural and construction sectors.

- **Public pressure**
  There is a growing awareness of the impact of plastics on the environment, with pressure on brand owners and especially retailers to reduce non-recyclable packaging. All of South Africa's major retailers are investigating alternatives to single-use packaging and plastic shopping bags.

- **Compostable materials replacing plastics**
  A growing concern for the plastics recycling sector is the rising interest in compostable materials as an alternative to plastic packaging. A key requirement for ensuring an end market for recyclate is to secure confidence in the material as a viable alternative to virgin plastics. Degradable or compostable materials affect the long-term integrity of the recyclate for long-use plastics products.

4.3.5. Recent developments

Investment in wash bay water treatment plants
Several large Cape Town based plastic recyclers have established, or are investigating the establishment of, on-site water treatment technologies. This has been for two key reasons:

- to ensure continued water supply for washing and consequently reduce municipal water costs; and
- continual removal of contaminants from the wash water, allowing for more effective washing and removal of nuisances from plastics that would otherwise compromise quality assurance such as persistent odours.

There is thus a market for water treatment technologies in the plastics recycling industry as well as for the treatment and disposal of effluents and solid wastes generated from these technologies.

Design for recycling
Packaging SA has updated its 'Design for Recycling of Packaging and Paper in SA' guidance document[49]. The guide provides designers of packaging with a better understanding of the implications of design decisions on the recycling system. This document will likely be driven by Packaging SA if they are awarded the management of the paper and packaging IndWMP. This should increase the recyclability of packaging, increasing the supply and quality of recyclables reaching recyclers.

Impact of China's Green Sword Programme
China's Green Sword Programme has resulted in the banning of some waste imports into China. As roughly 93.7% of SA's plastic recycling is done locally, the recycling sector has not been negatively affected by import bans. In a positive development, local recyclers do report that they are accessing better quality plastics that would otherwise have been sent to China. According to PlasticsISA (2018), the International Trade Administration Commission has been inundated with applications for import permits for waste from developed countries. The issuing of permits may put pressure on local collectors, especially informal collectors, who are not able to provide clean, high quality plastics to compete with the imported plastics.

In a related development, some local plastics recyclers report that they are concerned about illegal foreign recycling companies operating in SA, and the impact of these operations on the local market.

4.4. Builder's rubble

4.4.1. Market overview and opportunities

Builder's rubble is a mineral material comprising fired clay brick, concrete, and mortar, which is generated through both demolition activities and as wastage on construction sites. This material stream may be segregated at the point of generation, and is then better named 'recovered aggregate', being a useful secondary construction material that can be used in roads and foundations, among other applications.

Nationally, the potential market for the collection, processing and sale of recovered aggregate is presently 5.7 million tonnes/year[50] (with an estimated G5 sub-base value of R132 million[51]).

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[49] A copy of the document can be found on Packaging SA's website at www.packagingsa.co.za/info-library/design-for-recycling

[50] Estimated based on the correlation between GDP associated with the construction sector and rubble tonnage. Builder's rubble generated in 2017 is reported as 5.3 million tons (DEA, 2018); however, this figure does not include the material processed in the private sector.

[51] Estimated based on the correlation between GDP associated with the construction sector and rubble tonnage. Builders' rubble generated in

Nationally, the potential market for the collection, processing and sale of recovered aggregate is 5.7 million tonnes/year. The Western Cape has 2.6 million tonnes/year available, with only 30%-40% being processed.

The Western Cape has 2.6 million tonnes of builder's rubble available, with only 30%-40% currently processed and reused.

There are opportunities for rubble crushing companies, as well as the demolition and construction sector in the supply and application of builder's rubble in construction.

The main drivers of this market are lower logistics and materials costs for recovered aggregate from builder's rubble. The main barriers are the lack of uptake of recovered aggregate for road building by private sector authorities, due to the absence of material specifications including recovered aggregate.

South African market estimate

Recovered aggregate availability in South Africa
Builder's rubble generated in South Africa in 2017 is estimated at 5.36 million tons (DEA, 2018). In the City of Cape Town in 2017, 1.1 million tons of builder's rubble were recorded as entering landfill. The tonnage reported does not include rubble that was processed and reused by the private sector. As the City of Cape Town accounts for ~64%[52] of the rubble generated in the province, the Western Cape figure for rubble stockpiled at landfill in 2017 is estimated at 1.8 million tons in 2017, or 33% of the estimated total rubble recorded at landfills in South Africa.

Value of available recovered aggregate
As an indication of the potential in the market, it has been estimated that 25% of rubble entering landfills in Cape Town[53] may be suitable for sub-base (G5) if not base course material in road construction. The average 2018 price of a G5 virgin aggregate is R158 per m^3 (including VAT, collected). The value of sub-base material generated in South Africa in 2017 is estimated at R132 million (2018 prices).

Concentration of material supply
The supply of material may be relatively diffused, and certain volumes are required to justify processing of material for a high quality product. The metropolitan municipalities, being hubs of construction activity and population density, would therefore be key areas for builder's rubble generation. Based on the value of building plans passed in 2016 and 2017, KwaZulu-Natal, Gauteng and the Western Cape account for 86% of the value of plans passed in the country (StatsSA, 2017), indicating that the City of Cape Town, City of Johannesburg, City of Tshwane and eThekwini are best supplied with feedstock for rubble crushing operations.

The future supply of recovered aggregate is directly linked to the value and potential growth of the construction sector.

Outlook for the construction industry
In South Africa, civil works, which is primarily dependent on public sector spend, accounts for the majority of gross fixed capital formation (GFCF). Residential and non-residential building each accounts for about a quarter of the GFCF of civil works (Figure 21). All three asset groupings are expected to register growth rates of between 1% and 2.5% in 2019.

Gauteng, the Western Cape and KwaZulu-Natal are the top three performers in terms of the value of the construction sector. Although Gauteng at 35% accounts for the largest proportion of construction value add, with the Western Cape at 19% and KwaZulu-Natal at 17%, the Western Cape's construction sector is the fastest growing nationally (cidb, 2018).

The processing capacity and market for recovered aggregate is currently the most mature in the Western Cape, with the City of Cape Town being the focus of activity, and Gauteng registering rapid growth in the sector. The KwaZulu-Natal market supports few crushing companies, but increased interest in recovered aggregate is being recorded in the province.

2017 is reported as 5.3 million tons (DEA, 2018), however this figure does not include the material processed in the private sector.

52 Based on 2015 data, from the Department of Environmental Affairs and Development Planning.

53 Can be extrapolated to South African metros where the majority of builder's rubble is generated.

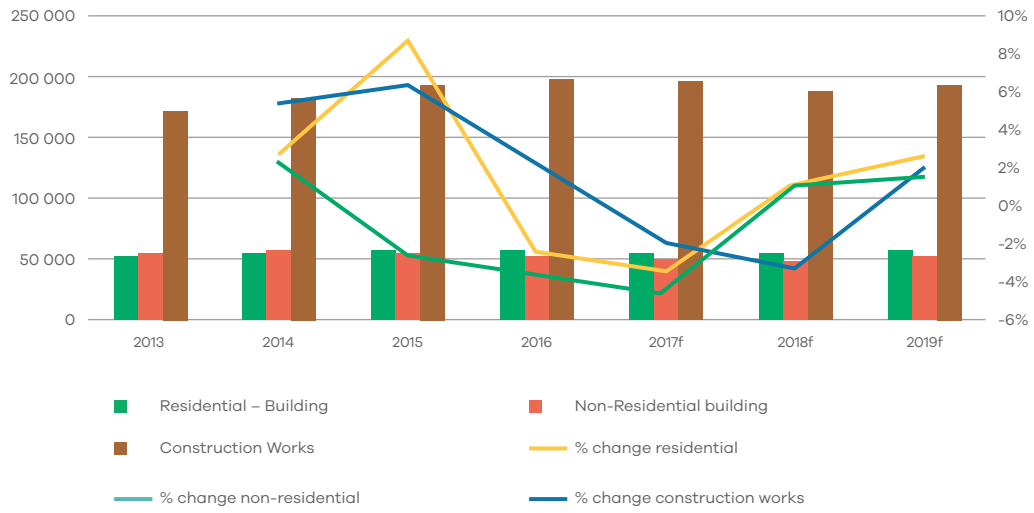

Figure 21: Gross Fixed Capital Formation and forecast of construction sector growth

Source: cidb (2018), as based on Industry Insight's data

4.4.2. Drivers

The growth in the recovered aggregate sector is purely market driven, with no external drivers such as high landfill fees, virgin material taxes or other instruments driving market growth. This is in distinct contrast to well-developed recovered aggregate markets globally that have relied on external instruments for establishment and growth. The green building market in South Africa has been enabled through limited energy supply, and increasingly through water scarcity. The use of secondary building materials is not yet well incentivised through green building rating tools in the country. Main market drivers include lower cost of logistics, lower material and production costs, and performance:

- **Lower cost of logistics**
  The primary driver for the market in recovered aggregate is rising costs related to logistics. Recovered aggregate may be generated and made available closer to the point of application than virgin aggregate, which must be transported from quarries on the outskirts of urban centres.

- **Lower material and production costs**
  Recovered aggregate may be produced at lower costs than virgin aggregate, which is extracted and processed in large plants with high capital costs and high energy demand. Recovered aggregate is generally processed in smaller, if not mobile plants, resulting in lower energy demand. The recovered aggregate sector is also labour inclusive in the handling and sorting of material, such that there is substitution of labour for energy.

  The virgin aggregate price is on average 1.3 to 1.7 times the cost of recovered aggregate in the City of Cape Town. These prices are those quoted for collection of product from the quarry or crushing company; logistics costs are therefore not represented.

- **Performance**
  With growing industry application of recovered aggregate, there is increasing confidence in the quality of the aggregate and the performance achieved.

4.4.3. Risks and barriers

In addition to the general risks and barriers mentioned in Section 2.5, the drivers below pertain to builder's rubble specifically:

Lack of uptake by public sector roads' authorities
In high performing markets for recovered aggregate such as the Netherlands and Japan, the majority of the material is applied in roads. This lack of uptake is related to the **absence of specifications for road building aggregate, including secondary materials**, and a reluctance with engineers to specify alternative materials. Although required aggregate performance has been demonstrated for recovered aggregate in roads, the majority of the industry is not yet convinced of the durability of the material under local conditions and long return periods for road maintenance in South Africa.

Water scarcity, particularly in the drier western region of the country. Although limitations on water supply does pose a risk to the industry, the City of Cape Town and the Western Cape have demonstrated effective response to water scarcity in the sector. Quarter 2 employment statistics reported by Statistics South Africa presented a growth in job numbers of 4 000 in the construction sector from quarter two 2017 to quarter two 2018.

There is potential for significant substitution of potable water with alternative water sources, especially treated effluent, such that construction activities on-site may be completed without potable water, except for hand washing and food preparation.

The construction materials sector has a higher water intensity, and substitution of potable water is more challenging. However, preliminary testing of concrete samples prepared with treated effluent from City of Cape Town treatment works has demonstrated favourable results, even for structural concrete applications.

4.4.4. Recent developments

President Ramaphosa's 'Infrastructure Deal'
South Africa's president has committed to timely and effective delivery of infrastructure through a R400 billion fund allocated over this three-year budget cycle. This 'blended' fund will comprise bonds, equity and debt financing in a public-private partnership to realise South Africa's infrastructure needs, and thereby boost the construction sector.

Guidelines for Application of Secondary Materials in Roads – unlocking the largest market for recovered aggregate
The development of the guidelines was initiated by a resolution of the Road Pavement Forum in May 2016. To develop these guidelines, a Recovered Materials Working Group (RecMat) was formed. Once the guidelines have been tested and further pilot sections implemented, the document will become a technical SANRAL report. It is expected that additional secondary materials will be included in the document as research into alternative materials in South Africa progresses.

The potential uptake of the guidelines is being strengthened by the review and updating of industry standards. These include the concurrent updates to SANS 1083: aggregate for concrete to be inclusive of secondary materials including rubble, and the development of new COTO[54] specifications as an update to COLTO[55] Standard specifications for road and bridge works for state authorities (1998). The COTO draft document includes reference to secondary materials in road construction and rehabilitation. However, supporting guidelines for the application of recovered aggregate have not been developed, which is the mandate of the RecMat committee, designated by the Road Pavement Forum in 2016.

Revisions to National Roads Policy
The National Roads Policy is currently being revised. The public comment process was concluded in April 2018. It is interesting to note that *Policy Statement 15* is likely to be retained, i.e. "All Road Authorities will develop a 'green' road network, which conforms to the principles of sustainability…".

The statement includes a commitment to develop a green rating tool applicable to all roads built and rehabilitated in South Africa. This includes criteria related to materials, with the use of appropriate secondary (or reclaimed) materials improving the green rating of a road.

The Sustainable Roads Forum (SuRF) has developed a rating tool for roads, which is partly being tested by SANRAL, Eastern Region. Once the National Roads Policy has been gazetted, SuRF will utilise the statutory foundation to test its rating tool more widely and embed it within operations of roads authorities. SuRF is currently housed within the South African Roads Forum (SARF), and has already engaged the Department of Transport regarding development and implementation of the green roads rating tool. No timescales for the final policy and possible implementation of the tool have been communicated.

Green Procurement – Department of Housing, Western Cape Government
A number of green procurement policy initiatives in the public sector may strengthen the market position of recovered aggregate.[56]

[54] Committee of Transport Officials

[55] Committee of Land Transport Officials

[56] One such initiative of the Western Cape Government is the Green Procurement Programme for the Construction of State Subsidised Human Settlements in the Western Cape, which was put out to tender in August 2018.

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5
Funding and Incentives

A range of general and sector-funding solutions and incentives is available to investors, manufacturers and service companies in the green economy.

It covers international sources, such as Development Finance Institutions (DFI), local funding pools including the public and private sector, and a considerable range of tax incentives.

5.1. General database web page

The GreenCape Finance Desk hosts a web page[57] with a number of Green Finance resources that cover funding and incentives available to companies in the green economy. A few of the available database are highlighted below.

5.1.1. Green Finance Database

In conjunction with the South African National Energy Development Institute (SANEDI), GreenCape maintains a database of funding sources and primarily dti-driven incentives that may be relevant to green economy investors. The database contains information on more than 100 funding opportunities, including an overview of the opportunity and its contact details and links. It is ideal for any entity seeking a broad range of funding solutions and financial incentives, with South African institutions being the main source of opportunities. The database is available to view and download online[58].

5.1.2. Government funding and incentives database

An updated document focused on South African government funding and incentives is available to view and download online[59].

5.1.3. Finfind database

Finfind[60] is an innovative online finance solution that brings together SME finance providers and finance seekers. With a focus on finance readiness, Finfind has more than 200 lenders and over 350 loan products available to SMEs. The database is ideal for South African SMMEs who are seeking funding and/or business advisory services, and those who want to improve their understanding of finance.

5.1.4. AlliedCrowds database

AlliedCrowds[61] is the first complete aggregator and directory of alternative finance providers in the developing world. Sign-up is free and allows users to access a global database where one can filter for sector (including greentech, agriculture and social impact), type of capital (equity, lending, grant), and type of funding (crowdfunding, angel investing, venture capital, impact investing). In addition:

- Themed databases around the Sustainable Development Goals (SDGs) and the World Green Economy Organisation (WGEO) are available.
- Reports, including a number specifically about African funding sources, can also be downloaded for free.
- You can also contact Allied Crowds to create a customised funding database for you.

This resource is ideal for any entity seeking a broad range of financial solutions on a global scale.

[57] https://www.greencape.co.za/content/focusarea/green-finance-databases

[58] https://www.greencape.co.za/assets/Uploads/GreenCape-Finance-Database-v6.xlsx

[59] https://www.greencape.co.za/assets/Uploads/Government-Funding-and-Incentive-Booklet.pdf

[60] www.finfindeasy.co.za

[61] https://alliedcrowds.com/


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The Western Cape: Africa's green economy hub

The Western Cape is a world-class investment destination.

The province provides businesses and investors with prime locations, modern infrastructure, a skilled workforce, low operational costs and an abundance of natural resources. It is also a sought-after place to live, with unrivalled natural beauty, vibrant culture, excellent schools and universities, and an outstanding quality of life. In 2017, Cape Town was ranked among the top 21 global investment destinations by Foreign Direct Investment (fDi) Intelligence, a division of the Financial Times.

A great place for green business

There are compelling reasons why the Western Cape Province is viewed by many as Africa's green economy hub. Coupled with a strong and rapidly growing market for green technology and services in South Africa and beyond, the Western Cape offers:

- Africa's renewable energy (RE) and cleantech hub, with a critical mass of leading companies present.
- Local presence of major professional services and financiers.
- Significant market opportunities for businesses and investors in agriculture, energy services, utility scale solar and wind, waste, water, bioeconomy and resource efficiency.
- A supportive government that has made ease of doing business and the green economy key priorities.
- Five universities with comprehensive R&D capabilities and dedicated green economy skills programmes.
- A range of investment incentives in the Atlantis Special Economic Zone (SEZ) for Green Technologies.

Supporting businesses and investors

The province also offers dedicated support for businesses and investors focusing on greentech and services, including:

InvestSA One Stop Shop: Offers convenient investor support on permits, licensing and registrations - all under one roof.

GreenCape: Provides dedicated support and market intelligence to green economy sectors.

Wesgro: The official investment and trade promotion agency for the Western Cape.

SAREBI: A business incubator providing non-financial support to green entrepreneurs.

SARETEC: Offers specialised industry-related and accredited training for the wind and solar industries.

Market opportunities in the province and South Africa

Some of the major market opportunity areas in the province and South Africa in the next five years are outlined in the graphic on the next page (see individual MIRs and the GreenCape website for more information).

R&D capabilities and skills

The region's five universities – University of Cape Town, Stellenbosch University, University of the Western Cape, the Cape Peninsula University of Technology and the George campus of the Nelson Mandela Metropolitan University – underpin all of this with comprehensive research and development (R&D) capabilities and dedicated green economy skills programmes.

Major market opportunities: Western Cape and South Africa

Agriculture

Precision agriculture
Tools, data analysis, local manufacturing & financing.

Solar energy for agriculture
Minimum market of R120 million (WC) and R420 million (SA) for solar PV in agri & agri-processing.

Controlled environment agriculture
R600 million potential market (WC), 15% annual growth (WC).

Energy services (SA-wide)

Solar PV systems & components
600MWp installed capacity; R1.7bn additional investment in 2018 (R7.7bn to date)

Local manufacturing & assembly
Solar PV systems and components – systems require compliance with local content regulations

Energy storage
Keystone of future energy services market; ~R5bn market for demand side management and back-up power by 2035

Utility scale renewable energy (SA-wide)

Independent power production
6.3GWp independent power procured, 13.7GWp additional capacity by 2030, based on updated IRP (5.67GWp solar, 8.1GWp wind).

Rest of Africa
Greater uptake of RE & decentralized systems. Off-take guarantees and local currency debt innovation needed.

Local manufacturing
Refined local content requirements, with specific components obligated to be locally manufactured e.g. wind towers, tower internals, panel laminating, PV mounting structures

Waste

Municipal PPP
Public-private partnership projects of R1.3bn (WC)

Organic waste treatment
Landfill ban require treatment technologies to process 1 m/t p.a. of organic waste (WC)

Alternative waste treatment
Cape Town has highest landfill cost in SA & good business case for AWT. R1bn+ invested by solution providers since 2016 (SA)

Water

Industrial and Commercial
Water intense food & bev sectors expected gross capital formation of ~R14bn by 2021

New developments
Green building certifications increased 25-fold since 2010 (SA)

Municipal
Significant opportunities in metro markets incl. new R5.8bn (417 MLD) Cape Town augmentation programme (WC)

Bioeconomy & resource efficiency

Food value retention
At least R600m retained through improved cold chain management & waste reduction (SA)

Solar thermal
Already installed: R33m (WC), R135m (SA); ~R3.7bn potential market in agri-processing

Biogas
For electricity, heating & transport; R100m of installations expected by 2023

Atlantis Special Economic Zone for Green Technologies

The Atlantis SEZ is a zone dedicated to the manufacturing and provision of services in the green technology space - technologies that reduce or reverse the impact of people on the planet. Wind turbines, solar panels, insulation, biofuels, electric vehicles, materials recycling and green building materials are all examples of green technologies that will be welcomed to the zone.

The zone welcomes manufacturers, service providers, suppliers and other players in the value chains of different green technologies.

The SEZ is situated in the Atlantis industrial area north of Cape Town, south of Wesfleur, east of Dassenberg Road, and west of the Witsand community.

Why invest in the SEZ?

There are strong and growing South African and African markets for greentech. The South African greentech manufacturing market is worth at least R30bn; with a growing greentech market in the neighbouring countries. South Africa has opportunities in energy, waste, agriculture, transport and other sectors and is a great entry point for the SADC market.

Atlantis is a great location and development ready. 93 hectares of zoned City of Cape Town land is available for leasing to investors. Bulk infrastructure is in place and Atlantis has new public transport and shipping links and fibre connectivity. Atlantis is also close to major ports, roads, universities and greentech markets.

Investors have access to extensive investment support through the One Stop Shop for investor support and the rest of the investor support ecosystem, which includes InvestSA, GreenCape, the City of Cape Town, and Wesgro. Together the ecosystem provides information and advocacy; market intelligence; facilitated access to permits and licenses, planning and development approval; and skills training.

Investors and tenants are accessing attractive incentives in the form of tax relief and allowances, employment tax incentives, fast-tracked development approvals, fee exemptions and subsidies.

There is an attractive, wide-ranging skills base to recruit from with 5 universities and many more colleges in the province, and a large range of unskilled, semi-skilled, technical and professional candidates.

For more information, contact the SEZ's Investment Promotion Facilitator, Jarrod Lyons: jarrod@greencape.co.za

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GreenCape's support to businesses and investors

GreenCape is a non-profit organisation that works at the interface of business, government and academia to identify and remove barriers to economically viable green economy infrastructure solutions. Our vision is a thriving prosperous Africa, mobilised by the green economy.

Working in developing countries, GreenCape catalyses the replication and large-scale uptake of green economy solutions to enable each country and its citizens to prosper.

We work with businesses, investors, academia and government to help unlock the investment and employment potential of greentech and services, and to support a transition to a resilient green economy.

We assist businesses by removing barriers to their establishment and growth and provide our members with:

- free, credible and impartial market information and insights
- access to networks of key players in government, industry, finance and academia
- an advocacy platform to help create an enabling policy and regulatory environment for green business

We assist local, provincial and national government to build a resilient green economy by providing:

- support on the development of standards, regulations, tools and policies
- expert technical knowledge on key sectors in the green economy
- access to networks of key players across business, academia, and internationally

Since inception in 2010, GreenCape has grown to a multi-disciplinary team of over 40 staff members, representing backgrounds in finance, engineering, environmental science and economics.

We have facilitated and supported R17bn of investments in renewable energy projects and manufacturing. From these investments, more than 10 000 jobs have been created. Through our WISP (industrial symbiosis) programme, by connecting businesses with waste / under- used resources, we have to date diverted nearly 63,000 tonnes of waste from landfill.

Our market intelligence reports form part of a working body of information generated by sector desks and projects within GreenCape's three main programmes – energy, waste and resources.

Figure 22 below shows the different focus areas within each of our programmes.

Benefits of becoming a GreenCape member

We currently have over 1 100 members, and offer free membership. Becoming a member of GreenCape will give you access to the latest information regarding developments in the various sectors; access to tools, reports, and project information; and offer you the opportunity – through our networking events – to meet and interact with various stakeholders in the green economy.

① Renewable Energy

Utility-scale projects, localisation of component manufacturing, incentives & financing options, wheeling & energy trading.

② Energy Services

Energy efficiency & embedded generation, electric vehicles, alternative basic electrification, incentives & financing options.

③ Alternative Waste Treatment

Municipal decision-making & policy & legislative tools on alternative waste treatment options; small-scale biogas, recycling & reuse (dry recyclables, construction & demolition waste).

④ Western Cape Industrial Symbiosis Programme (WISP)

The team matches businesses to share unused resources, cut costs & create value. They also support entrepreneurs to identify & realise new business opportunities in the waste industry.

⑤ Water

Water provision & economic development; greentech opportunities for water use efficiency, treatment & reuse, business water resilience.

⑥ Sustainable Agriculture

Precision-, conservation- and controlled environment- agriculture; valorisation of wastes to high value bio- products, including bio-energy.

Figure 22: GreenCape's focus areas

Support through the International Cleantech Network

GreenCape's membership of the International Cleantech Network (ICN) gives our members access to international business opportunities in countries where other cleantech clusters are based (mainly Europe and North America).

To become a member or to get your ICN passport, please contact GreenCape or visit our website: www.greencape.co.za

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Annexes

Annex A: Western Cape waste tonnages

Total waste tonnages generated per district municipality / metropolitan city in 2015

Source: DEDAT (2016)

Material	Western Cape	CoCT	Cape Winelands	West Coast	Overberg	Central Karoo	Eden
Municipal Solid Waste	2 387 353	1 671 146	286 482	119 368	95 495	23 874	190 988
- Organic	489 293	342 505	58 715	24 465	19 572	4 893	39 143
- Paper	295 214	206 649	35 426	14 761	11 809	2 952	23 617
- Plastics	222 741	155 919	26 729	11 137	8 910	2 227	17 819
- Glass	163 370	114 359	19 604	8 168	6 535	1 634	13 070
- Metals	531 258	371 880	63 751	26 563	21 250	5 313	42 501
- Non-recyclable	685 477	479 834	82 257	34 274	27 419	6 855	54 838
Industrial	528 661	382 451	59 386	23 708	18 324	2 585	42 206
- Organics	105 732	76 490	11 877	4 742	3 665	517	8 441
- Non-organics	422 928	305 961	47 508	18 967	14 659	2 068	33 765
Commercial	352 440	254 968	39 590	15 806	12 216	1 723	28 138
- Organics	193 842	140 232	21 775	8 693	6 719	948	15 476
- Non-organics	158 598	114 735	17 816	7 113	5 497	775	12 662
Construction & Demolition	1 704 680	1 090 995	272 749	85 234	85 234	17 047	153 421
Tyres	18 111	12 678	2 173	906	724	181	1 449
Wet sewerage sludge	295 023	190 995	39 846	19 525	12 691	3 530	28 436
Agricultural residues	2 125 083	46 557	277 731	885 118	507 462	15 821	392 394
Volatile Animal Waste	149 680	11 226	22 452	28 065	24 323	18 710	44 904
Forestry residues	91 021	9 102	4 551	4 551	9 102	0	63 715
E-waste	62 251	43 575	7 470	3 113	2 490	623	4 980
Total	7 714 303	3 713 693	1 012 430	1 185 394	768 061	84 094	950 631

Annex B: CoCT waste characterisation study

JG Afrika (Formally Jeffares and Green) were appointed by the CoCT to undertake a waste characterisation assessment at six of its waste aggregation sites over a given period and subsequently extrapolate this across all CoCT facilities.

Material			Fraction
Packaging / Recyclable	Paper		13.23%
	Cardboard		
	Glass		3.80%
	Plastics	Soft	7.16%
		Hard	7.13%
	Tetrapak		0.53%
	Multilayer		1.60%
	Metals		1.97%
Hazardous	Ewaste		0.34%
	Hazardous	Cleaning, toiletries	0.07%
		Fluorescent bulbs	0.001%
		Batteries	0.001%
	Nappies		6.75%
Organics	Food Waste	Mixed	8.51%
		Liquids	0.44%
		Starches	0.56%
		Dairy	0.03%
		Fruit / Veg	4.45%
		Meat	0.53%
	Residual organics		5.94%
	Garden waste		7.37%
Other	Residual	Remaining fraction	18.80%
	Textile		6.38%
	Other		1.50%
	Construction		1.68%
	Wood		1.25%

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