South African Waste Sector – 2012

An analysis of the formal private and public waste sectors in South Africa

A National Waste Research, Development (R&D) and Innovation Roadmap for South Africa:

Phase 1: Status Quo

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FORWARD

One of the Strategic Objectives of the Socio-Economic Partnerships programme of the Department of the Science and Technology (DST) is to "*To identify, grow and sustain a portfolio of high-potential science, technology and innovation capabilities for sustainable development and the greening of society and the economy*". This is also part of the Global Change Grand Challenge as articulated in the DST 10-year Innovation Plan. In particular it refers to the research theme of Reducing the Human Footprint of the Global Change Research Plan.

As a means to achieve the strategic objective the DST is investing in the development of a Waste Research, Development and Innovation (RDI) Roadmap for South Africa. As part of the evidence gathering and establishment of a baseline the first South African Waste Sector was undertaken. It is hoped that this will become the key reference document for policy makers, academia and industry in their strategic planning for the waste sector. It is also the vision of the DST that this Waste Sector Survey will be repeated periodically to track the development of Sector. The DST would like to take this opportunity to thank the Council for Scientific and Industrial Research (CSIR), and in particular Dr Linda Godfrey, for the excellent work undertaken to achieve the DST objective.

The Department of Science and Technology (DST) and the CSIR also wish to thank all municipalities and private companies who made the time to participate in this survey and who willingly provided information that will support the future development of the sector. Without their input, this 2012 survey would not have been possible.

Department of Science and Technology

EXECUTIVE SUMMARY

This survey of the South African formal waste sector, for 2012, was commissioned by the Department of Science and Technology, as a means of gathering information to support decision-making and strategic planning. The aim of the survey was to focus on waste sector and organisational information, e.g. employee, financial and innovation information. The study did not aim to collect any information on waste quantities, e.g. tonnages of waste, since this was already well captured by the Department of Environmental Affairs in their national waste information baseline report for 2011 (DEA, 2012). The findings of this sector survey will be fed into the development of a National Waste Research, Development and Innovation (RDI) Roadmap for South Africa.

The results of this first national waste sector survey present a minimum picture of the sector for 2012. The results provide a good understanding of the 'core' of the waste sector, and some insight into the peripheral players.

The minimum number of people employed within the formal South African waste sector (public and private) (for 2012) is **29,833 people**. The majority of these employees are situated within large enterprises (77.5% of private waste sector employees) and metropolitan municipalities (64.9% of public sector employees).

The minimum financial value of the formal South African waste sector (public and private) (for 2012) is **R15.3 billion**, or 0.51% of GDP. The majority of this revenue is situated within large enterprises (88.0% of private sector revenue) and metropolitan municipalities (80.4% of public sector revenue). It was also found that 62.0% of the total revenue generated from waste activities in 2012, was done so by companies which had been in the industry for more than 25 years. Companies which started up waste activities in the past 5 years contributed a minimum of R188m into the economy in 2012.

Spend on waste R&D and HCD remains low for the waste sector. The minimum spend on waste R&D for 2012 was R50.2m, approximately 0.33% of the value of the total sector. Spend on waste HCD for 2012 was R429m, approximately 2.8% of the value of the sector. The public sector showed a four times greater spend on HCD than the private sector, yet still shows a greater percentage of unskilled employees. This investment in HCD is therefore still to manifest in an actual change in employee skill levels (e.g. change in functional roles, or degrees/diplomas).

With respect to higher qualifications, there is evidence of 1,324 diplomas, 1,066 degrees, 119 masters degrees, and 14 PhD in the South African waste sector. However, these figures are rather low, considering the number of graduates who are likely to be exposed to some form of waste management training material during their studies. The sector, in conjunction with Government, will need to look at how it attracts and retains highly qualified graduates in the waste sector, so as to stimulate technological and non-technological innovation.

The sector has shown positive transformation over the past two decades (since 1994) with 77.2% of private sector respondents indicating they are BBBEE certified, with an average BBEEE level 4. With respect to race, 83.8% of private sector employees and 98.3% of municipal employees are people of colour. As for gender, 37.8% of private sector employees and 32.1% of municipal employees are female.

The strong commitment by national and provincial government to the management of waste over the past 10-15 years appears to have stimulated the waste sector, with many new enterprises starting up waste activities. This high level support and commitment by national and provincial government must be continued if we are to see the waste sector grow. While legislation has the potential to stimulate new sector development, growth and resultant innovation, if over-regulated it can hinder or slow this innovation. The goal will therefore be for government to find a balance between ‘encouraging’ and ‘controlling’.

With respect to waste services along the value chain, technologies and waste types, a strong complimentary role between the private and public sectors is evident. Where an aspect of waste management is ‘missing’ within local government, this ‘gap’ is being filled by the private sector (although not yet fully). The positive response by the private waste sector to introduce new technological and non-technological innovations to the South African waste market, suggests that they have an important role to play in transferring these innovations into the public sector. The private waste sector is a potential partner to support the transfer of technological innovations from supplier (local and abroad) into municipalities. Mechanisms to further support partnerships between the public and private sectors must be explored. Government must identify means of encouraging and supporting the introduction of technological innovation across the waste sector, so as to encourage a shift away from landfilling towards alternative waste management options. Mechanisms to address the relatively slow uptake of innovation by micro, very small and small enterprises in the waste sector must also be explored.

Waste-related employment within municipalities appears to have levelled-off at around ±20,000 persons. The public sector could absorb another ±5,000 employees, if current vacant positions in municipalities were filled. However, if we are to get anywhere close to achieving Goal 3 of the NWMS, to grow the contribution of the waste sector to the green economy, by creating 69,000 new jobs and 2,600 additional SMEs and cooperatives participating in waste service delivery and recycling by 2016 (DEA, 2011), we will have to look towards the private waste sector (and/or the informal sector). We therefore need to find opportunities for growth in the private waste sector. To do this, we are going to need to find ways that support the sector (economic, financial and policy), that encourage the sector (incentives), that adjust current price distortions in the waste sector and that will allow for a natural flow away from landfilling to alternative waste management options, and that strengthen ties between the private and public sectors to encourage transfer of innovations and skills.

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ABBREVIATIONS

BBBEE	Broad-Based Black Economic Empowerment
CIPRO	Companies and intellectual property registration office
CSIR	Council for Scientific and Industrial Research
DEA	Department of Environmental Affairs
DHET	Department of Higher Education and Training
DST	Department of Science and Technology
DTI	Department of Trade and Industry
GCGC	Global Change Grand Challenge
GDP	Gross Domestic Product
GCIS	Government Communication and Information System
HCD	Human Capital Development
HSRC	Human Sciences Research Council
MIFF	Municipal Infrastructure Investment Framework
NAICS	North American Industry Classification System
NQF	National Qualifications Framework
NPC	National Planning Commission
NPO	Non-profit Organisation
NRF	National Research Foundation
NWMS	National Waste Management Strategy
OECD	Organisation for Economic Co-operation and Development
PBO	Public Benefit Organisation
R&D	Research and development
RDI	Research, Development and Innovation
SALGA	South African Local Government Association
SIC	Standard Industrial Classification
StatsSA	Statistics South Africa
WtE	Waste-to-Energy

DOCUMENT INDEX

This report forms part of a suite of reports produced for the Department of Science and Technology (DST) as part of the development of a national Waste Research, Development and Innovation (RDI) Roadmap.

2012/13:

REPORT NUMBER	REPORT TITLE	AUTHORS
CSIR/NRE/SUSET/ER/ 2012/0045/A	Phase 1 - HCD: Skills for an Innovative Waste Sector: Workshop Report (11-12 July 2012)	Lombard, R.K., Lombard, J., Godfrey, L. and Roman, H.
CSIR/NRE/PW/ER/ 2012/0052/A	Phase 1 - HCD: Current waste HCD initiatives in South Africa	Lombard, J., Lombard, R.K. Godfrey, L. and Roman, H.
CSIR/NRE/SUSET/ER/ 2012/0053/A	Phase 1 - HCD: Core waste management skills and implementation modalities	Lombard, J., Lombard, R.K., Godfrey, L. and Roman, H.
CSIR/NRE/SUSET/ER/ 2012/0063/A	Phase 1 - Institutional framework: Current and required institutional mechanisms to support waste innovation	Schoeman, C., Mapako, M., Kalan, S., Godfrey, L. and Roman, H.

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CSIR/NRE/GES/IR/ 2013/0078/A	South African Waste Sector – 2012 An analysis of the formal private and public waste sector in South Africa	Godfrey, L., Strydom, W., Muswema, A., and Oelofse, S.

All of these documents are available on the Waste RDI Roadmap website (www.wasteroadmap.co.za) or from the CSIR Library Services (www.csir.co.za).

1 INTRODUCTION AND BACKGROUND

The South African government has recognised the waste sector as an industry sector that can contribute towards job creation – both skilled and unskilled jobs – and economic growth[1]. To help facilitate this growth in the sector, the Department of Science and Technology (DST) has embarked on a process to establish a national Waste Research, Development and Innovation (RDI) Roadmap. The Roadmap will guide investment by the DST in waste research and development (R&D), innovation and human capital development.

The lack of information on the South African waste sector was recognised in a report to the Department as a constraint to waste innovation (DST, 2012). In the report, it was noted that "*to date, no comprehensive sector analysis has been undertaken on the size, skill base, value and employment opportunities within the South African waste sector*". A recommendation of the report was that a waste sector analysis be undertaken to inform the development of the Waste RDI Roadmap. This report addresses this recommendation.

The aim of this sector analysis is therefore to establish a baseline of the size and contribution of the formal waste sector to the South African economy, in 2012. The report aims to provide insight into the South African waste sector, including information on organisation size (employment and financial), skills level and qualifications, roles within the sector, and adoption of technological and non-technological innovations. It is hoped that this report will provide valuable information to all government departments involved in the management of waste in South Africa. In addition, it provides a mechanism for municipalities and private companies to benchmark themselves, their investment in R&D and HCD, and their uptake of technological and non-technological innovation, against their peers.

[1] Government has identified the role that the waste sector can play in transitioning South Africa to a green economy in policy documents such as the New Growth Path, National Development Plan, Green Economy Accord, and the National Waste Management Strategy.

2 METHODOLOGY

The methodology adopted for this waste sector analysis has been guided by the –

- South African Innovation Survey (HSRC, 2011)
- National Environmental Management: Waste Act (Act 59 of 2008)
- South African Biotechnology Sector Audit (DST, 2007)
- Business register questionnaire of Statistics South Africa (StatsSA)

The approach included –

- defining the waste sector,
- establishing a database of organisations to be included in the survey,
- development, piloting and distribution of questionnaires to facilitate data collection, and
- data capture, analysis and interpretation.

Each of the steps is discussed in more detail in this section.

2.1 Defining the waste sector

The South African waste sector is not an established economic sector, and has as such, not been officially defined. This first step in undertaking the waste sector survey was therefore to define the sector. Furthermore, for the purposes of this study, both the target population (those players in the sector who needed to be included) and the exclusions (those who would be excluded) needed to be identified. Defining the sector has guided the approach to this survey as well as the presentation of results.

2.1.1 Target population

The waste sector is complex and not easy to outline. Chalmin & Gaillochet (2009:5) refer to the waste sector as "*one of the most difficult sectors to apprehend… because of the extent to which the formal and informal sectors are intermingled*". This is further complicated by organisations that have waste management as core and secondary activities. The South African waste sector is also not recognised as a distinct economic sector. Unlike other countries which have specific economic categories assigned to the various waste management activities, South Africa does not have recognised Standard Industrial Classification (SIC) codes for the waste sector. This makes the collection of formal economic data for the local waste sector very difficult to collate and report on.

While relatively good data exists for the public waste sector, through regular reporting by municipalities to National Treasury and StatSA, there is very little organisational data (financial and employee) for the private waste sector, other than what is available for a few large private companies in their published annual reports. The private waste sector is therefore a largely unknown element.

The South African waste sector includes both formal and informal sectors, each of which play an important role in the management of waste in the country. This Waste Sector Analysis is **targeted specifically at the formal waste sector** and has been directed at all organisations (public and private) active in the management of waste in South Africa.

The formal waste sector is defined here (**Figure 1**) as including –

- waste handlers (private and municipalities)
- waste equipment providers
- waste consulting/engineering companies
- waste research and development organisations
- waste and resources sector associations

Where waste handlers include anyone undertaking the following activities –

- cleansing
- collection/transport
- storage/transfer

- sorting/separation of recyclables
- reprocessing/recovery of recyclables
- treatment and
- disposal (landfilling)

It is acknowledged that these activities[2], or an organisation's role within the waste sector, may not be as clear and distinct as suggested by **Figure 1**. Instead, it is likely that roles may be blurred between traditional waste management companies, recyclers/reprocessors, consulting/engineering, R&D and equipment providers. And that waste flows between the informal and formal sectors result in these two sub-sectors being bound to, and dependent upon, each other.

2.1.2 Exclusions

Since the analysis intentionally targeted those responsible for the management of waste (post generation), this study excludes –

- Generators of waste
- Internal waste reuse or recycling – where waste is reused or recycled within industries and as a result never enters the formal waste stream
- Informal waste sector – waste pickers and informal kerbside collectors
- Small (often informal) drop-off and buy-back centres – currently this 'intermediate' waste role player (between collector and recycler) is a largely unknown entity in the waste sector
- Adhoc transportation of waste by general transportation companies
- Provincial and national government departments

Figure 1: Defining the formal South African waste sector

[2] Where the following definitions are intended to align with those of the National Environmental Management: Waste Act (Act 59 of 2008):
- **Cleansing** refers to city cleansing
- **Collection and transport** includes municipal waste collection services, the transportation of waste
- **Storage and transfer** means the accumulation of waste in a manner that does not constitute treatment or disposal of that waste
- **Sorting and separation of recyclables** means a process where waste is reclaimed for further use, which process involves the separation of waste from a waste stream for further use
- **Reprocessing and recovery of recyclables** means the controlled extraction of a material or the retrieval of energy from waste to produce a product
- **Treatment** means any method, technique or process that is designed to (a) change the physical, biological or chemical character or composition of a waste; or (b) remove, separate, concentrate or recover a hazardous or toxic component of a waste; or (c) destroy or reduce the toxicity of a waste, in order to minimise the impact of the waste on the environment prior to further use or disposal
- **Disposal** means the burial, deposit, discharge, abandoning, dumping, placing or release of any waste into, or onto, any land.

2.2 Database

To ensure that the survey included as many private waste companies and municipalities as possible, a database of names and contact details was compiled.

For municipalities, contact details were obtained from the Department of Environmental Affairs (DEA), the Government Communication and Information System's (GCIS) published Provincial and Local Government Directory, and from the South African Local Government Association (SALGA). Data consisted of the telephone number, and email and postal addresses for every Municipal Manager and Chief Financial Officer (CFO). Following the first round of distribution of the questionnaire, municipalities were phoned to obtain the name and contact details of the person responsible for the management of waste in the municipality. The questionnaire was thereafter resent to the specific waste manager in the municipality (where available).

For private companies, contact details were obtained from attendance/delegate lists at conferences, workshops, and stakeholder engagements; from a search of the Department of Trade and Industry's (DTI) online CIPRO database; internet searches and published members of the IWMSA. In addition, a number of companies had already contacted the DST and/or CSIR, requesting to be included in the survey. These companies were added to the database. Organisations had been alerted to the survey either from communication at WasteCon2012 or via Waste Sector Associations who had communicated the survey on behalf of DST. Many waste generators who received the questionnaire also alerted the CSIR of their waste service providers (given that generators were not required to complete the questionnaire). Once all of the data had been combined, the database contained 6750 entries. This was refined, through a process, to 1704 individuals who received the questionnaire. Following the first round of questionnaire distribution, companies were then phoned to verify the nature of the organisation, i.e. whether they were in fact involved in the waste sector, and to update their contact details. Following this initial round of verification, the database was reduced to 434 private companies thought to be actively participating in the management of waste and associated resources in South Africa.

2.3 Questionnaire

Given the potentially large number of municipalities and private waste companies (>500) and their geographic distribution throughout the country, self-administered questionnaires were deemed the most appropriate means of collecting data on the South African waste sector. A questionnaire (Appendix 1) was drafted which aimed to capture the types of data required by DST.

2.3.1 Piloting

The questionnaire was piloted with four companies and one municipality, namely Compass Waste Services (Pty) Ltd; Enviroserv Waste Management (Pty) Ltd; Hlobane Waste Management Services; WastePlan Holdings (Pty) Ltd and Pikitup Johannesburg (Pty) Limited (on behalf of City of Johannesburg). This allowed for testing of the questionnaire, followed by minor refinements, prior to distribution.

2.3.2 Distribution

A final questionnaire was distributed via email on 15 April 2013 to private companies (addressed to the Chief Executive Officer) and 16 April 2013 to local and metropolitan municipalities (addressed to the Municipal Manager). A hardcopy of the questionnaire, including covering letter from DST, was also mailed to every local and metropolitan municipality during the week of the 15-19 April 2013. Email addresses used were obtained from the database compiled for this project.

2.3.3 Data capture

Data from all municipal and private company questionnaires received, were captured in MSWord Excel spreadsheets. Data was verified for consistency and accuracy following complete capturing. Where fields had been omitted by the respondent, an

effort was made to source this missing information, either from the respondent directly, or from data already publicly available.

2.4 Participation

The waste sector (both public and private) has shown itself to be a somewhat non-participatory sector in providing organisational information. This may be due to the fact that this was the first sector survey undertaken and organisations were suspicious of the reasons for data collection. Private companies confirmed, in instances, that they would not provide data for fear of repercussions by the Green Scorpions (although no compliance questions were asked) and because of sensitivity around financial information (although confidentiality was guaranteed).

Municipalities were extremely difficult to reach electronically and telephonically, with there being no up-to-date database (real-time) of contact details for the relevant waste managers. In many instances emails to municipalities bounced back as undeliverable. Even though hardcopies were also posted to municipalities, care of the municipal manager, the questionnaire did not always reach the waste department. Trying to reach the correct person in the municipality telephonically was often hindered by either no answer from the reception, or the required person (or their assistant) not being in office. This highlights a need for a mechanism of entry into waste departments within municipalities to support data collection and information sharing.

There is also a very narrow view of what the waste sector is, i.e. only waste collection and disposal. Many recycling and treatment companies contacted, do not consider themselves part of the waste sector. As such, based on responses received, the survey is likely to give a good understanding of the 'core' of the waste sector (**Figure 1**), which are the waste collectors/disposers, and some insight into the peripheral players, such as the transporters, recyclers, consulting/engineering companies, etc.

The participation rate of public and private organisations is provided in **Table 1**.

Table 1: Responses received

	Private sector	Public sector
Number of organisations [(#)]	434	[(†)] 234
Responses received	136	69
Percentage (sample)	[(*)] 31.3%	29.5%

[(#)] Number of organisations included in the survey

[(†)] Based on the StatsSA figures of 226 local municipalities and 8 metropolitan municipalities, as at June 2012 (StatsSA, 2013a)

* Note, that because the size of the private waste sector in South Africa is not known, the sample as a percentage of the population, cannot be given. The response rate of known companies was 31.11%

While relatively low, the percentage returns are better than expected for self-administered email- and postal-questionnaires. The initial, voluntary participation of ±19% was increased to ±30% through numerous follow-up telephonic and email reminders by the project team. The response rate for the Waste Sector Survey is higher than the 26.7% achieved for the South African Innovation Survey of 2008 (HSRC, 2011).

Statisticians consulted on the participation rates, advised that as long as a good distribution in company and municipality size was obtained, and that respondents included the large waste companies and metropolitan municipalities, there was a high probability that the sample (and presented results) was representative of the South African waste sector. The distribution of organisations (private and public) participating in the Waste Sector Survey, based on annual revenue for 2012, is shown in **Figure 2**. While further details are provided in the following sections, the results show a wide range in respondent organisation sizes.

The appropriate spread of companies and municipalities (**Figure 2**) (by revenue and by employee number), and the inclusion of the top five waste companies and six of the eight metros[3], would suggest that the results (*percentages*) presented in this report, are representative of the South African waste sector.

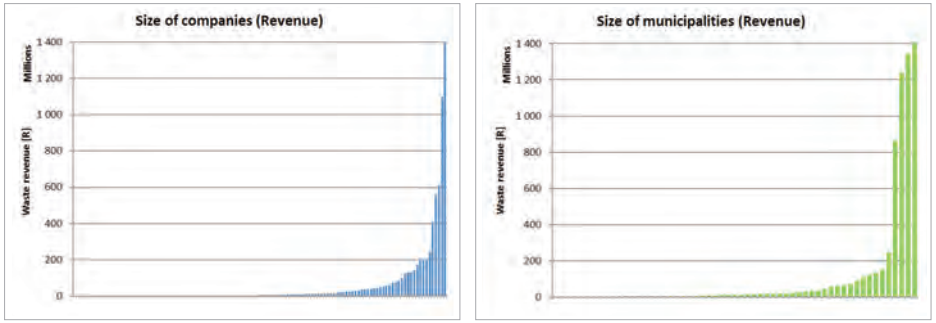

Figure 2: Distribution of companies and municipalities (by revenue)

The absolute numbers presented in this report, e.g. for total number of people employed (Section 3.5.1), number of higher degrees and diplomas (Section 3.5.3); total waste sector revenue (Section 3.6.1); spend on waste research and development (Section 3.6.4); and spend on waste human capital development (Section 3.6.5), represents a *minimum number / size / value* for the sector.

[3] One of the largest metropolitan municipalities in South Africa chose not to participate in this survey.

3 RESULTS AND DISCUSSION

The following section presents the findings of the 2012 Waste Sector Survey. The results are presented separately for the private and public (municipalities) waste sectors. Where appropriate, the results are combined to give an overview of the formal South African waste sector.

The results are presented per section[4] of the questionnaire (Annexure 1):

- Waste sector and technologies
- Basic organizational information
- Employee information
- Financial information
- Technological and non-technological innovation

3.1 Reporting period

The results are presented for municipalities 2011/2012 financial year (1 July 2011 to the 30 June 2012). For the private waste sector, results are presented for the company's 2012 financial year, the start and end date of which varies for different companies. The results are therefore collated and presented for the year 2012.

3.2 Defining organisation size

3.2.1 Private sector

The South African Innovation Survey (HSRC, 2008) adopted the National Small Business definition of enterprise size (based on employee number), as the unit of reporting (National Small Business Amendment Act, 2003) (**Table 2**). To facilitate comparison between the National Innovation Survey (HSRC, 2008) and the Waste Sector Survey, the same measure of enterprise size is adopted here.

Table 2: Stats SA size class (employee number) based on the National Small Business Amendment Act (2003)

Size 1 (Large enterprises)	Enterprises with more than 200 employees
Size 2 (Medium enterprises)	Enterprises with fewer than 200 but more than 50 employees
Size 3 (Small enterprises)	Enterprises with fewer than 50 but more than 20 employees
Size 4 (Very small enterprise)	Enterprises with fewer than 20 employees

* Where employees are considered full-time equivalent of paid employees

The total turnover associated with each class of enterprise size (and associated employee numbers) is provided in the Schedule of the National Small Business Amendment Act. Size of class and total turnover varies depending on the industry sector or subsector in accordance with the Standard Industrial Classification (SIC). Since the waste sector is not identified as a specific industrial category, there are no employee or total turnover ranges provided for enterprises in the waste sector. The enterprise sizes therefore first needed to be defined for the waste sector.

The data received from respondents has been used to define enterprise size for the South African private waste sector. Questionnaire responses were sorted according to the number of employees (employee categories) (**Table 3**). The corresponding minimum, maximum and average total revenue for 2012 was then captured. The results show very wide ranges in total turnover within each employee category. However, from the results, there appears to be some similarity to the financial sizes per employee category used for the Manufacturing Sector, and the Electricity, Gas and Water Sector. The enterprise size adopted for the waste sector, and used in the analysis of the data in this report, is therefore based on the definitions for the Manufacturing sector, and the Electricity, Gas and Water sectors (**Table 4**).

[4] Note that the order of presentation in the report is not the same as that outlined in the questionnaire. An overview of the sector (Section D) is presented first, to give the reader some insight into the sector, before moving on to organisational information.

Table 3: Analysis of total revenue per employee category (respondents)

Employee categories	% Respond	Total Turnover [Rm] (respondents)			
		Min	Max	Mean	Total
>200	7.5%	58	1,396	409	4,088
50-200	16.5%	9.5	611	117	2,223
20-50	19.5%	0.9	55	17	417
5-20	38.3%	0.01	40	4.5	187
<5	18.0%	0.03	18	2.1	46

Table 4: Adopted definition of enterprise size for the waste sector (total revenue)

	Waste Revenue [Rm]
Large enterprises	> 51
Medium enterprises	13 – 51
Small enterprises	5 – 13
Very small enterprises	0.2 – 5
Micro enterprises	< 0.2

* Based on the Manufacturing sector, and the Electricity, Gas and Water sector

The values for total revenue, as given in **Table 4** have therefore been used in this study as the basis for grouping enterprises[5] into their respective size classes for the waste sector.

3.2.2 Public sector

For the purposes of defining municipality size neither number of employees nor total revenue have been used. Instead, the municipal infrastructure investment framework (MIFF) categories (CoGTA, 2009) (**Table 5**) have been adopted in this report for the purposes of analysing and presenting municipal innovation activity.

Table 5: Municipal Infrastructure Investment Framework (MIIF) categories

MIIF category	Description
A	Metropolitan municipalities (metros)
B1	Secondary cities, local municipalities with the largest budgets
B2	Local municipalities with a large town as core
B3	Local municipalities with small towns, with relatively small population and significant proportion of urban population but with no large town as core
B4	Local municipalities which are mainly rural with communal tenure and with, at most, one or two small towns in their area
C	District municipalities

[5] Enterprises are defined for the purposes of this study as waste activities. As such, an enterprise may be a company where waste is the core business, or a waste department/unit, where waste is a core or secondary business.

3.3 Waste sector and technologies

3.3.1 Role within the waste sector

Question: Role in sector: What role does your organisation play in the waste sector?

The results show that the majority, 67.6% of private sector respondents (**Figure 3**) and 100.0% of municipalities (**Figure 4**), listed themselves as waste handlers, where a waste handler includes anyone cleansing, collecting/transporting, storing/ transferring, sorting/separating recyclables, reprocessing/recovery of recyclables, treating or disposing of waste.

Consulting/Engineering firms made up the second largest percentage of private sector respondents at 37.4%, followed by equipment providers at 16.5%. An estimated 13.7% of private sector respondents indicated that they play a role in waste R&D compared 2.9% of municipal respondents.

Some of the private sector respondents (36.6%) indicated multiple roles, e.g. handler and equipment provider, or handler and engineering, or consulting/engineering and R&D.

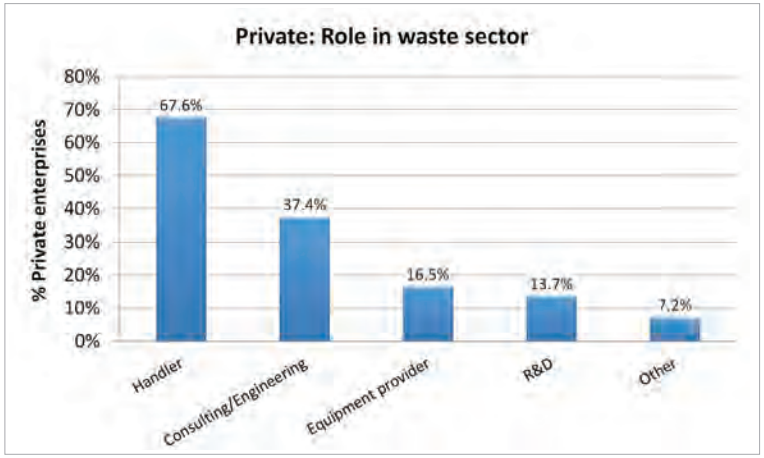

Figure 3: Nature of respondents and their role within the private waste sector (*)

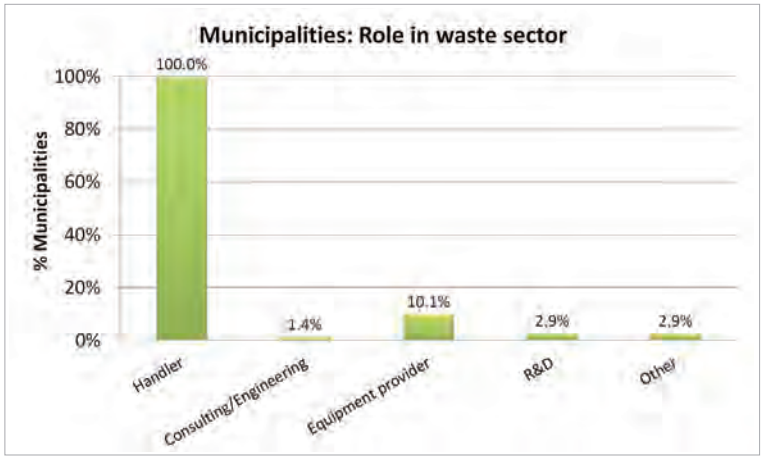

Figure 4: Nature of respondents and their role within the public waste sector (*)

(*) Since more than one role could be selected by respondents, the results exceed 100%.

3.3.2 Service rendered

Question: Type of service[6]: In which area(s) of waste management does your organisation operate?

The results (**Figures 5 and 6**) reflect the constitutional mandate of local government with respect to waste management, i.e. city cleansing, waste collection and disposal. Some municipalities indicated that recycling activities (sorting/separating and/or reprocessing/recycling) are being undertaken within their municipality; however, the municipalities often indicated that these activities were being undertaken by private companies or individuals. In the absence of knowing this for all municipal respondents, the data has been retained within the graph, to highlight at least the awareness that some municipalities have (approximately 20-30% of municipal respondents) that recycling activities are taking place within their municipality.

Figures 5 and **6** also show the complimentary relationship between the private and public sectors. Where services are low for municipalities, the private sector has identified these areas of opportunity and is responding to them.

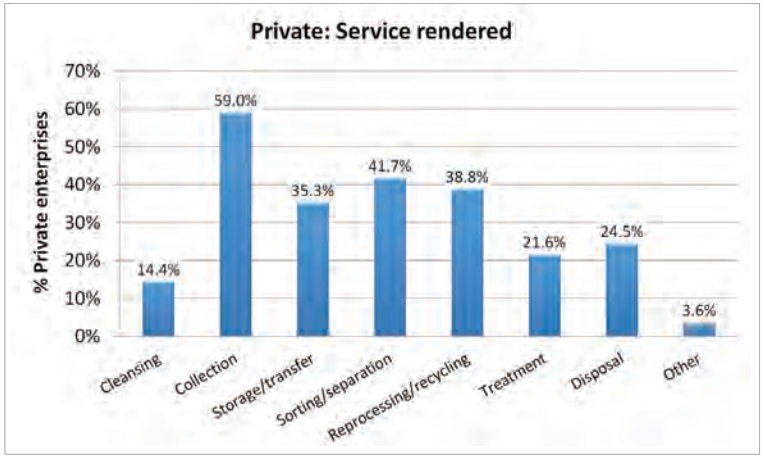

Figure 5: Service rendered by private enterprises along the waste value chain

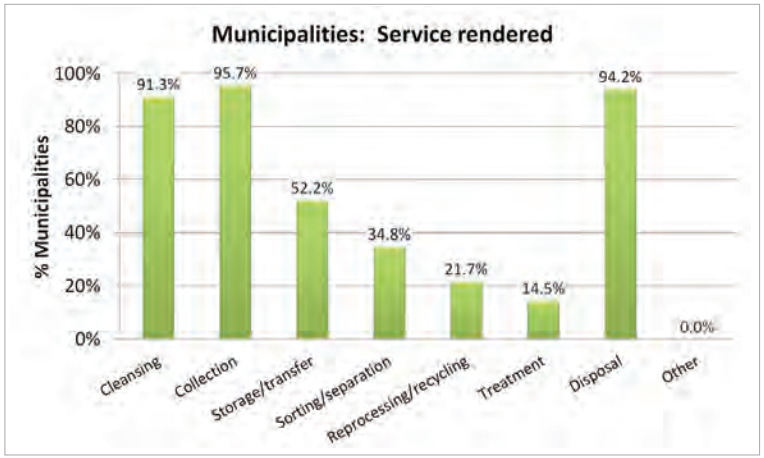

Figure 6: Service rendered by municipalities along the waste value chain

[6] Services rendered relates to the activities of the organization along the waste value chain, from initial cleaning and collection through to final disposal. The question was only completed by waste handlers (private and municipalities) and equipment providers.

3.3.3 Waste types handled

Question: With which type(s) of waste does your organisation deal?

The results (**Figures 7 and 8**) show the full spectrum of waste types handled by the private and public sectors.

As with services rendered, some municipalities indicated that recyclables were being handled within their municipality, however, municipalities often indicated that these activities were being undertaken by private companies or individuals. In the absence of knowing this for all municipal respondents, the data has been retained within the graph, to highlight at least the awareness that some municipalities have (nearly 50% of municipal respondents) that recycling activities are taking place within their municipality.

Figures 7 and 8 also show the complimentary relationship between the private and public sectors with regards to the types of waste handled. Where certain wastes have not been handled by municipalities, the private sector has identified these waste streams as areas of opportunity and is responding to them.

The lowest number of responses received from respondents related to handling of power generation waste (12.9%), tyres (17.3%), construction and demolition waste (18.0%) and mining waste (23.0%). This is somewhat surprising, since power generation waste and mining waste make up two of the largest waste streams in South Africa (by volume). Furthermore, construction and demolition waste makes up a considerable volume of general waste to landfills (20% by mass) (DEA, 2012).

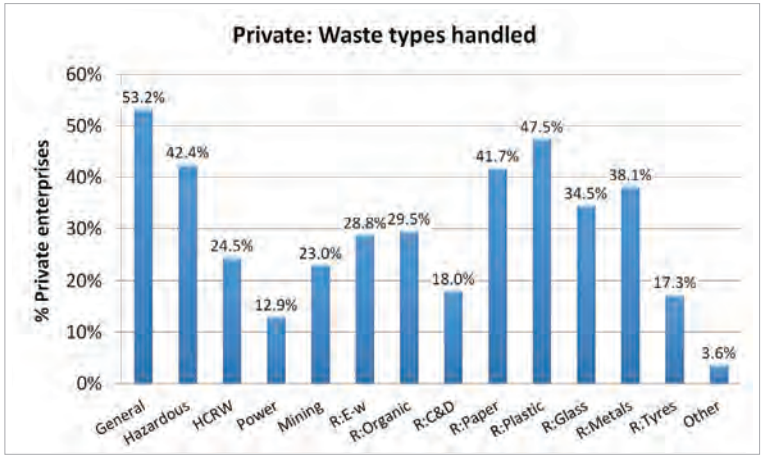

Figure 7: Types of waste handled by private enterprises

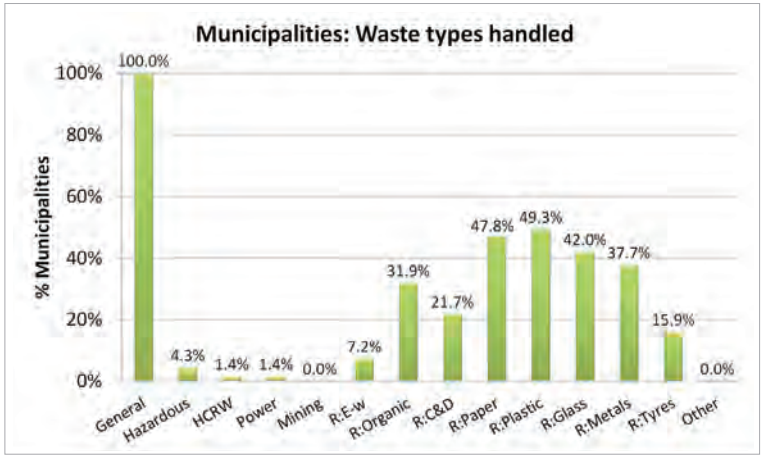

Figure 8: Types of waste handled by municipalities

* Where 'R:' in the above graphs indicates potentially recyclable waste streams
HCRW – health care risk waste; R:C&D waste – construction and demolition waste; R:E-w – electronic waste

* Note that type of waste handled, does not in any way relate to the quantities (tonnages) of waste handled, simply the number of organisations handling this type of waste.

3.3.4 Waste technologies

Question: Technology: What types of waste technology are currently in use by your organisation?

This question only needed to be completed by waste handlers and equipment providers. Information on the specific technologies currently in use within the waste sector would have been very insightful and of benefit to DST (to support future technology investment), however it was recognised that this information was likely to be sensitive. Participants were given the choice of selecting current technologies from landfilling, thermal-, chemical-, and biological- treatment, material recycling, or other. Space was provided for respondents to give more detail as to the technology(s) in use, but this option was not used by many respondents, confirming the sensitivity of current technology information.

The results **(Figures 9 and 10)** show an adoption of alternative technology solutions (not only landfilling) by the private waste sector, however, municipalities still rely very heavily on landfilling as the primary solution for the management of waste (**Figure 10**). It would appear that biological treatment (e.g. composting, anaerobic digestion) is not utilised extensively amongst respondents. While expected, the technology option remains under-utilised given that large quantities of biomass waste also being produced by industry. An estimated 13% of general waste generated in South Africa is organic waste (DEA, 2012).

As noted previously, some municipalities indicated that recyclables were being handled within their municipality; however, some municipalities indicated that these activities were being undertaken by private companies or individuals. In the absence of knowing this for all municipal respondents, the data on material recycling (technology option) has been retained within the graph to highlight at least the awareness that some municipalities have of recycling activities taking place within their municipality.

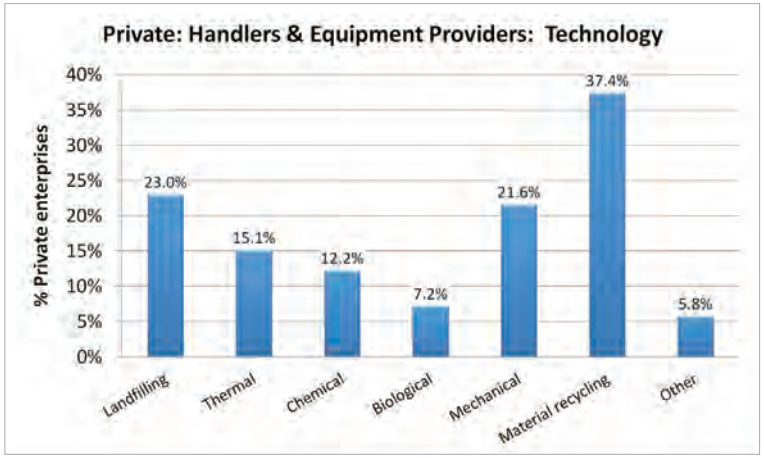

Figure 9: Current technology options in use within the private waste sector

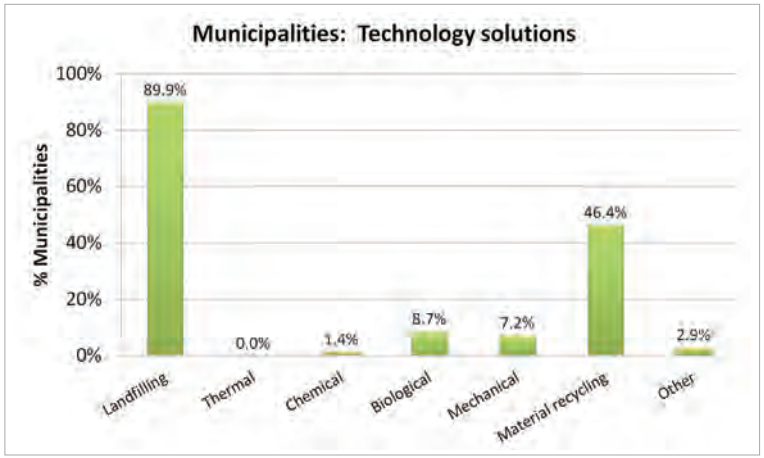

Figure 10: Current technology options in use within the municipalities

3.4 Basic Organisational Status

A summary of basic organisational information for the private waste sector is provided in the following section.

3.4.1 Private sector

While private companies (Pty Ltd) make up the majority of private enterprise types (59.1%), enterprises include closed corporations, parastatals, and other (which included trusts, non-profit organisations (NPO), public benefit organisations (PBO), and sole proprietors) (**Figure 11**).

For 65.0% of private sector respondents (**Figure 12**) waste management is considered a core business, while for 35.0% of respondents, waste is a secondary business. It should be noted that some respondents indicated waste to be a secondary business, with their core business being listed as e.g. 'recycling', 'composting', 'metals recovery', 'renewable energy', which highlights again the very narrow definition that participants have of the waste sector. Many participants consider waste management to be only the collection and disposal of waste, and not other activities within the waste hierarchy such as reuse, recycling and treatment. To many enterprises, 'waste' is just another raw material in their process. This is encouraging from a waste reuse and recycling perspective, but it does make 'ring-fencing' the waste sector somewhat difficult.

This sense of not being part of the waste sector was evident in follow-up discussions with companies, examples of which are provided in the **Text Box: 1** on the following page.

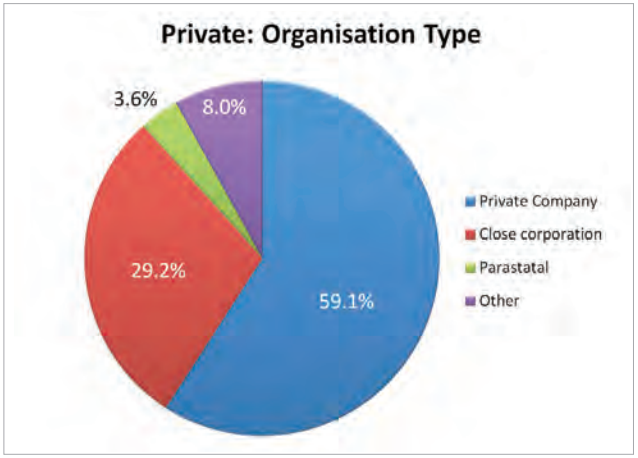

Figure 11: Distribution of private sector respondents by organisation type

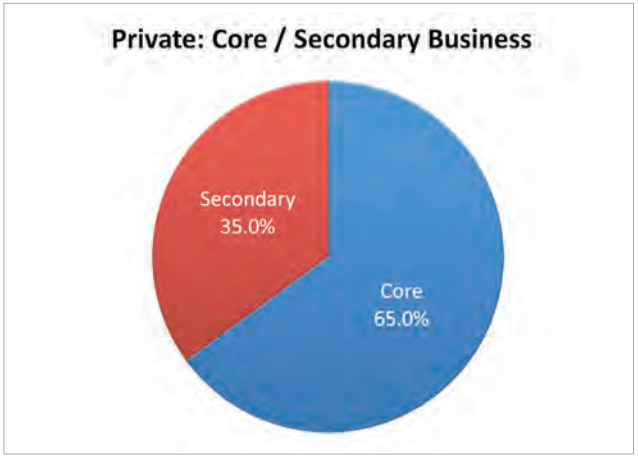

Figure 12: Primary and secondary nature of waste business (private sector)

Text Box: 1 – Examples of the narrow definition of the sector

According to a civil engineering company active in landfill construction, "*We are not in the waste management industry – we merely construct landfills for municipalities and other private clients to consultants' designs and specifications. Our business involves earthworks, roadworks, construction and the like*."

There were also some companies that mistook their role in the waste sector. For example, a large vehicle supplier to the waste industry completed the questionnaire based on the waste they generate in their plant, as opposed to the equipment they provide to the sector, which is a much larger and more significant role to the waste sector.

Manufacturers who reprocess waste (recyclables) in the manufacturing of new products also mistook their role within the waste sector. As noted by one 'reprocessor' "[Our company] *doesn't fall into the category of Waste Company or Waste Management Company, Waste Trader, etc. We don't sell waste, we buy waste, transport it, beneficiate it and consume it*." One recycler noted that, "*We own two scrap yards, which receive scrap and process it. We consider scrap a raw material in the iron industry, however, I am aware that others do not perceive scrap in this way."* A second recycler replied that, "*we are an in-house recycling company whereby we recycle and sell the material back to the customer. We are therefore not bound to the waste sector as such.*"

3.4.1.1 BBBEE Level

Question: Is your organisation broad-based BEE certified? If Yes, what is your BEE certification (Level 1-8)?

The results suggest that the waste sector is relatively well transformed, with 77.2% of respondents indicating that they have Broad-Based Black Economic Empowerment (BBBEE) certification (**Figure 13**). Of those certified, the average certification level[7] is a level 4 (**Figure 14**).

3.4.1.2 Age of the private waste sector

Question: 11. In what year did your organisation first start providing waste goods or services?

Figure 15 shows that there has been a spate in the start-up of waste companies or waste offerings since the promulgation of South Africa's first legislation around waste in 1989, i.e. the permitting of landfill sites under Section 20 of the Environment Conservation Act (Act 73 of 1989). At least half (50.4%) of these companies have started in the last 10 years alone (2002-2012).

Superimposing large national and provincial government initiatives (waste policy and projects) onto **Figure 15** would suggest that there is some correlation between initiatives by government, including the three large, Danida-funded waste management projects,[8] the promulgation of recent legislation and regulations, and the start-up of waste enterprises.

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[7] DTI (2005). Broad-based black economic empowerment Act, Section 9(5): Codes of Good Practice

[8] Danida (Danish Aid Agency) has supported three large waste management projects in South Africa over the past two decades, including the development of the First National Waste Management Strategy (1999); the Gauteng Health Care Risk Waste and Waste Information

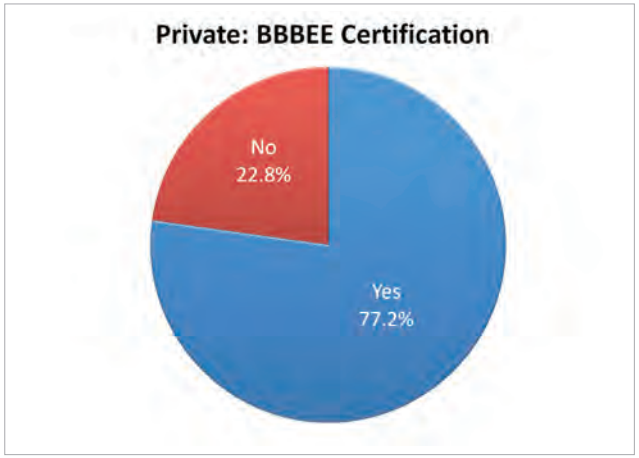

Figure 13: Percentage of private enterprises with BBBEE certification

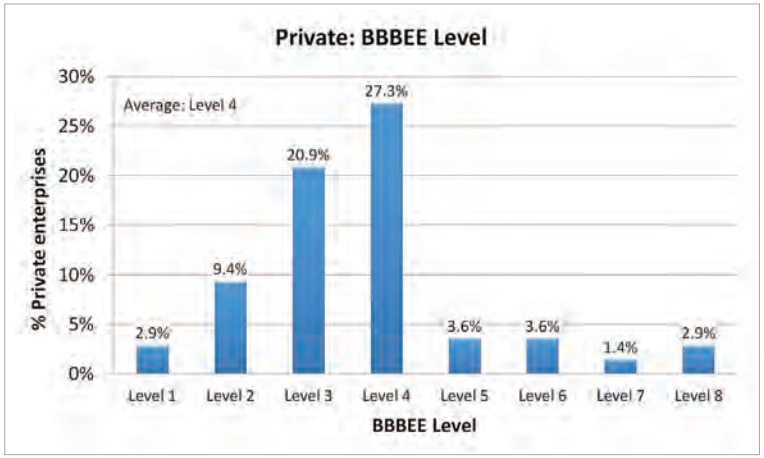

Figure 14: Level of BBBEE certification for private enterprises

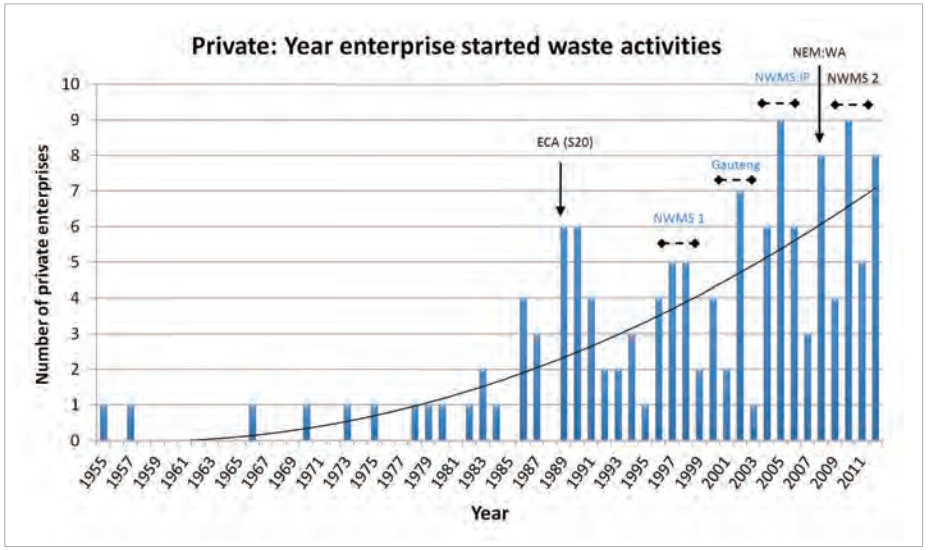

Figure 15: Start-up of private waste enterprises, by year

There is mixed evidence as to whether environmental legislation negatively impacts a company's or country's productivity and economic performance (EC, 2012a). Christiansen and Haveman (1981), for example, suggested that environmental regulations resulted in an 8-12% slowdown in US productivity between 1965 and 1979. While environmental regulations may impact development, it would appear that they also stimulate other (often new) economic sectors, in this case the South African waste sector. A visible, strong commitment by government towards addressing waste issues in the country may therefore be a prompt to private waste sector development and growth, which is encouraging.

3.4.1.3 Geographic distribution

Question: Our organisation has active waste operations in the following province(s).

System project (2002-2003); and the National Waste Management Strategy Implementation Project (NWMSI) (2004-2006) (*indicated in blue on the timeline in Figure 15*).

The results (**Figure 16**) show that the majority of the private enterprises have waste operations within the three main economic hubs of South Africa, namely Gauteng, KwaZulu-Natal and the Western Cape, where the bulk of the general and hazardous waste[9] is being generated (DWAF, 2001; DEA, 2012).

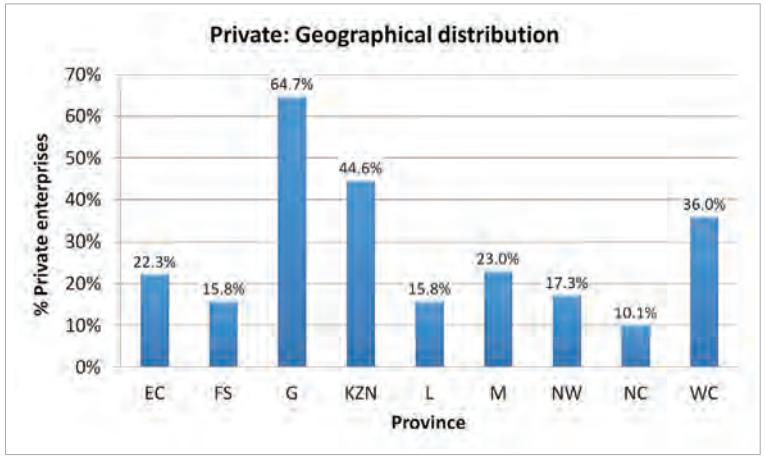

Figure 16: Geographic footprint of waste enterprises in South Africa

Question: In which geographic market(s) did your organisation sell waste goods or services during your last financial year?

The results (**Figure 17**) show that while the majority (56.1%) of private sector respondents have only a regional footprint (SA(s), some provinces), and some 38.1% of respondents have a national footprint (SA(n), all provinces), the footprint does extend up into Africa and also into the rest of the world. The nature of the relationships with Europe, Asia, America and Australasia would be interesting to explore further, through follow-up discussions.

[9] Excluding mining and power generation waste which are largely concentrated in Mpumalanga and Gauteng provinces

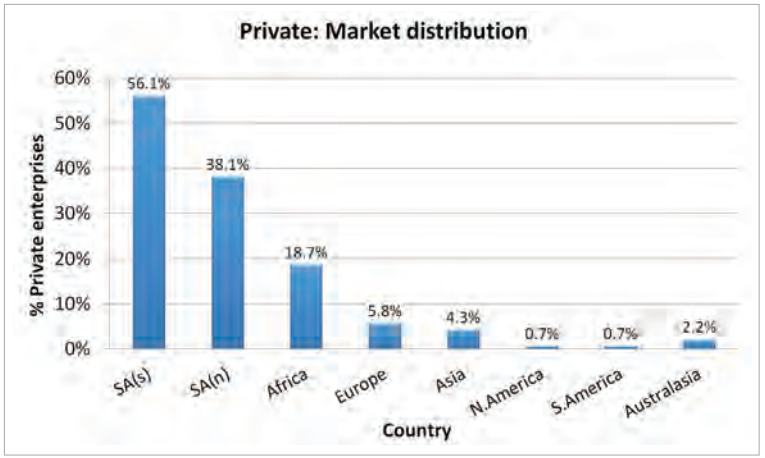

Figure 17: Market for South African waste goods and services

While there is no predominant theme between the type of organisation with footprints into the Americas or Australasia, it would appear that the relationship with Asia and Europe is mostly held by recycling company respondents (**Table 6**). An estimated 83.3% of private sector respondents, who indicated that they provided goods and services into Asia, were recycling companies.

Table 6: Relationship between type of company and market distribution

Continent	Percentage private sector respondents
Asia	83.3% recycling companies
Europe	42.8% e-waste recyclers; 28.6% consulting/engineering
Americas	No correlation
Australasia	No correlation

3.4.2 Public sector

As shown in **Figure 18**, there was a good distribution of responses received from metropolitan municipalities (A), with a return rate of 75%, declining to a 22%

response rate for local B3 and B4 municipalities. **Figure 18** shows the number of respondents as a percentage of the total number of municipalities in that category.

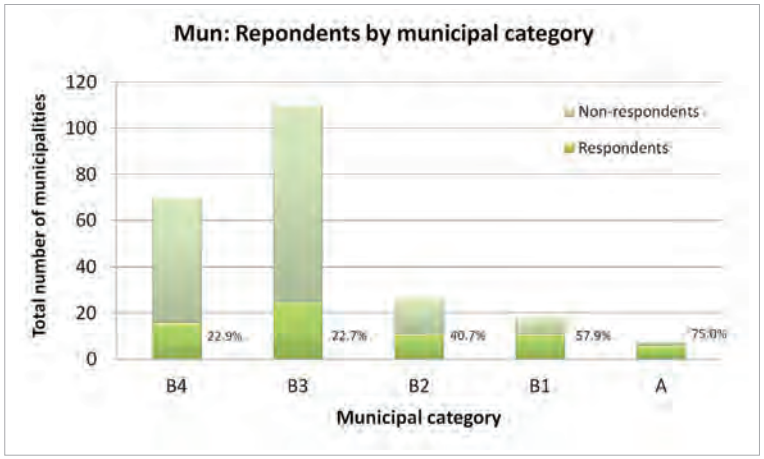

Figure 18: Municipal respondents as a percentage of total number (by municipal category)

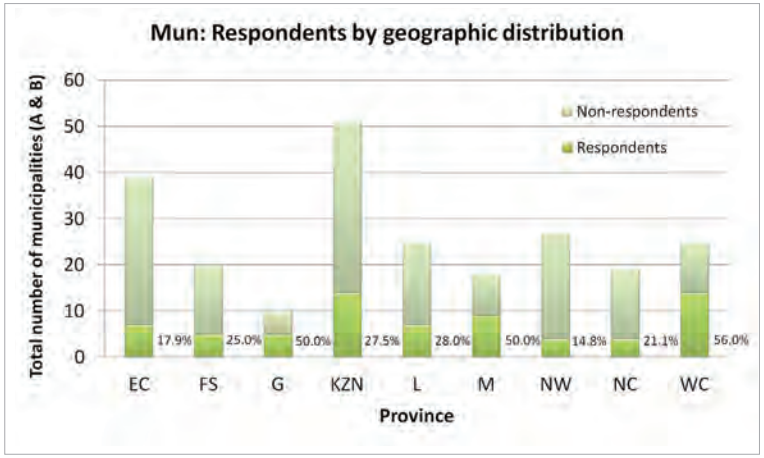

Figure 19: Municipal respondents as a percentage of total number (by geographic distribution)

In terms of geographic footprint, the majority of municipal responses, as a percentage of the number of municipalities in the province, were from the Western Cape, Gauteng and Mpumalanga, where 50% of municipalities in the province provided responses. This decreased to 17.9% of municipalities in the Eastern Cape and 14.8% in the North-West. **Figure 19** shows the municipalities who returned questionnaires as a percentage of the total number of municipalities in the province.

While noted that the response rate overall was low for municipalities, it is encouraging that a high number of responses were received from the metropolitan and large local municipalities, as well as municipalities in the three most economically active provinces. This would suggest that a very high percentage of the public waste sector is reflected in the results of this survey.

3.5 Employee Status

3.5.1 Number of waste employees

The study by the Department of Environmental Affairs (DEA) on macroeconomic trends, targets and economic instruments (DEA, 2009) presented a figure of 29,505 people employed in the South African waste sector. With 20,505 people employed in the public sector[10] and 9,000 (guesstimate) employed in the private sector (**Table 7**).

Data received from the questionnaires indicates a minimum of **29,833 employed** in the formal waste sector (public and private) as at 2012[11] (**Table 7**). An estimated 2-3 times this number are believed to earn a living from the informal waste sector, largely through recycling activities (DEA, 2009; WIEGO, 2009), however no official statistics on the South African informal waste sector currently exist.

[10] Based on the number of positions *filled* in municipalities in 2006 (National Treasury, 2008 cited in DEA, 2009)

[11] Employee information for the large metropolitan municipality which did not participate in this study could not be sourced online, and so is excluded from this figure.

Table 7: Minimum number of people employed in the formal waste sector

Waste sector	Number of waste employees 2009 (DEA)	2012
Private	9,000	9,741
Public	20,505	20,092
Total	29,505	29,833

3.5.1.1 Private sector

The results (**Figure 20**) show that 77.5% of people employed in the private waste sector, are currently employed within 'Large' enterprises.

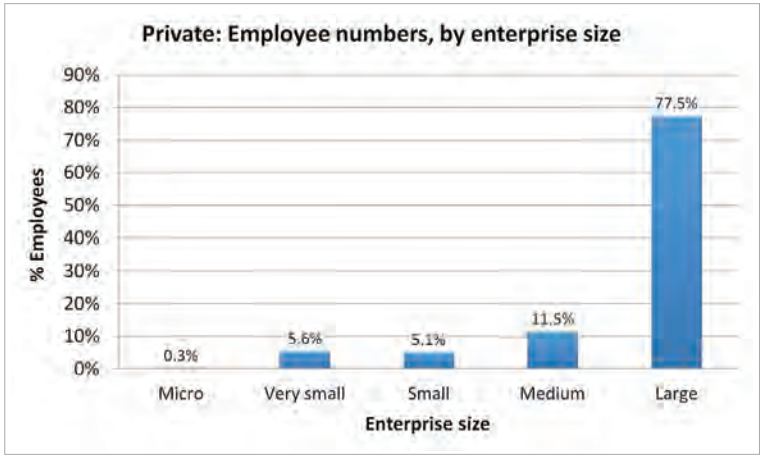

Figure 20: Percentage of waste employees per enterprise size

However, the private waste sector is made up of companies varying considerably in size (financial and employees), from 1 person (self-owned) up to nearly 1,000 persons (**Figure 21**). An estimated 35.1% of private waste companies employ less than 10 staff members, indicating the receptive environment within the private waste sector for the establishment of small-, medium- and micro- enterprises (SMMEs).

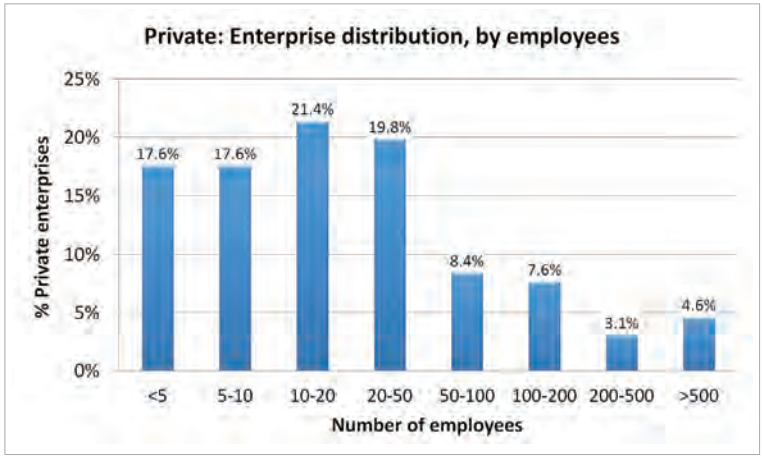

Figure 21: Percentage of enterprises, by employee number

3.5.1.2 Public sector (Municipalities)

The results indicate a minimum number of employees in waste management in municipalities of 20,092. This compares favourably with the figures of positions filled of 20,505 (in 2006) and 20,560 (in 2009) (DEA, 2009; National Treasury 2011). This might suggest that municipalities are stabilizing at around 20,000-21,000 employees in the management of waste (2006-2012), with the potential to grow to 25,000 if all vacant positions could be filled (or wanted to be filled). However, employment is not equally distributed across all municipal categories (**Table 8, Figure 22**).

Table 8: Minimum number of people employed in waste operations per municipal category (2012)

Municipal category	Waste employees Number	% of total
- Category A	13,038	64.9%
- Category B	7,054	35.1%
Total	**20,092**	**100.0%**

The results show that 64.9% of waste employees in municipalities are employed within Category A, metropolitan municipalities (**Figure 22**).

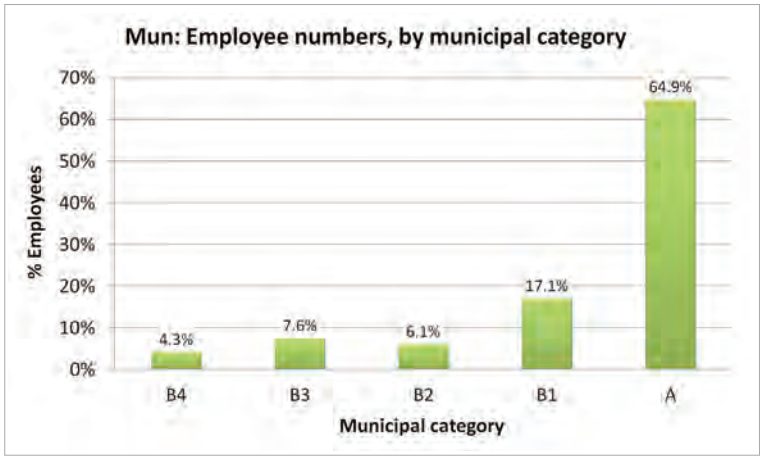

Figure 22: Percentage of waste employees per municipal category

According to National Treasury (2011), metros showed a 35.2% growth in waste management positions between 2006-2009, while local and district (combined), showed a negative growth of -12.1% in waste management positions (**Table 9**). This reflects the need for metropolitan municipalities to deal with increasing tonnages of waste being generated. However, the ability of metros to attract and retain employees in waste management appears to be a problem, with only 73.5% of waste management positions in metros filled in 2009. There is no indication how this has changed in the past three years.

Table 9: Growth in municipal *positions* in waste management (Treasury, 2011)

Municipal category	Total positions (2006)	(2009)	Percentage growth	Positions filled (2009)	%
Category A	8,303	11,226	35.2%	8,251	73.50%
Category B + C	15,769	13,867	-12.1%	12,309	88.76%
Total	24,072	25,093	4.24%	20,560	81.94%

The public waste sector is made up of municipalities varying considerably in size (waste employees), from less than five (<5) employees to in excess of 5,000 employees (**Figure 23**), with the majority of municipalities (30.9%) employing between 50-100 personnel in the management of waste.

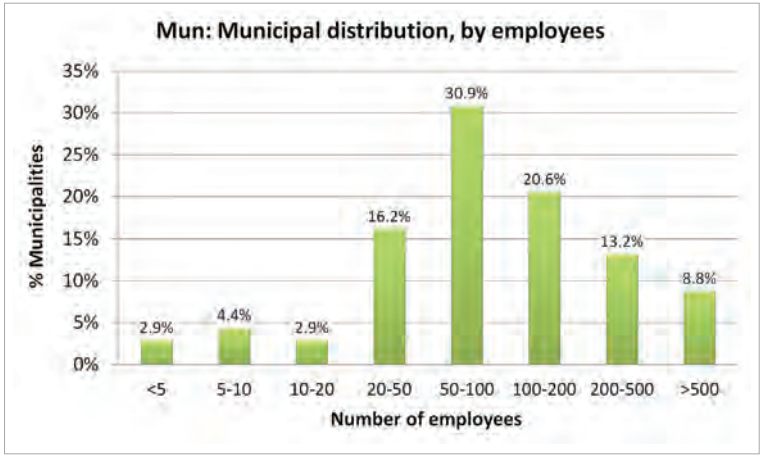

Figure 23: Percentage of municipalities, by employee numbers

3.5.2 Allocation of staff per skill category

In terms of the allocation of these waste staff, organisations were asked to assign their waste management staff into one of three skill categories:

- Skilled – waste technical specialists, e.g. qualified (degree or experienced) engineers, scientists, waste professionals
- Un/semi-skilled – waste labour, e.g. drivers, operators, spotters
- Other – includes management, finance, admin, support services, i.e. providing support to the waste team, etc.

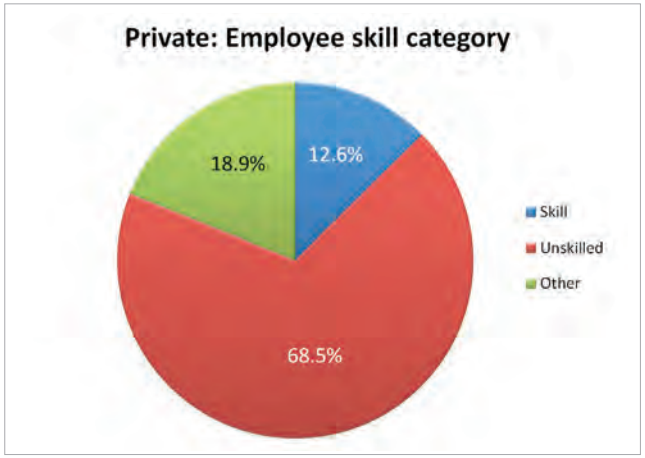

Figure 24: Status of employees for private sector, by skill category

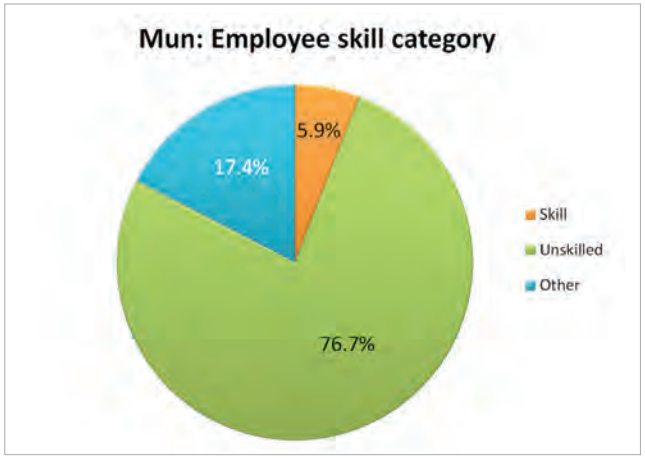

Figure 25: Status of employees by public sector, by skill category

The results (**Figures 24 and 25**) show a larger percentage of unskilled/semi-skilled employees within municipalities (76.7%) than within private companies (68.5%), but a larger administrative/support base within private companies (18.9%) than within municipalities (17.4%).

3.5.3 Employee qualifications

When asked the total number of staff with the following highest qualification (<Matric, Matric, Diploma, Degree, Masters, PhD), a number of respondents, indicated that they do not keep the education level of their staff on file, or where they do, they do not have it readily available, i.e. not electronically. Should Government wish to track these statistics on highest qualification, a mechanism will need to be put in place to collect the data from organisations.

The available results (**Figures 26 and 27**) mirror the results presented in Section 3.5.2 (skill category), with a greater percentage of 'unskilled' employees with a matric or less in municipalities. For the private sector, 84.6% of employees hold a matric or less, compared to 89.5% of employees in municipalities. Only 0.1% of employees in municipalities hold a masters or PhD degree compared to 1.7% of employees in private enterprises.

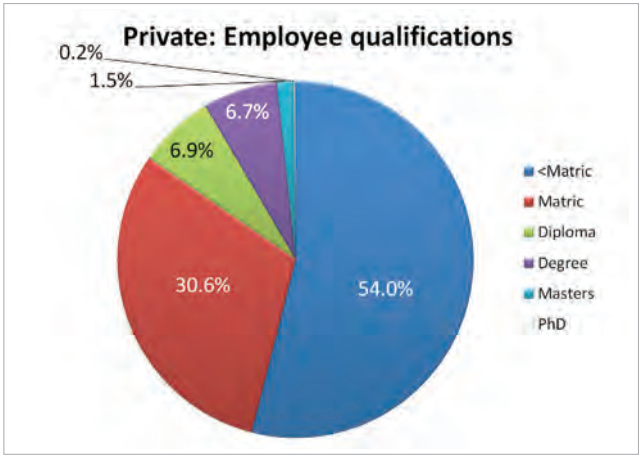

Figure 26: Status of employees for private waste sector, by highest qualification

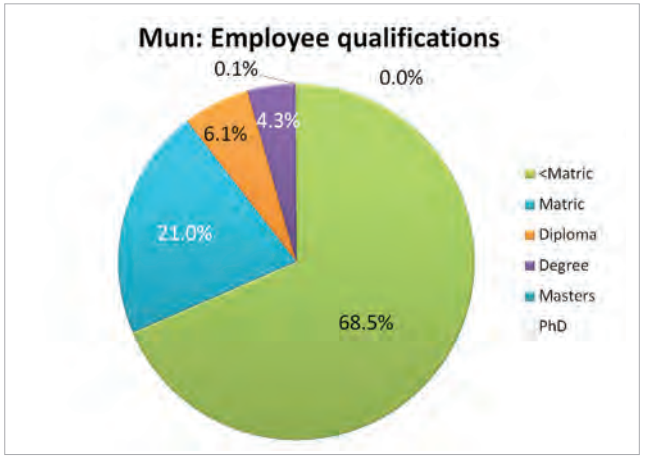

Figure 27: Status of employees for public waste sector, by highest qualification

Data from the Department of Higher Education and Training (DHET) HEMIS3 database, suggests that some 1,500-2,500 undergraduates and 1,100-1,300 Masters and PhD graduates (per annum) could potentially be exposed to waste management subject matter during the course of their studies (graduates over the period 2006-2011). However, from the results presented in **Table 10**, these graduates appear not to be moving into the waste sector (**Figure 28**).

Table 10: Known diplomas and degrees in the waste sector

Waste Sector	Diploma	Degree	Masters	PhD
Private	468	456	102	13
Municipalities	856	610	17	1
Total	1,324	1,066	119	14

* Note: The above table on diplomas and degrees does not include data from one of the largest private waste management companies. The results present a minimum indication of undergraduate and post-graduate qualifications.

Figure 28: Highest qualifications of employees within the public and private waste sectors

The sector, in conjunction with Government, will therefore need to look at how it attracts and retains highly qualified graduates in the waste sector, to stimulate technological and non-technological innovations.

3.5.4 Employee status

The results (**Figures 29 and 30**) show a larger percentage of employees on contract in the private sector (22.2%) than in municipalities (10.0%) which reflects the strong drive within municipalities within the past few years to move employees from contract to permanent staffing. For municipalities, this compares favourably with the findings published by Statistics South Africa, that 92% of filled positions in waste management departments across all municipalities in South Africa are permanent, full-time appointments (StatsSA, 2008).

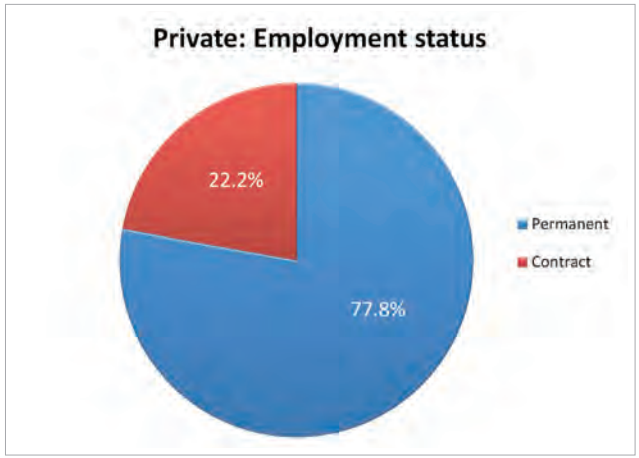

Figure 29: Employment status of the private waste sector

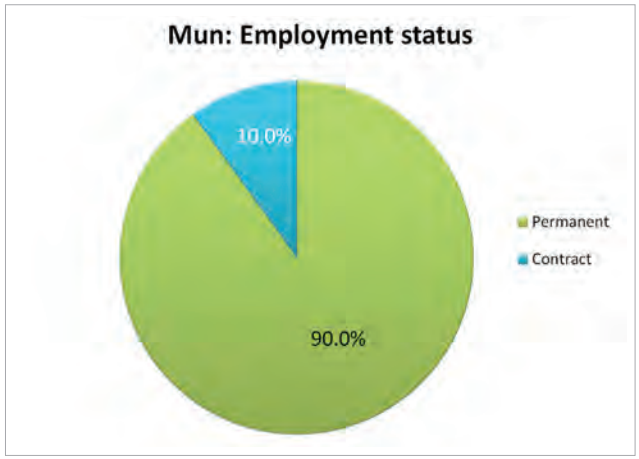

Figure 30: Employment status of the public waste sector

3.5.5 Employee race

Regarding race of employees, the results (**Figures 31 and 32**) also reflect a positive transformation within the waste sector, with 83.8% of private sector employees and 98.3% of municipal employees being people of colour.

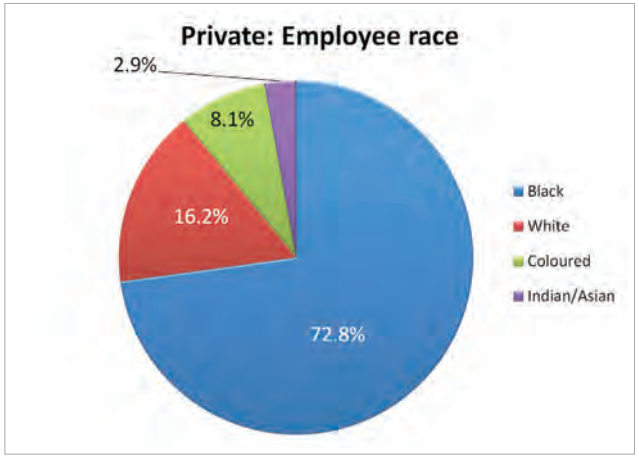

Figure 31: Status of employment of the private sector, by race

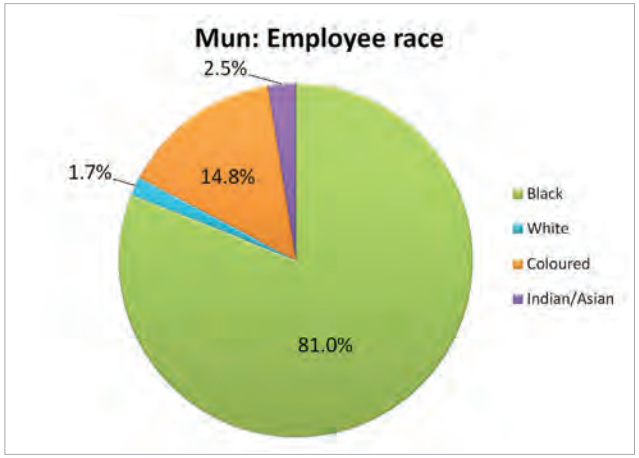

Figure 32: Status of employment of the public sector, by race

3.5.6 Employee gender

For what has always been a male dominated industry, the waste sector appears to also be transforming with respect to gender, with 37.8% of private sector employees and 32.1% of municipal employees being female (**Figures 33 and 34**).

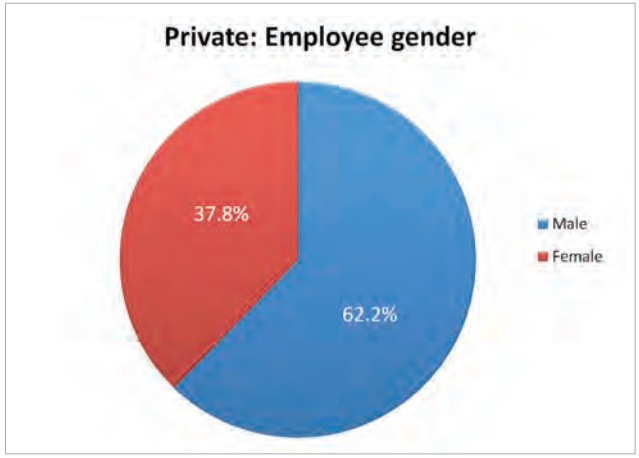

Figure 33: Status of employment of the private sector, by gender

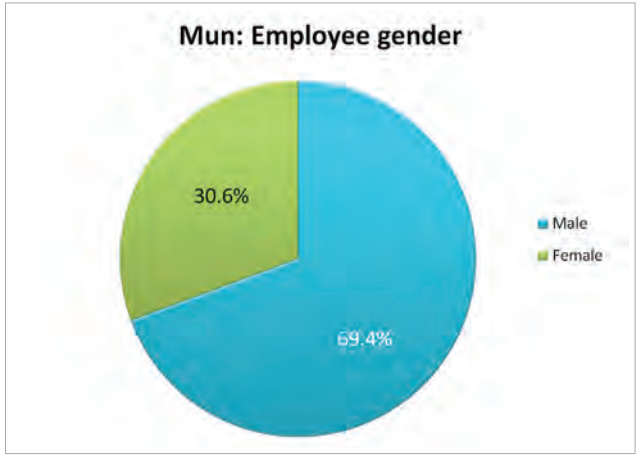

Figure 34: Status of employment of the public sector, by gender

3.5.7 Growth

Question: In the next three years, do you see your waste activities growing in size (recruit new staff), remaining as is (no staff recruited), declining in size (reducing staff).

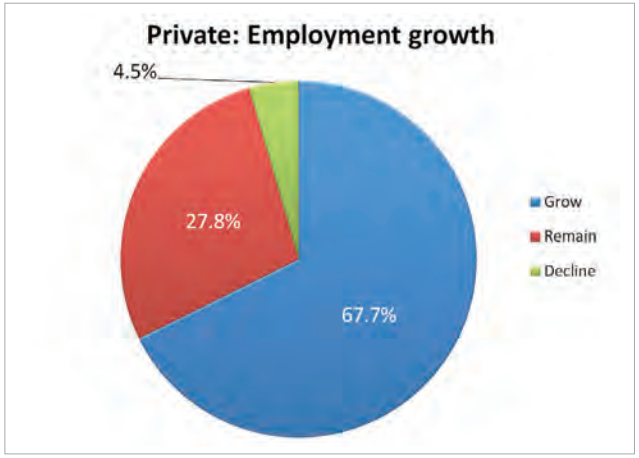

Figure 35: Potential employment growth in the private sector

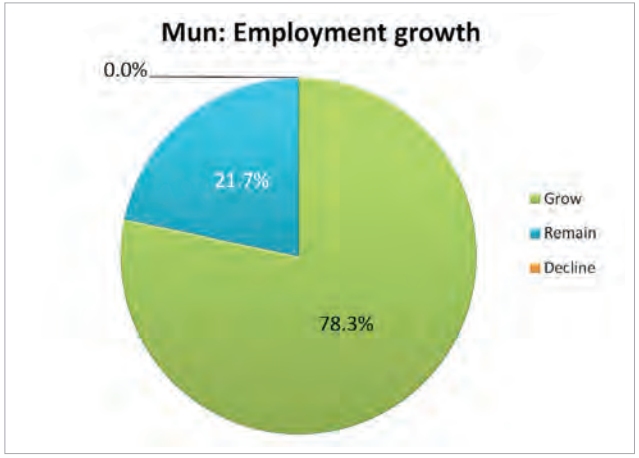

Figure 36: Potential employment growth in the public sector

The majority of private enterprises (67.7%) and municipalities (78.3%) (**Figures 35 and 36**) indicated that they were planning to recruit more staff, which is encouraging in terms of job creation in the sector. However, it should be noted that recruitment within municipalities may simply be to fill currently vacant positions.

However, of the 4.5% of private enterprises that indicated they were planning on reducing their number of staff in the next three years, 50.0% are active in the sorting and reprocessing of recyclables, and 33.3% are in waste collection and storage. This envisaged reduction in staff numbers may hint at the strain that the South African recycling sector is currently under with regards to increasing electricity, transport and labour costs, or it may also reflect a move towards system automation.

3.6 Financial Status

3.6.1 Revenue of the waste sector

12.6% of private companies and 10.3% of municipalities chose not to complete the financial section of the questionnaire. In communication with respondents from private companies, the reason(s) given included –

- a perceived risk of disclosing financial information to government,
- the organisation did not have the breakdown of income or expenditure of waste-related activities, where waste was not a core business, or
- where the business was new and a full year of financial data was not yet available, or not available for 2012.

The concept of 'revenue' derived from waste (as posed in the questionnaire) was also problematic for the waste reuse/recycling sub-sector. For many of these organisations, the waste creates no direct income, as it simply replaces a raw material in the process and hence an expense. The waste certainly has 'value' to the organisation as a process input, but alternative ways of capturing this financial 'value' for future surveys, needs to be explored.

The concept of 'revenue' was also problematic for some municipalities, who interpreted this to be income generated from rendering waste services, as opposed to annual budget available for the rendering of waste services. Since some municipalities appear not to charge for waste services, they reflected the revenue for their municipality as zero (or negative).

The study by the Department of Environmental Affairs on macroeconomic trends, targets and economic instruments (DEA, 2009) presented a formal waste sector worth R10 billion per annum (total annual expenditure on solid waste management), of which about 70% was through the public sector, largely local government, and 30% through the private sector. Total expenditure on waste was taken as an indicator of value, since the public sector often does not recover sufficient income to cover expenditure.

The results (**Table 11**) suggest a minimum value of the formal South African waste sector (public and private) as at 2012, of **R15.3 billion per annum**, or 0.51% of GDP.

Table 11: Minimum financial value of the formal waste sector

	DEA [R] (2009)	Revenue [R] (2012)	Adjusted [R] (2012)
Private	3,000,000,000	6,961,644,605	6,961,644,605
Public	7,000,000,000	6,835,768,307	[(12)] 8,323,879,000
Total	10,000,000,000	13,797,412,912	15,285,523,605

[12] Since not all municipalities responded, including a large metropolitan municipality, the full year forecast waste management expenditure for 2011/12, provided by National Treasury, is adopted here as an estimate of the financial size of the public sector.
Reference: Municipal Budget and Reporting Regulations format (Detail of schedules A2 to A10); 01.A2 Standard Classification; Table A2 Budgeted Financial Performance (revenue and expenditure by standard classification) (figures finalised as at 2012/10/09)
http://mfma.treasury.gov.za/Media_Releases/mbi/2012/Pages/budgetinfo2012.aspx

While municipalities were asked to report on their total waste revenue in the questionnaire (equitable share plus self-generated waste revenue), as with the macroeconomic report by DEA (DEA, 2009), standard expenditure is adopted here as an indication of the financial size of the public waste sector. This is due to the fact that there is often little relationship between waste revenue and expenditure in municipalities, making expenditure a better indication of the true cost and revenue 'requirements' for the public sector (DEA, 2009). In addition, revenue data collected from municipal respondents (questionnaires) (**Table 11**), already exceeds the standard revenue (full year forecast) for waste management of R6,828,761,000 as presented by Treasury.[12]

The ratio of the public:private sector value has shifted from 70:30 (DEA, 2009) to 54:46 for 2012, highlighting the narrowing of the gap between the value of the public and private waste sectors.

3.6.2 Revenue by organisation size

As shown in **Figures 37 and 38**, more than 80% of the waste revenue for 2012 is tied up in large private waste enterprises and metropolitan municipalities (Type A). With 88.0% of reported private sector waste revenue residing in large waste enterprises, and 80.4% of public sector waste revenue residing in metropolitan municipalities.

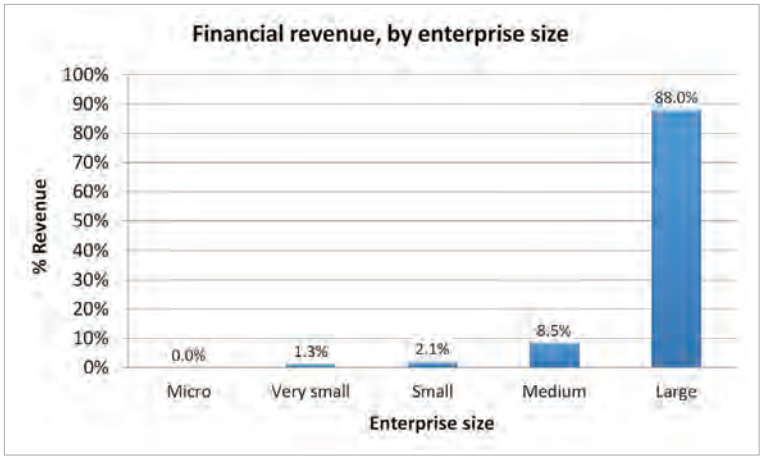

Figure 37: Waste revenue, by enterprise size

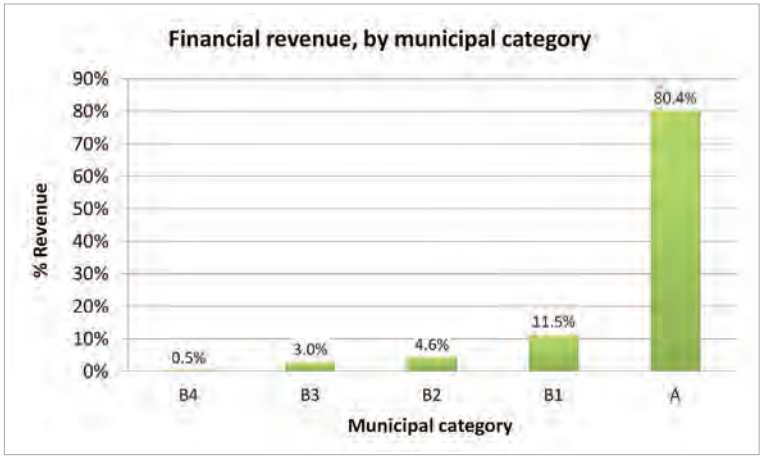

Figure 38: Waste revenue, by municipal category

The results (**Figures 39**) also reflect a private waste sector made up of a few large companies, with annual revenues in excess of R50 million per annum, and a large number of small companies, with annual revenues of less than R5million per annum.

An estimated 48.7% of private sector respondents have an annual revenue of <R5 million per annum.

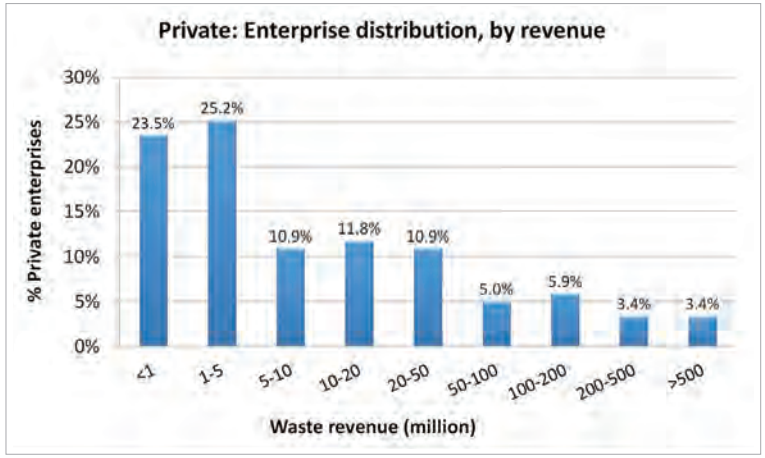

Figure 39: Number of enterprises per financial revenue category

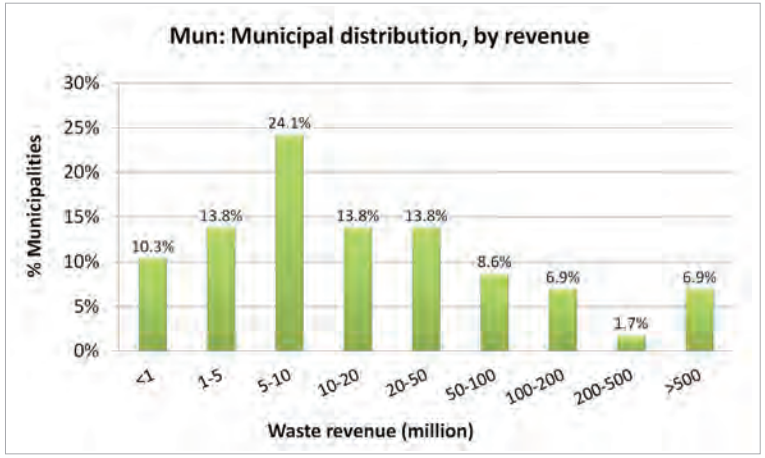

Figure 40: Number of municipalities per financial revenue category

The public sector shows 24.1% of large municipalities, with annual revenues in excess of R50 million per annum, with the majority (51.7%) of municipalities reflecting an annual revenue of between R5-R50 million. An estimated 24.1% of municipalities have an annual revenue of <R5 million per annum (**Figure 40**).

3.6.3 Revenue by enterprise age

In the private waste sector, annual revenue is not only skewed by enterprise size, but also by the age of the enterprise. **Figure 41** shows that 62.0% of the total revenue generated from waste activities in 2012, was done so by companies which had been in the industry for more than 25 years. Data provided by respondents, shows that companies who started up waste activities in the past 5 years, contributed a minimum of R188m into the economy in 2012. It is not to say that all of this is 'new' revenue to the economy. Some of this may be 'transferred' revenue from another company (access to market share) or a since closed company[13].

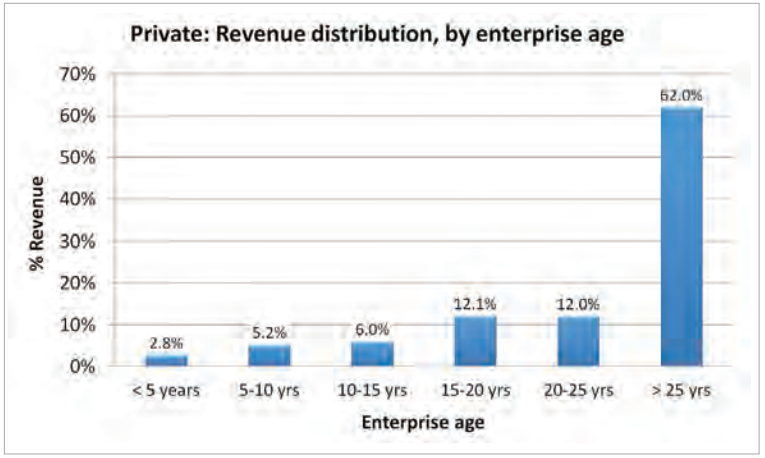

Figure 41: Revenue distribution, by enterprise age

[13] This survey was not able to collect any information on the sustainability of companies within the waste sector. While we have information on companies and when they started, we have no information on companies that have started and closed prior to 2012.

3.6.4 Spend on waste R&D

The estimated spend on waste research and development (R&D) within the private and public waste sectors is shown in **Table 12.**

Table 12: Minimum spend on waste R&D (2012)

Waste Sector	Waste R&D [R]
Private	37,251,663
Public	12,996,567
Total	50,248,230

* Note: One large waste management company did not provide data on R&D spend and this information could not be obtained from their published online annual report.

In terms of rand value, the private sector spends approximately 2.9 times more on waste R&D than the public sector. However, R&D spend as a percentage of each sector's available revenue (value), suggests a 3.4 times higher spend on waste R&D by the private sector than the public sector (**Table 13**).

Table 13: Minimum spend on waste R&D as a percentage of sector value (2012)

Waste Sector	Minimum sector value [R]	Waste R&D [R]	Waste R&D as % of sector value
Private	6,961,644,605	37,251,663	0.54%
Public	8,323,879,000	12,996,567	0.16%
Total	15,285,523,605	50,248,230	0.33%

The minimum spend on waste R&D equates to approximately 0.33% of the value of the sector (**Table 13**) and 0.002% of GDP.

3.6.5 Spend on waste HCD

The estimated spend on waste human capital development (HCD) within the private and public waste sectors is shown in **Table 14.**

Table 14: Minimum spend on waste HCD (2012)

Waste Sector	Waste HCD [R]
Private	84,396,037
Public	344,166,234
Total	428,562,271

* Note: One large waste management companies did not provide data on HCD spend and this information could not be obtained from their published online annual report.

In terms of rand value, the public sector spends approximately 4.1 times more on waste HCD than the private sector. However, HCD spend as a percentage of each sector's available revenue (value), suggests a 3.4 times higher spend on waste HCD by the public sector than the private sector (**Table 15**).

Table 15: Minimum spend on waste HCD as a percentage of sector value (2012)

Waste Sector	Minimum sector value [R]	Waste HCD [R]	Waste HCD as % of sector value
Private	6,961,644,605	84,396,037	1.21%
Public	8,323,879,000	344,166,234	4.13%
Total	15,285,523,605	428,562,271	2.80%

The minimum spend on waste HCD equates to approximately 2.8% of the value of the sector (**Table 15**) and 0.01% of GDP.

During follow up telephonic calls with representatives of private companies, it was indicated that often, the spend on waste HCD reflects the 1% payment of the skills levy, as opposed to spend on actual training (courses, conferences, degrees, etc). If

this is the case, then this spend on waste HCD does not always translate into actual skills development on the ground.

The results suggest that municipalities are spending roughly four times the amount of money on HCD, as opposed to the private sector. Reflecting back on the employee section and the large percentage of unskilled employees in municipalities, this might suggest that –

- Municipalities have identified the skill issue as an obstacle to service delivery and have begun to invest heavily in HCD,
- Municipalities are investing in HCD, but this is not reflecting in a change in skill level, i.e. migrating from 'unskilled' to 'skilled', or in obtaining a degree or diploma (implies very low level of basic training – NQF levels 1-4), or
- There is a high migration of employees through municipalities, with the result that the investment in HCD is not reflecting in the skills level at municipalities (retention),
- The private sector is able to attract more highly skilled persons to start with, resulting in less of a need for HCD spend.
- Municipalities act as a 'training ground' for young professionals who then move into the private waste sector once trained.

3.7 Innovation Status

The South African government recognises the role that innovation has to play in supporting improved industry competitiveness and economic growth (DTI, 2010; 2011; NPC, 2011). Government has mapped out a ten-year plan which acknowledges the role of innovation in moving South Africa towards a knowledge based economy, which will play a driving role in enhancing productivity, economic growth and socio-economic development (DST, 2007).

The European Union has looked extensively at the contribution of innovative firms to the Union's competitiveness and job creation. The studies (EC, 2012; 2012a) look at eco-innovation[14] development and adoption and the competitiveness of European Union firms; and at new instruments to encourage the investment in process and marketing innovations. Their findings show that innovation can support maximising the domestic value of a country's exports and can contribute to external competitiveness; that "*eco-innovating firms are, on the whole, more successful than conventional innovators*" and that "*innovation is the most important source for capturing value-added and developing or keeping competitive advantages*" (EC, 2012a:8; 2012a:69).

For the purposes of this study, the following definitions of innovation, product-, process-, organisational-, and marketing- innovation, and novelty of innovation are adopted.

Innovation - "Innovation goes far beyond R&D" (OECD, 2013)

The Oslo Manual for measuring innovation (OCED, 2005) defines four types of innovation –

- product innovation,
- process innovation,
- marketing innovation, and
- organisational innovation

PRODUCT innovation is defined as "the introduction of a new product (good or service), or a significantly improved product (good or service), such as user friendliness, components, software or sub-systems. The innovation (new or improved) must be new to your organisation, but it does not need to be new to the waste sector or market. It does not matter if the innovation was originally developed by your organisation or by another organisation".

PROCESS innovation is defined as "the introduction of a new or significantly improved process for making or delivering goods and services, e.g. methods of manufacturing products; new or significantly improved logistics, delivery or distribution of your products; or new or significantly improved supporting activities for your processes, such as maintenance and operating systems for purchasing, accounting or computing. The innovation (new or improved) must be new to your organisation, but it does not need to be new to the waste sector or market. It does not matter if the innovation was originally developed by your organisation or by another organisation".

ORGANISATIONAL innovation is defined as "the introduction of new or significantly improved knowledge management systems to better use or exchange information, knowledge and skills within your organisation; major changes to the organisation of work within your enterprise, such as changes in the management structure or integrating different departments or activities; new or significant changes in your external relations with other firms or public institutions, such as through alliances, partnerships, outsourcing or sub-contracting".

MARKETING innovation is defined as "significant changes to the design or packaging of a good or service; new or significantly changed sales or distribution methods, such as internet sales, franchising, direct sales or distribution licenses. The innovation (new or improved) must be new to your organisation, but it does not need to be new to the waste sector or market. It does not matter if the innovation was originally developed by your organisation or by another organisation".

[14] Eco-innovation is any form of innovation resulting in or aiming at significant and demonstrable progress towards the goal of sustainable development, through reducing impacts on the environment, enhancing resilience to environmental pressures, or achieving a more efficient and responsible use of natural resources (European Commission, 2011).

The following section looks at the adoption of innovation in the South African waste sector, with a focus on product- and process- innovation (technological) and marketing- and organisational- innovation (non-technological) innovation.

3.7.1 Innovation activity

Question: *During the past five years, did your organisation introduce new or significantly improved waste goods or services (PRODUCT innovations) or significantly improved waste processes (PROCESS innovations) to its operations?*

The results (**Figures 42 and 43**) show greater innovation activity[15] (technological and non-technological) amongst the private waste sector than amongst municipalities. 51.9% of private enterprises compared to 41.2% or municipalities indicated they had introduced new product innovations, while 56.3% of private enterprises compared to only 35.3% of municipalities indicated they had introduced new process innovations.

With respect to non-technological innovations, when asked "*During the past five years, did your organisation introduce new or significantly improved ORGANISATIONAL innovations to its operations?*", 53.3% of private companies compared to only 44.1% of municipalities indicated they had. When asked "*During the past five years, did your organisation introduce new or significantly improved MARKETING innovations to its operations?*", only 40.0% of private companies compared to only 23.5% of municipalities indicated they had.

The lower adoption of marketing innovation by municipalities makes sense, since municipalities do not need to market their services within a competitive environment, unlike the private waste sector.

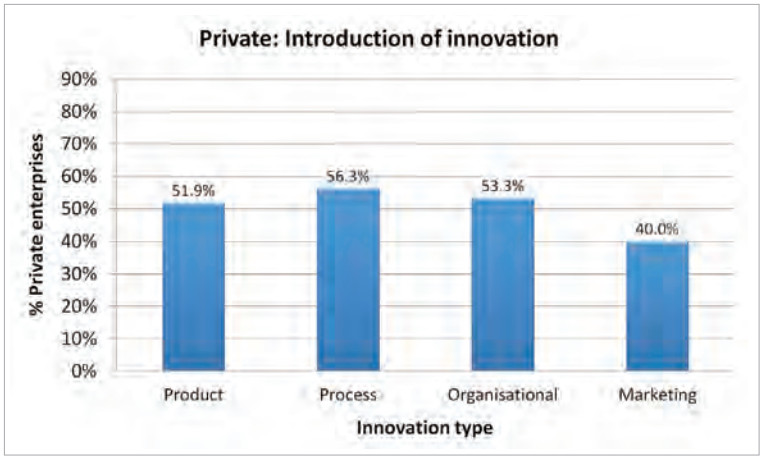

Figure 42: Introduction of innovation within the private waste sector

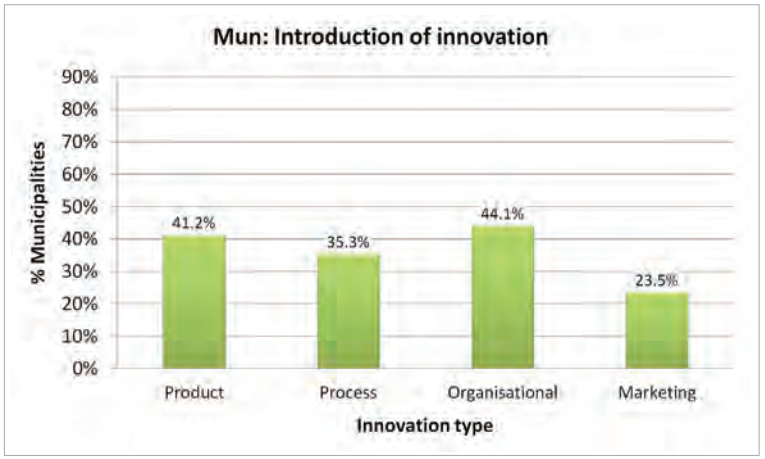

Figure 43: Introduction of innovation within the public waste sector

[15] Where innovation activity is defined for the purposes of this study as the sum of product, process, organisational and marketing innovation.

3.7.2 Market for product and process innovations

Where respondents had indicated that they had introduced new product or process (technological) innovations, they were requested to indicate whether the innovation was:

- New to the South African waste market
- Only new to your organisation

The private waste sector showed a greater tendency to introduce new technological innovations to the South Africa waste market, compared to municipalities who typically introduced technological innovations to their own operations (**Figures 44 and 45**). Over 50% of private sector respondents indicated that they had introduced product or process innovations that were new to the South African waste market.

Levels of novelty of innovation:

New to the SA waste market – You introduced a new or significantly improved product or process innovation into the waste market before your competitors (it may have already been available in other sectors / markets)

New to your organisation – You introduced a new or significantly improved product or process innovation that was already available from your competitors in the waste market

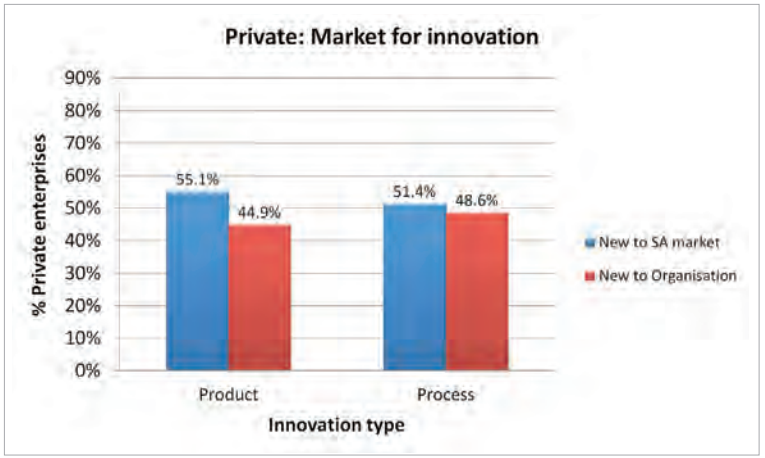

Figure 44: Market for the innovation, within the private waste sector

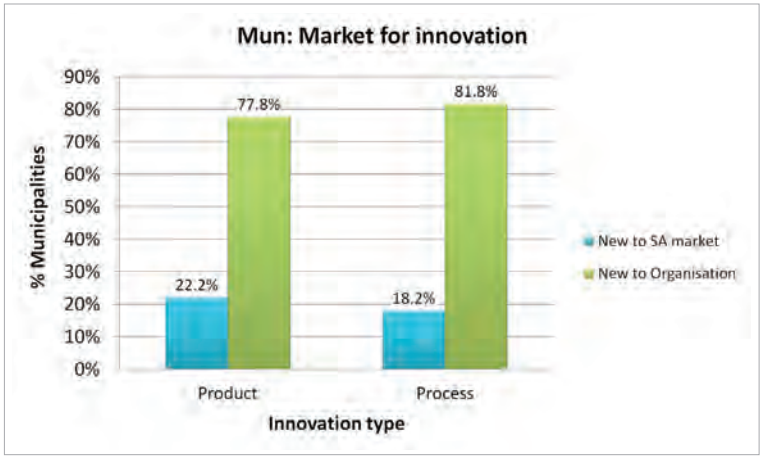

Figure 45: Market for the innovation, within the public waste sector

3.7.3 Origin of technological innovations

Finally, respondents who had introduced new product and process (technological) innovations, were asked to indicate whether these waste innovations had originated mainly in South Africa or from abroad (**Figures 46 and 47**)?

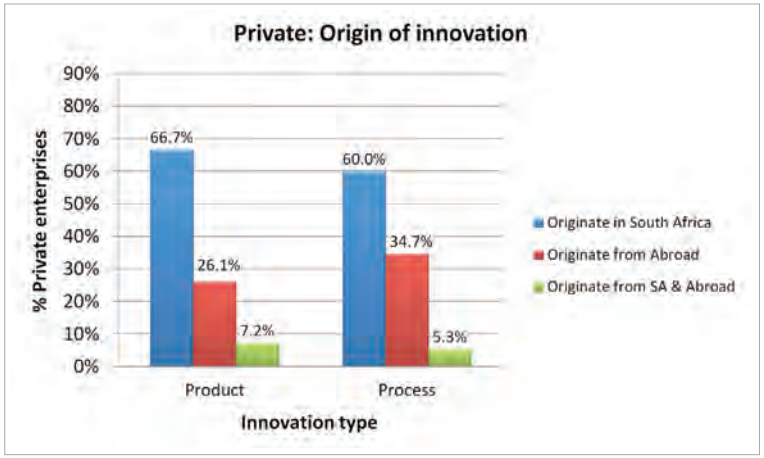

Figure 46: Origin of the innovation, for the private waste sector

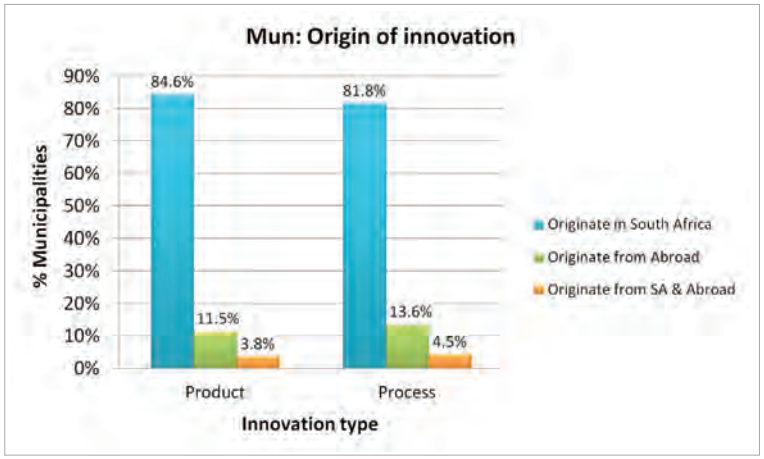

Figure 47: Origin of the innovation, for the public waste sector

The private waste sector (**Figure 46**) showed a higher tendency than municipalities (**Figure 47**) to introduce technological innovations from overseas, with 26.1% of private enterprises indicating that they had sourced their product innovations mainly from abroad, and 34.7% their process innovations.

This is higher than the figure of 24.0% for the broader South African business sector, reported on in the South African Innovation Survey for 2008 (HSRC, 2011). It would be interesting to assess this against more recent innovation figures for South Africa, to see whether the waste sector does in fact source more of its technological innovation from abroad compared to other sectors. However, there has been no published innovation report for South Africa, since 2008.

3.7.4 Planned introduction of new technological innovations

When respondents were asked "*Is your organisation planning to implement new technological innovations in the coming two years?*", 60.9% of private waste companies and 55.2% of municipalities indicated that they would be, which is encouraging from the perspective of innovation activity (**Figures 48 and 49**). However, it would be interesting to revisit those organisations who indicated they would be implementing new technological innovations, to get a sense of what types of technologies will be implemented and whether these technologies reflect, and support, a move away from landfilling to alternative waste management options.

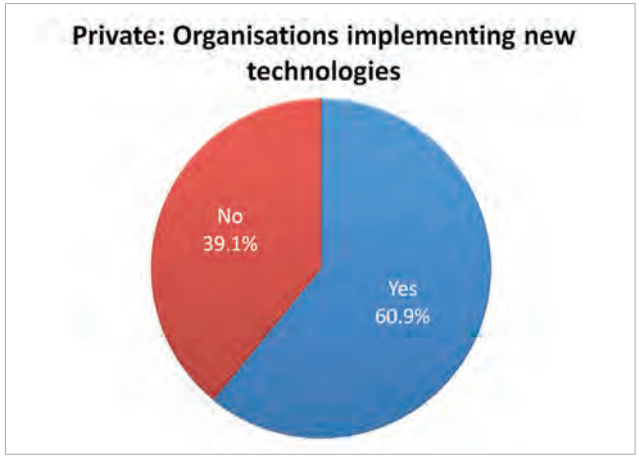

Figure 48: Planned introduction of new technological innovation

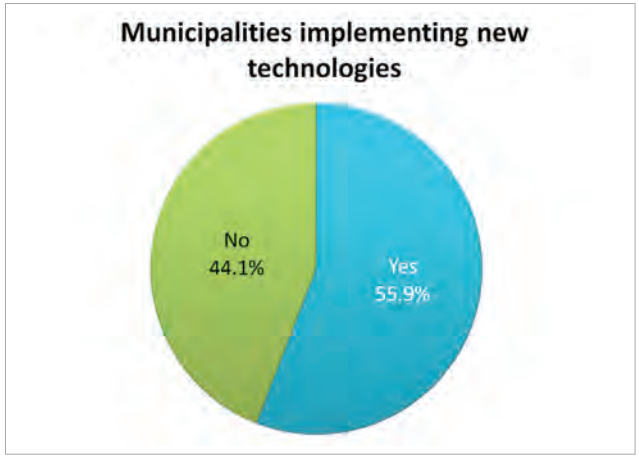

Figure 49: Planned introduction of new technological innovation

3.7.5 Innovation in the private sector

Taking a closer look at innovation activity within the private waste sector, there appears to be a correlation between enterprise size (total waste revenue) and the adoption of innovation. **Figures 50 and 51** show that the larger the organization (financially), the greater the likelihood of innovation activity (technological and non-technological). This makes sense, as there is a financial risk attached to introducing new innovations, a risk which is more easily carried by larger, more financially secure companies. With increasing company size, there is also a need for ensuring competitive advantage, and hence the need for continuously innovating and adapting.

Figure 50 shows that large enterprises had the highest innovation rate, with 68.8% of large enterprises showing innovation activity, compared to an innovation rate of 20.5% for micro enterprises.

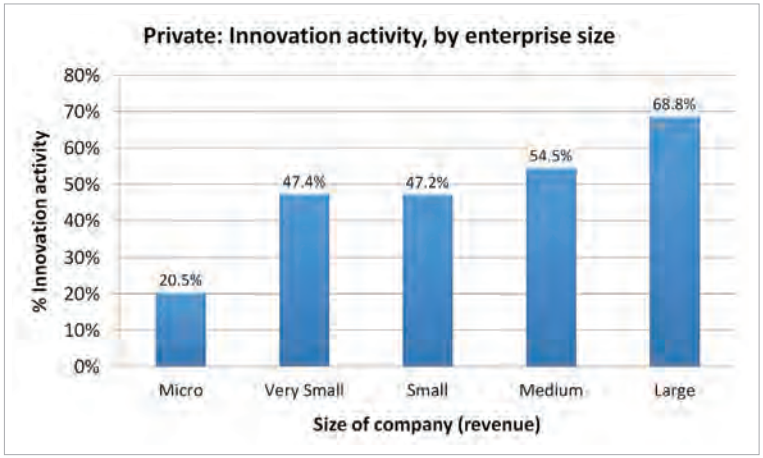

Figure 50: Innovation activity by enterprise size (total)

These findings are in line with innovation activity for South Africa (HSRC, 2011) and with international research findings (Balasubramanian and Lee, 2008), which show a

correlation between enterprise size and innovation. It is encouraging to note that the South African waste sector reflects the general innovation trend for the South African business sector (HSRC, 2011), with increasing innovation activity with increasing enterprise size. However, percentage wise, the South African waste sector appears to lag behind the norm for the South African industry and service sectors, on innovation activity. This may reflect the slow move away from landfilling in South Africa to alternative waste management options and the slow uptake of innovation. This is likely to change in coming years with the strong policy drive towards alternative waste management practices and the need for companies to reinvent themselves to remain competitive.

Figure 51 gives a breakdown of the innovation activity within the different size classes of enterprises. Within large enterprises, 65.0% of enterprises had adopted product innovations, 65.0% process innovations, 75.0% organisational innovations and 70.0% marketing innovations. This compares to micro enterprises, where only 18.2% of enterprises had adopted product innovations, 27.3% process innovations, 18.2% organisational innovations and 18.2% marketing innovations.

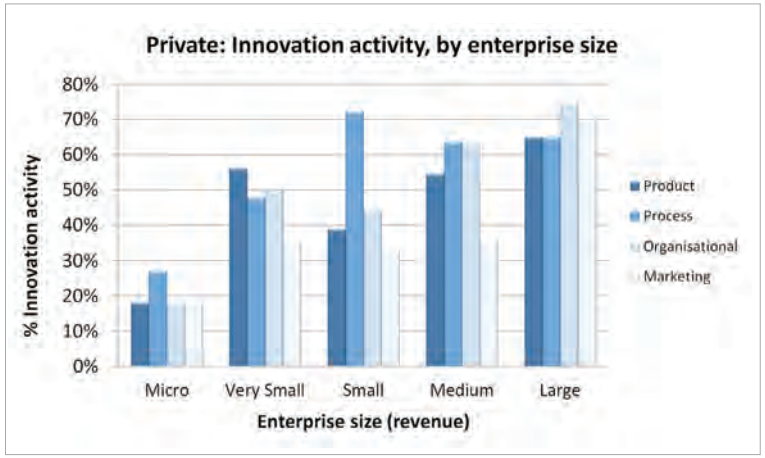

Figure 51: Innovation activity within enterprise size classes (innovation type)

Government has identified the need to "*direct and provide increased support to SMEs to develop and commercialise high technology products and processes"* with the aim of creating "*more successful and innovative SMEs that will use new systems and innovations to produce new products for global and local markets*" (DTI, 2010:47). As such, the DST Waste RDI Roadmap must identify means of encouraging and supporting, the introduction of technological innovation –

- Across the waste sector, so as to encourage a shift away from landfilling, to alternative waste management options (supporting national policy)
- In micro, very small and small companies with an annual revenue of <R13m per annum

While international research has found a positive relationship between a firms' age and its level of innovation (Sorensen and Stuart, 2000; Balasubramanian and Lee, 2008), no correlation was found between enterprise age and innovation activity for the private waste sector in South Africa (**Figure 52**). Both young and old companies show relatively high levels of innovation activity.

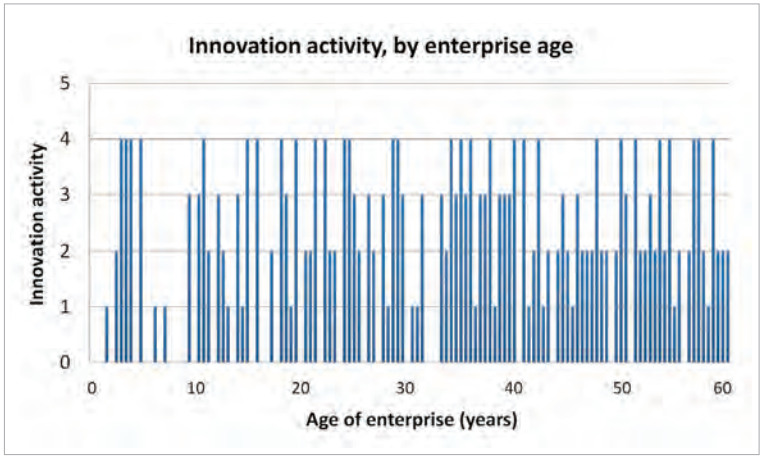

Figure 52: Innovation activity by enterprise age

3.7.6 Innovation in the public sector

As with private waste companies, municipalities also show increasing levels of innovation activity, the larger the municipality, with the exception of the small B4 municipalities which show surprisingly elevated levels of innovation activity (**Figures 53 and 54**).

However, discussing these results with key stakeholders in the sector, there was general surprise at the higher than expected innovation activity by municipalities (although still lower than the private sector). To clarify this point, it must be noted that innovation is not only considered a world first, ground-breaking technology. Innovation includes new to the country, new to the waste sector and new to the organisation (levels of novelty). If one therefore starts from a very low base, the introduction of a simple product or process, new to the organisation (e.g. a rear-end loader vehicle or composting), may be considered innovation.

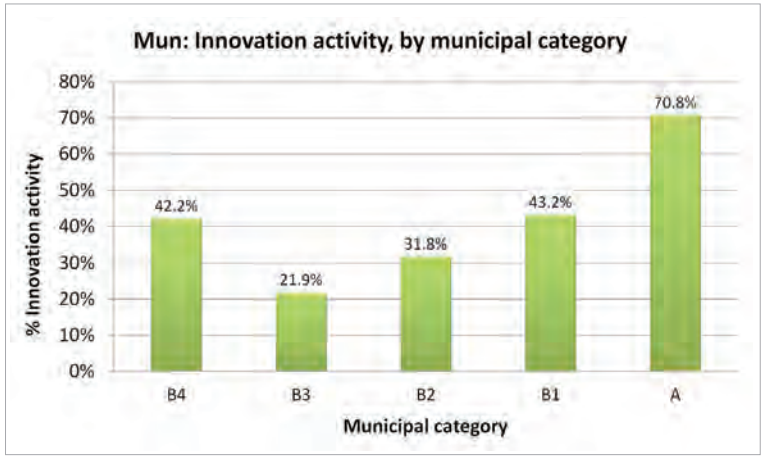

Figure 53: Innovation activity, by municipal category (total)

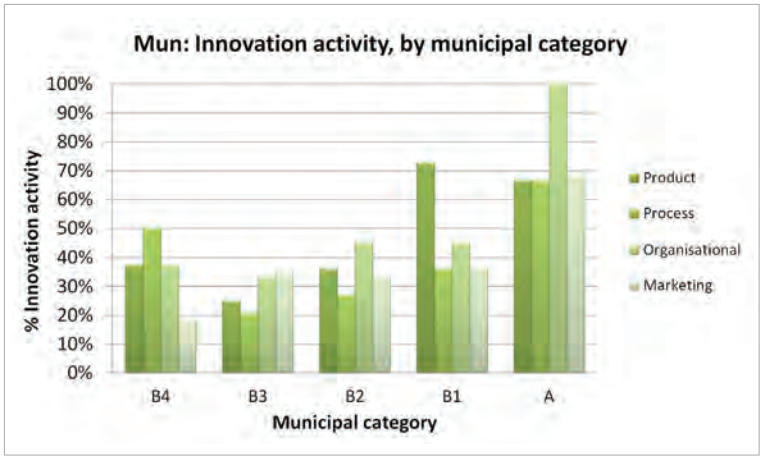

Figure 54: Innovation activity within municipal category (innovation type)

3.7.7 Summary of innovation activity in the waste sector

The fact that 89.9% of municipalities are still locked in to landfilling (**Figure 10**) as their main waste management option, would suggest that any innovation which is occurring within municipalities, is not focussed on identifying and implementing alternative final disposal/treatment solutions. Innovation with respect to alternative waste management technologies is being done largely by the private sector (**Figure 9**) and possibly a few metropolitan municipalities (**Figure 10**), which further highlights the important role that the private sector has to play in moving South Africa up the waste hierarchy. The positive response by the private waste sector to introduce new technological innovations to the South African waste market (not only to own organisation), suggests that they have a very important role to play in transferring these innovations into the public sector. The private waste sector is therefore a potential stepping-stone for technological innovations from supplier (local and abroad) into municipalities. Mechanisms to support partnerships between the public and private sectors should be explored through the Waste RDI Roadmap (not only through the formal public-private partnership (PPP) route).

3.8 Obstacles to innovation

The DST report on "Current and Required Institutional Mechanisms to Support Waste Innovation" (DST, 2012), identified seven broad themes of issues affecting the introduction of waste innovations, both technological and non-technological in South Africa. These included:

- legislative
- economic and financial
- institutional
- behaviour and perceptions
- infrastructural
- information sharing and collaboration, and
- human capital development

These 'obstacles' to waste innovation were tested again during this survey, with a wider audience[16]. The results, presented in **Figure 55**, shows that economic/financial and legislation remain the two predominant issues for both the public and private waste sectors.

However, in discussion with respondents there may be a significant difference between the public and private sectors interpretation of economic/financial constraints. For municipalities, the issues remain largely around available budgets (finances) to render waste services, with a sense that existing budgets are too small to make any significant impact in the management of waste. However, considering that the public sector receives at least R8.32 billion rand per annum to address waste issues, the problem may be more around the use of this funding than the availability of funding.

For the private sector, the issues are more around economics and the broader waste management system. Issues raised include price distortions in the market, making landfilling still much cheaper than recycling or waste-to-energy alternatives. The cost of waste-to-electricity as opposed to coal-to-electricity, makes waste-to-energy a more expensive alternative (currently), especially in the absence of incentives or disincentives to correct these distortions.

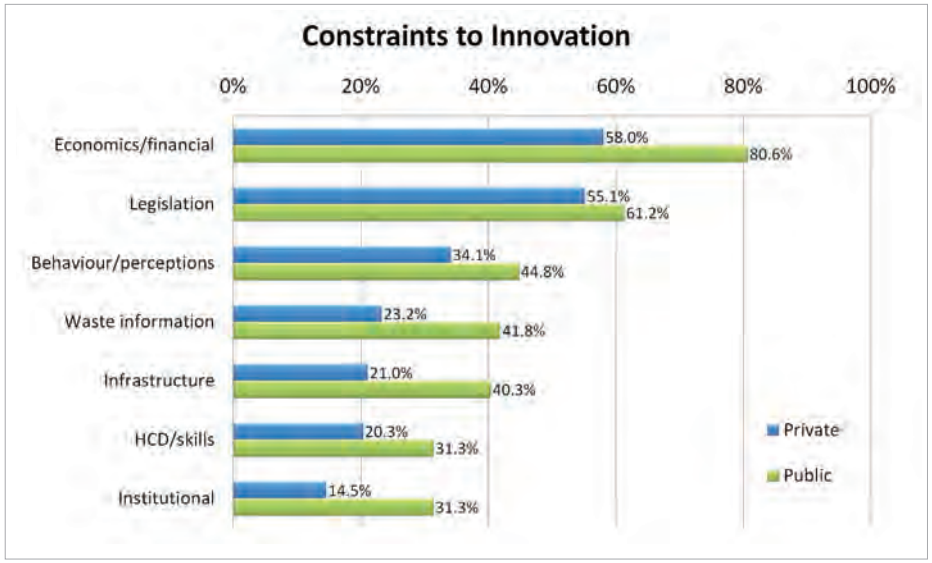

Figure 55: Recognised constraints to waste innovation in South Africa

Legislative issues, in particular the definition of waste, which respondents feel constrains reuse and recycling opportunities, and bureaucratic and slow authorisation and licencing processes, remains a 'threat' to innovation[17]. This links in closely with the point raised earlier, that many companies involved in the recycling and reprocessing of waste materials (metal, plastic, paper, glass, etc.) do not see

[16] It must be noted that while the question was phrased specifically in terms of obstacles to waste innovation, some respondents have suggested that these are also obstacles to doing business, and not only obstacles to innovation.

[17] It is noted that the Department of Environmental Affairs is in the process of reviewing the definition of waste through the National Environmental Management: Waste Amendment Bill.

themselves as being part of the waste sector. Their disassociation with the waste sector may be in an effort to circumnavigate the 'heavy' legislative requirements placed on recyclers. The strong commitment by government to better manage waste (reflected through the implementation of legislation) has been shown to stimulate growth in the sector (Section 3.4.1.2). However, environmental legislation, in this case waste legislation, is a double-edged sword. While it has the potential to stimulate new sector development, growth and resultant innovation, if over-regulated, can hinder or slow this innovation. The trick will therefore be for government to find a balance between encouraging and controlling.

Regarding infrastructure, the results support the point raised in Section 3.7.5, that the private sector has been more effective at introducing new technological innovations. The fact that infrastructure is a major constraint for municipalities but not for the private sector, once again highlights the importance of collaboration between the private and public sectors, and the need for support to municipalities.

With respect to HCD/skills, these results also highlight the issues raised in **Sections 3.5.2** and **3.5.3**, around the discrepancy in the skill base and qualifications of employees in the public and private sectors, and the need for on-going skills development in the waste sector.

4 ESTIMATING THE POTENTIAL VALUE OF THE WASTE SECTOR

In an effort to validate the minimum financial size of the South African waste sector of R15.3b (**Table 11**), as determined through this sector survey, alternative means of estimating sector value are explored here. The first option looks at estimating the value of the waste sector, based on the typical contribution of the sector to GDP. The second option (a rather crude analysis) looks at valuing the sector, if all waste were to be landfilled at sanitary engineered landfill sites according to design and operation requirements put forward in legislation.

(1) Waste sector as a % of GDP

The contribution of the waste sector to a country's GDP is not always clear, since it is often lumped together with other sectors such as electricity, gas, water, wastewater, and remediation activities, which combined contribute some 2-3% of GDP (ABS, 2011; Gilmore *et al*., 2011; HKCSD, 2011; IC, 2013). Contribution also varies depending on whether reported as turnover or value added. According to Christensen (2011) the cost of waste management in metropolitan areas corresponds to approximately 0.5% of a country's GDP, while the Bureau of Economic Analysis (Gilmore *et al*., 2011) indicates the US waste management and remediation services sector as contributing 0.3% of GDP consistently over the period 2007-2010, the same as that suggested for the UK (pers comm, ESAUK). The Nominal GDP for South Africa was estimated at R3 trillion for the year 2012 (StatsSA, 2013). Assuming a value 0.3-0.5% of GDP, this would equate to a South African waste sector worth R9-R15b/annum. The results from this sector survey therefore suggest that the South African waste sector is currently sitting at the top end of this range, at 0.51% of GDP (as at 2012).

However, through commitment and investment, the EU has been able to grow their eco-industry relating to waste and pollution to 1.6% of GDP (CEC, 2002). Australia has been able to create a recycling industry contributing 1.2% to the country's GDP (ACR, 2008). Assuming a conservative growth to 1% of GDP, at current GDP values, this would translate to a South African waste sector worth R30b/annum.

(2) Value of the sector if all waste were to be landfilled (as proxy)

South Africa was estimated to generate 108 mT of waste in 2011, of which 59 mT was general waste, 48 mT was currently unclassified waste and the remaining 1 mT hazardous waste (DEA, 2012a). While no accurate figures exist, a large percentage of the waste generated in South Africa is either illegally disposed of, or disposed of to landfills which are not designed and operated according to Minimum Requirements (e.g. open dumpsites). This results in a loss in value to the sector, and in landfill disposal costs which are lower than they should be, and which results in any alternative waste management options appearing more expensive and unaffordable.

Assuming then that all waste was to be landfilled at an engineered landfill site which was licensed and which met Minimum Requirements for disposal, a theoretical value of the waste sector could be calculated (based on more realistic disposal tonnages and disposal costs), thereby bringing all waste generated into the 'value' of the sector (**Table 16**).

Table 16: Potential value of landfilling all waste

Waste type	Typical disposal cost [R] (*)	Tonnages of waste [T] (2011)	Landfill value [Rb]
General waste	100 – 150/T	59,353,901	5.9 – 8.9
Unclassified waste (†)	100 – 150/T	47,781,314	4.8 – 7.2
Hazardous waste	600 – 800/T	1,319,096	0.79 – 1.1
Total			**11.5 – 17.1**

(*) It is acknowledged that general and hazardous waste disposal costs vary considerably depending on the waste type, disposal option and particular landfill. Typical disposal costs have been obtained from persons in the waste industry.

(†) In the absence of this waste being classified, the assumption is made that unclassified waste is disposed of to landfill at the same cost as general waste

If all waste were therefore to be landfilled at current market related prices for disposal, the potential value of the waste sector would be R11.5-R17.1b. However, a study conducted by the City of Cape Town indicates the unit cost of disposal to landfill, including normally projected OPEX and CAPEX, as well as additional rehabilitation and closure costs not budgeted for, as R216/tonne in 2011 (increasing to R248/T in 2019) (CoCT, 2011). At this disposal to landfill cost, the value of the sector would increase to R21.0b.

Discussions with consulting engineers in the South African waste sector indicated that the implementation of the new '*Standards for Disposal of Waste to Landfill*', still under development by DEA, will result in a ±50% increase in landfill disposal costs for general waste and a ±20% increase in landfill disposal costs for hazardous waste. The implementation and enforcement of this single piece of legislation would result in an increased potential 'value' of the sector to R22.4-R33.4b (0.75-1.1% of GDP), a positive step towards correcting the price distortions in the waste market due to current low landfill costs.

Secondly, the reason for calculating the value of the sector based on 100% landfilling, is that any costs (net) incurred by a move to alternative waste management options (e.g. recycling, waste-to-energy) greater that the cost of landfilling, would need to be justified to society. By establishing the potential value of the sector and knowing the current value, one can determine the real potential for sector growth and the opportunities for alternative waste management options, other than landfilling.

This rather crude analysis would suggest that there is value still to be extracted from the sector, by enforcing current waste legislation and directing waste into properly designed and operated waste facilities. Then, by determining what waste management is really costing South Africa, it creates opportunities to divert waste away from landfilling towards recycling and treatment, with energy recovery.

It is suggested that a more comprehensive research study be undertaken to establish an economic model of the South African waste sector and thereby accurately value the sector. That such a study not only value the sector in terms of income and expenditure, but also the value that can be created within the sector through investment and the resulting job creation; as well as the goods that can potentially be derived from 'waste'. Only then can government and the private sector make informed decisions around the financial viability of alternative waste management options (including incentivising or dis-incentivising alternatives).

5 CONCLUSIONS AND RECOMMENDATIONS

The results of this waste sector survey present a minimum picture of the sector for 2012. Since the study captured the majority of large private companies and metropolitan municipalities, as well as a good distribution across organisations (financial and employee size), the authors are confident that the results represent that of the formal waste sector. The aim of the survey was to understand the broad waste sector, not only traditional waste collection and disposal companies. However, it must be highlighted that many organisations have a very narrow definition of the waste sector, and although actively participating in waste recycling or equipment service provision to the sector, did not see themselves as being a role-player in the waste sector. The results therefore provide a good understanding of the 'core' of the waste sector, and some insight into the peripheral players.

This first national waste sector survey, conducted for the formal South African waste sector (public and private), shows that the formal sector employs a minimum of **29,833 people** (as at 2012). The majority of these employees are situated within large enterprises (77.5% of private waste sector employees) and metropolitan municipalities (64.9% of public sector employees). An estimated 2-3 times this number are believed to earn a living from the informal waste sector, largely through recycling activities (DEA, 2009; WIEGO, 2009), however no official statistics on the South African informal waste sector currently exist.

The minimum financial value of the formal South African waste sector (public and private) (for 2012) is **R15.3 billion**, or 0.51% of GDP. The majority of this revenue is situated within large enterprises (88.0% of private sector revenue) and metropolitan municipalities (80.4% of public sector revenue). It was also found that 62.0% of the total revenue generated from waste activities in 2012, was done so by companies which had been in the industry for more than 25 years. Companies which started up waste activities in the past 5 years contributed a minimum of R188m into the economy in 2012.

Spend on waste R&D and HCD remains low for the waste sector. Results show that the spend on waste R&D for 2012 was approximately 0.33% of the value of the sector. This is within the range suggested in a report to DST, of <0.5% (DST, 2012), although still disappointingly low. Spend on waste HCD equates to approximately 2.8% of the value of the sector. However, for the private sector this spend on waste HCD may reflect the 1% skills levy, as opposed to spend on actual training. The public sector showed a four times greater spend on HCD than the private sector, yet still shows a greater percentage of unskilled employees. This investment in HCD is therefore still to manifest in an actual change in employee skill levels.

The ratio of key indicators, between the private and public waste sector is given in **Table 17**. The results show a narrowing in the gap between the size of sub-sectors.

Table 17: Percentage split in key indicators for the public and private waste sectors (2012)

Waste sector	Employees	Total Revenue	R&D Spend	HCD Spend
Private	32.7%	45.5%	74.1%	19.7%
Public	67.3%	54.5%	25.9%	80.3%

With respect to higher qualifications, there is evidence of 1,324 diplomas, 1,066 degrees, 119 masters degrees, and 14 PhD in the waste sector. However, these figures are rather low, considering the number of graduates who are likely to be exposed to some form of waste management training material during their studies. The sector, in conjunction with Government, will need to look at how it attracts and retains highly qualified graduates in the waste sector, so as to stimulate technological and non-technological innovation. Since data on employee qualifications was often not available, should government wish to track these statistics, a mechanism will need to be put in place to capture the data within organisations.

The sector has shown positive transformation over the past two decades (since 1994) with 77.2% of private sector respondents indicating they are BBBEE certified, with an average BBEEE level 4. With respect to race, 83.8% of private sector employees and 98.3% of municipal employees are people of colour. As for gender, 37.8% of private sector employees and 32.1% of municipal employees are female.
The strong commitment by national and provincial government to the management of waste over the past 10-15 years appears to have stimulated the waste sector, with many new enterprises starting up waste activities. This high level support and commitment by national and provincial government must be continued if we are to see the waste sector grow. While legislation has the potential to stimulate new sector development, growth and resultant innovation, if over-regulated it can hinder or slow this innovation. The trick will therefore be for government to find a balance between 'encouraging' and 'controlling'.

With respect to waste services along the value chain, technologies and waste types, a strong complimentary role between the private and public sectors is evident. Where an aspect of waste management is 'missing' within local government, this 'gap' is being filled by the private sector (although not yet fully). The positive response by the private waste sector to introduce new technological and non-technological innovations to the South African waste market, suggests that they have an important role to play in transferring these innovations into the public sector. The private waste sector is a potential partner to support the transfer of technological innovations from supplier (local and abroad) into municipalities. Mechanisms to further support partnerships between the public and private sectors must be explored. Government must identify means of encouraging and supporting the introduction of technological innovation across the waste sector, so as to encourage a shift away from landfilling towards alternative waste management options. Mechanisms to address the relatively slow uptake of innovation by micro, very small and small enterprises in the waste sector must also be explored.

Waste-related employment within municipalities appears to have levelled-off at around ±20,000 persons. The public sector could absorb another ±5,000 employees, if current vacant positions in municipalities were filled. However, if we are to get anywhere close to achieving Goal 3 of the NWMS, to grow the contribution of the waste sector to the green economy, by creating 69,000 new jobs and 2,600 additional SMEs and cooperatives participating in waste service delivery and recycling by 2016 (DEA, 2011), we will have to look towards the private waste sector (and/or the informal sector). We therefore need to find opportunities for growth in the private waste sector by e.g. improving current levels of waste service delivery; capturing all waste within the sector (i.e. avoiding illegal dumping); improving the design and operation of landfills (in line with regulations) (adjusting true landfill costs); and by introducing alternative waste management options that divert waste away from landfilling towards waste minimisation, reuse and recycling, with energy recovery. To do this, we are going to need to find ways that support the sector (economic, financial and policy), that encourage the sector (incentives), that adjust current price distortions in the waste sector and that will allow for a natural flow away from landfilling to alternative waste management options, and that strengthen ties between the private and public sectors to encourage transfer of innovations and skills.

Particular actions which have been identified during this survey, include –

- Consideration of inclusion of the waste sector as a formal economic sector (allocation of SIC codes), to allow for the routine collection of data on formal waste sector activities, through existing mechanisms
- A roadshow by DTI, IDC, DST to introduce the waste sector to available economic incentives and financing instruments to support the start-up of new enterprises and the adoption of new technology solutions
- A participatory process with other line departments, led by DST, to discuss and unlock current obstacles to waste innovation (e.g. DEA, National Treasury, DTI, and CoGTA)
- R&D support for developing an economic model of the South African waste sector that can be used to guide decisions around alternative technology and waste management options

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ANNEXURE 1

WASTE SECTOR ANALYSIS QUESTIONNAIRE

WASTE SECTOR ANALYSIS - QUESTIONNAIRE

science & technology
Department: Science and Technology
REPUBLIC OF SOUTH AFRICA

☐ I have been informed about the purpose of this study (cover letter) and I/my organisation participates voluntarily

If this questionnaire has been incorrectly sent to your organisation and you do not deal with waste management in any way, please tick the adjacent box, complete Questions 1, 42 and 43 below and return to the CSIR via email or fax (Email: *LGodfrey@csir.co.za* or Fax: (012) 842-7687)

Please tick ☐

NO COMPANY-SPECIFIC INFORMATION WILL BE RELEASED. ALL INFORMATION PROVIDED IS STRICTLY CONFIDENTIAL AND WILL BE SUMMED TO PROVIDE AN OVERALL VIEW OF THE WASTE SECTOR

Section A. Basic Organisational Information

Note: If your organisation is part of a multi-national, please answer all questions only for your organisation in South Africa
Note: If your organisation has regional offices, please answer all questions for the total company and not for any single branch

1. Organisation / company name: _____

2. Type of organisation:
☐ Private company (Pty) Ltd ☐ Close Corporation ☐ Government/Parastatal ☐ University
☐ Co-operative ☐ Other _____

*Note: All data is to be given for your organisations most recently **COMPLETED** financial year (for which complete data exists)*

3. Start and end month of financial year: Start date: dd / mm / yyyy to End date: dd / mm / yyyy

4. Company registration number (if applicable): _____

5. Physical address of head-office (in South Africa): Suburb: _____ Postal Code: _____

6. Tel (head-office): ( ) Fax: ( )

7. Is your organisation broad-based BEE certified? ☐ Yes ☐ No

8. If Yes to Q7, what is your BEE certification (Level 1-8)? _____

9. Is waste management your organisations: ☐ Core business ☐ Secondary business

Where core business is defined as the primary area or activity that your company focuses on in its business operations, and where the majority of your income is generated through waste management activities

10. If waste is your secondary business, what is your core business? _____

11. What year did your organisation first start providing waste goods or services? _____

12. Our organisation has active waste operations in the following province(s) *(more than one can be selected with a 'X')*:
☐ Eastern Cape ☐ Free State ☐ Gauteng
☐ KwaZulu-Natal ☐ Limpopo ☐ Mpumalanga
☐ North-West ☐ Northern Cape ☐ Western Cape

13. In which geographic market(s) did your organisation sell waste goods or services during your last financial year: *(more than one can be selected with a 'X')*
☐ South Africa (some provinces) ☐ South Africa (national) ☐ Rest of Africa
☐ Europe ☐ Asia ☐ North America
☐ South America ☐ Australasia

Section B: Employee Information

** The aim of this sub-category of questions is to assess the size of the waste sector, the expertise of the current skills base, transformation within the sector, and availability of skilled professionals.*

***Note:** This question deals with the total number of employees (permanent and contract staff) in your organisation irrespective of whether waste is your core or secondary business and irrespective of whether they are employed to deal with waste activities or not. Information must be provided only for persons directly employed by you, and not*

a sub-contractor.

14. Total number of employees in your organisation: ☐ *As at the end of your last completed financial year*

Note: *The following questions (Q15-Q20) deal with the number of employees in your organisation (permanent and contract staff) dealing specifically with waste-related activities (line and support staff).*
If waste is your core business (Q9), then the following questions will equal all organisational employees (Q15 = Q14)

15. Total number of employees working in the area of waste management (line + support): ☐

16. Total number of waste staff per functional area *Note: Sum of Q16 answers should add up to Q15*
☐ Waste technical specialist (skilled) [1] ☐ Waste technical labour (un/semi-skilled) [2]
☐ Other [3]

Where (1) Waste technical specialists, e.g. qualified (degree or experienced) engineers, scientists, waste professionals, (2) waste labour, e.g. drivers, operators, spotters, (3) Other includes management, finance, admin, support services, i.e. providing support to the waste team etc.

17. Number of employees (by employment status): ☐ Permanent ☐ Contract
Note: Sum of Q17 answers should add up to Q15

18. Number of employees (by gender): ☐ Male ☐ Female
Note: Sum of Q18 answers should add up to Q15

19. Number of employees (by race):
☐ Black ☐ White ☐ Coloured ☐ Indian/Asian
Note: Sum of Q19 answers should add up to Q15

20. Total number of staff with the following highest qualification:
☐ Less than Matric ☐ Matric ☐ Diploma
☐ Degree ☐ Masters ☐ PhD
Note: Sum of Q20 answers should add up to Q15

21. In the next three years, do you see your waste activities (*select only one answer*):
☐ Growing in size (recruit new staff) ☐ Remaining as is (no staff recruited) ☐ Declining in size (reducing staff)

Section C: Financial information

** The aim of this sub-category of questions is ONLY to assess the contribution of the waste sector to the South African economy and the current national expenditure on waste R&D and HCD.*

ALL INFORMATION PROVIDED IN THIS QUESTIONNAIRE IS STRICTLY CONFIDENTIAL AND WILL NOT BE DISCLOSED AT THE ORGANISATIONAL LEVEL. ALL INFORMATION WILL BE SUMMED TO PROVIDE AN OVERVIEW OF THE SECTOR.

Note: All financial information to be provided exclusive of VAT for the organisations last completed financial year (See Question 3)

22. Total organisational revenue (*for last completed financial year*): ZAR ☐

23. Total operating revenue from waste management activities (*for last completed financial year*): (if different from Q22): ZAR ☐

24. Total operating expenditure on waste (*for last completed financial year*): ZAR ☐

25. Total expenditure on waste-related research & development (R&D) (*for last completed financial year*): ZAR ☐
** Where spent on internal or external waste research and development.*

26. Total expenditure on waste-related human capital development (HCD) (*for last completed financial year*): ZAR ☐
** Where spent on staff human capital development, e.g. further waste studies, courses, training, etc.*

27. Average waste-related capital expenditure per annum (over past five financial years): ZAR ☐
** Where spent on capital equipment e.g. waste equipment, waste infrastructure, waste technologies, waste vehicles, etc.*

Section D: Waste sector and technologies

** The aim of this sub-category of questions is to assess the distribution of waste companies across the waste sector, identify current technologies and opportunities for emerging innovation.*

28. *Role in sector:* What role does your organisation play in the waste sector? *(more than one can be selected with a 'X')*
☐ Waste handler [1] ☐ Waste consulting/engineering ☐ Waste sector association

☐ Waste equipment provider ☐ Waste research & development

☐ Other (specify) _____

Note: [1] *Where a waste handler is defined as anyone who provides waste cleansing, collection, transport, storage, transfer, recycling, recovery, treatment or disposal services. Municipalities are considered a waste handler (See Schedule 5B of the Constitution)*

Instructions for continuation: If you selected '*Waste Handler*' or '*Waste Equipment Provider*' for Question 28 please complete Question 29 and 30. If you did not select them, please continue to Question 31.

Note: This question is to be completed only by Waste handlers and Waste equipment providers –

29. *Type of service:* In which area(s) of waste management does your organisation operate? *(more than one can be selected with a 'X')*

☐ Cleansing ☐ Collection/ transport ☐ Storage / transfer

☐ Sorting / separation of recyclables ☐ Reprocessing / recovery of recyclables [1] ☐ Treatment

☐ Disposal (landfill) ☐ Other (specify) _____

[1] Where reprocessing / recovery involves the processing of a separated material as a product or raw material, including retrieval of energy from waste, to produce a product (it does not include the sorting and separation of recyclables out of the waste stream)

Note: The following question is to be completed only by Waste handlers and Waste equipment providers

30. *Technology:* What types of waste technology are currently in use by your organisation? *(more than one can be selected with a 'X')*
Note: Include details of technology where possible. If more space is needed, submit on a separate sheet.

☐ Landfilling _____

☐ Thermal treatment _____

☐ Chemical treatment _____

☐ Biological treatment _____

☐ Mechanical treatment _____

☐ Material recycling _____

☐ Other (specify) _____

31. *Type of waste:* With which type(s) of waste does your organisation deal? *(more than one can be selected with a 'X')*

☐ General waste (Municipal + Commercial) (GW01, GW10)	☐ Hazardous waste (excl. HCRW) (HW)	☐ Health care risk waste (HW19)
☐ Power generation waste (GW14, GW15, HW14, HW15)	☐ Mining waste	☐ Recyclable: E-Waste (GW18 or HW18)
☐ Recyclable: Organic waste (GW20)	☐ Recyclable: Construction and demolition waste (GW30)	☐ Recyclable: Paper (GW50)
☐ Recyclable: Plastic (GW51)	☐ Recyclable: Glass (GW52)	☐ Recyclable: Metals (GW53)
☐ Recyclable: Tyres (GW54)	☐ Other (specify): _____	

Section E: Technological innovations (product and process) (waste specific)

** The aim of this sub-category of questions is to assess the adoption of, and opportunities for, waste technology (both product and process) innovation.*

32. During the past five years, did your organisation introduce new or significantly improved waste goods or services (PRODUCT innovations) to its operations? ☐ Yes ☐ No

Where *PRODUCT innovation* is the introduction of a new product (good or service), or a significantly improved product (good or service), such as user friendliness, components, software or sub-systems. The innovation (new or improved) must be new to your organisation, but it does not need to be new to the waste sector or market. It does not matter if the innovation was originally developed by your organisation or by another organisation.

33. If yes to Q32, were these waste goods and services (*product innovations*) -

☐ New to the SA waste market?	You introduced a new or significantly improved good or service into the waste market before your competitors (it may have already been available in other sectors / markets)
☐ Only new to your organisation?	You introduced a new or significantly improved good or service that was already available from your competitors in the waste market

34. If yes to Q32, did these waste goods and services (product innovations) originate mainly in South Africa or from abroad?

☐ South Africa ☐ Abroad

35. During the past five years, did your organisation introduce new or significantly improved waste processes (PROCESS innovations) to its operations? ☐ Yes ☐ No

Where *PROCESS innovation* is the introduction of a new or significantly improved process for making or delivering goods and services, e.g. methods of manufacturing products; new or significantly improved logistics, delivery or distribution of your products; or new or significantly improved supporting activities for your processes, such as maintenance and operating systems for purchasing, accounting or computing. The innovation (new or improved) must be new to your organisation, but it does not need to be new to the waste sector or market. It does not matter if the innovation was originally developed by your organisation or by another organisation.

36. If yes to Q35, were these processes (*process innovations*) -

☐	New to the SA waste market?	You introduced a new or significantly improved process into the waste market before your competitors (it may have already been available in other sectors / markets)
☐	Only new to your organisation?	You introduced a new or significantly improved process that was already available from your competitors in in the waste market

37. If yes to Q35, did these processes originate mainly in South Africa or from abroad?

☐ South Africa ☐ Abroad

38. Is your organisation planning to implement new technological innovations in the coming two years? ☐ Yes ☐ No

Section F: Non-technological innovations (marketing and organisational) (waste specific)

** The aim of this sub-category of questions is to assess the adoption of, and opportunities for, waste technology (product and process) innovation.*

39. During the past five years, did your organisation introduce new or significantly improved ORGANISATIONAL innovations to its operations? ☐ Yes ☐ No

Where *organisational innovation* is the introduction of new or significantly improved knowledge management systems to better use or exchange information, knowledge and skills within your organisation; major changes to the organisation of work within your enterprise, such as changes in the management structure or integrating different departments or activities; new or significant changes in your external relations with other firms or public institutions, such as through alliances, partnerships, outsourcing or sub-contracting.

40. During the past five years, did your organisation introduce new or significantly improved MARKETING innovations to its operations? ☐ Yes ☐ No

Where *marketing innovation* includes significant changes to the design or packaging of a good or service; new or significantly changed sales or distribution methods, such as internet sales, franchising, direct sales or distribution licenses. The innovation (new or improved) must be new to your organisation, but it does not need to be new to the waste sector or market. It does not matter if the innovation was originally developed by your organisation or by another organisation.

** A recent study of the opportunities/constraints to waste innovation in SA identified seven (7) main constraints, as listed in Q41 See http://www.csir.co.za/nre/pollution_and_waste/opportunities_constraints.html for the full reports.*

41. *Which of the following constraints has your organisation recently experienced in implementing technological or non-technological innovations? (more than one can be selected with a 'X')*

☐ Legislation / policy / authorisations	☐ Economic / financial	☐ Institutional
☐ HCD / skills	☐ Waste information	☐ Behaviour / perceptions
☐ Infrastructure	☐ Other (specify): _____	

I certify that the information contained in this report is correct and complete to the best of my knowledge.

42. Date completed (dd/mm/yy): dd / mm / yyyy Signature: _____

43. Name of contact person: _____ Email: _____

Note: Name and email address of person completing the questionnaire or coordinating completion on behalf of your organisation

Please return this completed questionnaire to Dr Linda Godfrey of the CSIR, via one the following methods
Email: *LGodfrey@csir.co.za;* Fax: (012) 842-7687;
Post: Dr Linda Godfrey, CSIR, NRE, PO Box 395, Pretoria, 0001