Chapter 13

Waste management

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Chapter 13

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13.1 INTRODUCTION

South Africa's commitment to sustainable development is aimed at balancing the broader economic and social challenges of a developing and unequal society while protecting environmental resources. For the waste sector in South Africa this means care must be given to raw material use, product design, resource efficiency, waste prevention, and minimization where avoidance is impossible.

However, economic development, a growing population and increasing rates of urbanization in South Africa have resulted in increased waste generation which requires establishing and implementing effective waste management policies and programmes. A number of issues continue to be challenges for effective waste management. These include ineffective data collection systems and lack of compliance and enforcement capacity, lack of education and awareness amongst stakeholders within the waste sector, operational costs for management of waste, support for waste reduction at local government level, availability of suitable land for waste disposal, lack of structured incentives for reduction, and recycling and/or reuse of waste (DEA 2009a). The official country problem statement according to the National Waste Management Strategy (NWMS) (DEA 2012a) lists the following as the major challenges faced by South Africa in the waste management arena:

- A growing population and economy, which means increased volumes of waste generated. This puts pressure on waste management facilities which are already in short supply;
- Increased complexity of the waste stream due to urbanization and industrialization. The complexity of the waste stream directly affects the complexity of its management, which is compounded when hazardous waste mixes with general waste;
- A historical backlog of waste services for urban informal areas, tribal areas and rural formal areas. Although 61 per cent of all South African households had access to kerbside domestic waste collection services in 2007, this access remains highly skewed in favour of more affluent and urban communities. Inadequate waste services lead to unpleasant living conditions and a polluted, unhealthy environment;
- Limited understanding of the main waste flows and national waste balance because the submission of waste data is not obligatory, and where data is available, it is often unreliable and contradictory;
- A policy and regulatory environment that does not actively promote the waste management hierarchy. This has limited the economic potential of the waste management sector, which has an estimated turnover of approximately R10 billion per annum. Both waste collection and the recycling industry make meaningful contributions to job creation and GDP, and they can expand further;
- Absence of a recycling infrastructure which will enable separation of waste at source and diversion of waste streams to material recovery and buy-back facilities;
- Growing pressure on outdated waste management infrastructure, with declining levels of capital investment and maintenance;
- Waste management suffers from a pervasive under-pricing, which means that the costs of waste management are not fully appreciated by consumers and industry, and waste disposal is preferred over other options;
- Few waste treatment options are available to manage waste and so they are more expensive than landfill costs; and,
- Too few adequate, compliant landfills and hazardous waste management facilities, which hinders the safe disposal of all waste streams. Although estimates put the number of waste handling facilities at more than 2000, significant numbers of these are unpermitted.

The definition of waste derived from NEM:WA states that: "*Waste means any substance, whether or not that substance can be reduced, re-used, recycled or recovered:*

- *That is surplus, unwanted, rejected, discarded, abandoned or disposed of*
- *Which the generator has no further use of for the purposes of production*
- *That must be treated or disposed of*

That is identified as a waste by the Minister by notice in the Gazette, and includes waste generated by the mining, medical or other sector, but (i) a by-product is not considered waste; and (ii) any portion of waste, once re-used, recycled or recovered, ceases to be waste''.

The management of waste in South Africa has been based on the principles of the waste management hierarchy (Figure 13.1) from early waste policy (DEAT 2000) and entrenched in recent waste legislation. The adoption of the hierarchy has been in the policy since 2009, but the management of waste has not necessarily followed the hierarchal approach. It is only as a result of the promulgation of the NEM:WA and finalization of the NWMS that the implementation of the hierarchy approach was prioritized. Management of waste through the hierarchal approach is a recognized international model for the prioritization of waste management options. It offers a holistic approach to the management of waste materials, and provides a systematic method for waste management during the waste lifecycle addressing in turn waste avoidance, reduction, re-use, recycling, recovery, treatment, and safe disposal as a last resort. This aims to eventually reduce the reliance of South Africa's waste disposal on landfills, as currently the majority of waste ends up therein.

South African waste legislation is influenced and informed by the key elements of the waste hierarchy, which dictates the overall strategic approach for waste management. The waste hierarchy is also clearly visible in the NWMS for South Africa (DEA 2012a).

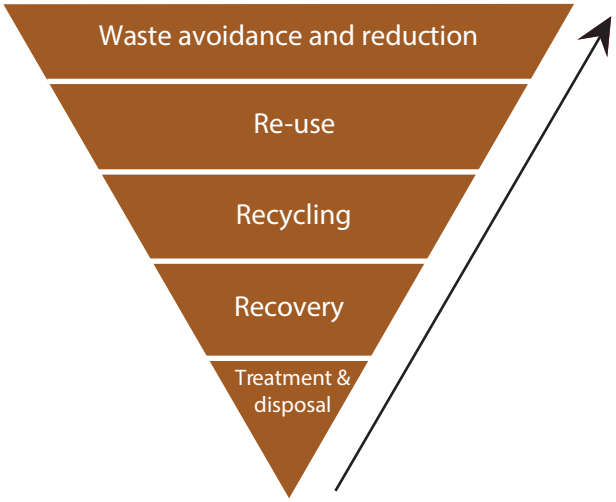

Figure 13. 1: Waste management hierarchy as per the National Waste Management Strategy
Source: DEA (2012a)

This approach towards waste management emphasizes the following key elements (DEA 2012a):

- **Avoidance and Reduction**: Products and materials must be designed in a manner that minimizes their waste components or in a manner that reduces the natural material quantities used and potential toxicity of waste generated during the production, and after use;
- **Re-use**: Materials can be used for similar or different purposes without changing form or properties. This approach seeks to re-use a product when it reaches the end of its life span. In this way, it becomes input for new products and materials;
- **Recycle**: This involves separating materials from the waste stream and processing them as products or raw materials. The first elements of the waste management hierarchy are the foundation of the cradle-to-cradle waste management approach;
- **Recovery**: Reclaiming particular components or materials or using the waste as a fuel;

- **Treatment and disposal**: This is a 'last resort' within the waste hierarchy. Treatment refers to any process that is designed to minimize the environmental impact of waste by changing the physical properties of waste or separating out and destroying toxic components of waste. Disposal refers specifically to the depositing or burial of waste onto, or into land; and,
- **Legal**: Processing, treatment, and disposal of waste must take place in accordance with the principles of environmental justice and equitable access to environmental services as articulated in the NEMA.

In this chapter, an overview of the status of waste management in South Africa is presented, based on key drivers. Specific focus is placed on the waste management hierarchy within the context of South Africa's 2012 NWMS, and the NEM:WA. It is according to this waste management hierarchy that all waste management practices across the country are analysed.

The South African waste management policy framework is presented. Attention is drawn towards national and international legislation and how it has affected the decisions of waste management mandatory functions within the spheres government, particularly in the last decade. Attention is further given to the shift in policy and legislative direction since the promulgation of the NEM:WA, the adoption of the NWMS and various waste management policies and regulations.

The roles and responsibilities of government institutions and the legislative mandates of key spheres of government are presented, including a presentation of the Government's performance management system, specifically Outcome 10 in relation to waste management, and international waste obligations. A view on key responsibilities in the provision of waste management services across the spectrum is presented. Challenges and opportunities regarding the management of waste are highlighted.

An analysis of the different waste classes is given. For general waste, generation trends for the following waste types are covered: municipal waste, construction and demolition, waste tyres and industrial packaging. For hazardous waste focus is given to health care risk waste, pesticides, electronic waste (e-waste), metallurgical waste and other hazardous waste streams, such as batteries, fluorescent light bulbs and nuclear waste.

Finally, the country's response to waste management challenges is presented. Specifically, focus is given to developments around national policy and legislation, waste treatment, recycling and disposal. Compliance monitoring and enforcement structures are analysed with regard to established legislated arrangements that include the designation of an Environmental Management Inspectorate and Waste Management Officers (WMOs). Key emerging issues are identified and discussed.

13.2 THE SOCIO-ECONOMIC CONTRIBUTION OF SOUTH AFRICA'S WASTE MANAGEMENT SYSTEM

South Africa has strived towards an improved, equitable and sustainable waste management regime. With good legislation in place, clarity in functional roles and responsibilities, international lessons and commitments, the South African approach demonstrates the country's commitment towards an efficient world-class system for waste management. However, South Africa does not have sufficient technical capacity and human capital in waste management field.

A number of opportunities for continuous improvement exist within the enabling legal framework and institutional arrangements on waste management. Emphasis for future improvements is placed on key system elements that can trigger higher efficiency in the waste service sector. These include:

- Service level agreements and contracting of services amongst key role players in government. In instances where spheres of government (e.g. district and local municipalities) share responsibilities, a clear contracting framework is required. This contractual arrangement must ensure that a single authority remains politically and administratively accountable for the service;
- A new emphasis on regionalization means better efficiency and transparency of service. This will ensure that resource mobilization is maximized. An obstacle to regionalization is funding of services; according to the Municipal Systems Act, when two local municipalities perform the same function, that same function becomes elevated to the district and Municipal Infrastructure Grant funds are no longer allocated to the districts. As a result, funding of such functions by the districts poses a challenge; and,
- A system where all revenue collected from waste management service provision is ring-fenced towards improving the same service is desirable within government institutions. Such a system for South Africa will result in improved financial management, re-investment into waste facilities and infrastructure, improved financial accountability and fair waste management service delivery.

South Africa remains at the forefront of environmental protection amongst developing countries and is committed to implementing a world class system that will improve waste management in the country.

13.2.1 Employment creation

Despite South Africa's positive economic trajectory, unemployment remains rife amongst skilled and unskilled people. This has led to government encouraging all sectors to quantify potential employment opportunities that can be created whilst rendering services. Given the nature of the waste sector, there are hidden opportunities that need to be unlocked, in order for this sector to contribute significantly to job creation.

While no accurate data exists on the contribution of the waste management sector to the South African economy, a

conservative assessment can be made based on the investment by government and the private sector in the delivery of waste services. An approximation is that about 70 per cent of solid waste expenditure is through the public sector, largely local government, while 30 per cent is private sector expenditure (StatsSA 2007). Figure 13.2 provides an estimate employment creation of 113,505 by the total waste sector.

The National Treasury has identified municipal solid waste management as one of the areas of municipal functioning with the greatest potential for job creation, particularly with respect to unskilled or semi-skilled labour (National Treasury 2008). Within the waste management sector in general, labour intensive waste recycling activities have great potential to create new employment opportunities, followed by the public and private sector respectively (Figure 13.2). Therefore current efforts by government to encourage recycling can be intensified. Table 13.1 provides the employment trends in waste management departments in municipalities between the 2005 and 2006 financial years.

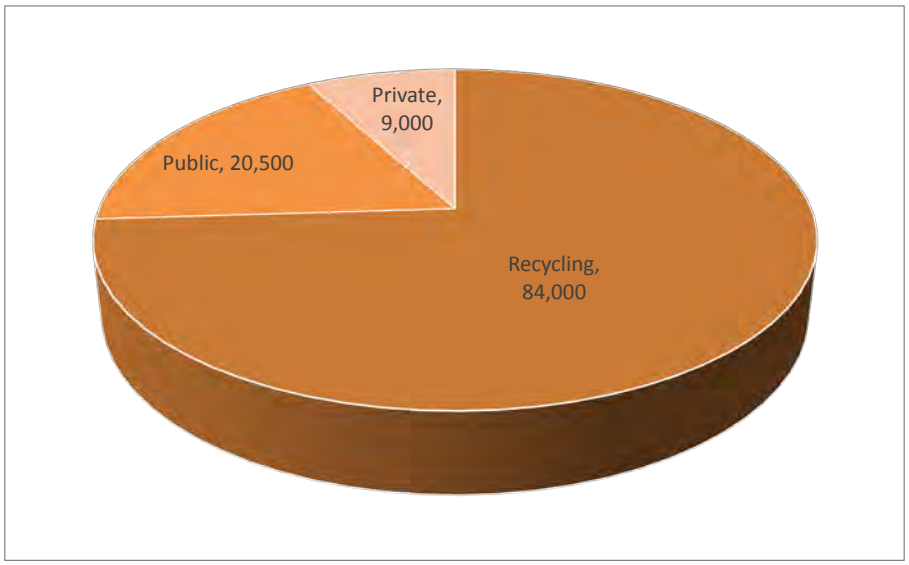

Figure 13. 2: Waste sector employment estimates
Source: DEA (2009b)

Table 13. 1: Employment within municipal waste management departments

Category	2005			2006		
	Total positions	Positions filled	Positions vacant	Total positions	Positions filled	Positions vacant
Metros	11,073	9,454	14.6	10,491	8,708	17.0
Category B and C	13,514	12,106	10.4	13,439	11,797	12.2
TOTAL	24,587	21,560	12.0	23,930	20,505	14.0

Source: National Treasury (2008)

Within the public sector waste management, municipalities are generally expected to have created increasing employment opportunities. This expectation is mainly due to the mandatory legislative responsibility to provide for cleansing, general waste collection and disposal. However, there appears to be a decline in the number of available employment opportunities (posts) in refuse removal services within waste departments in municipalities. Some arguments suggest that it is because of increasing salary costs of employing qualified personnel at local government level. In instances where such employment opportunities exist, there are a sizeable number of vacancies in municipalities (12 to 14 per cent). Metropolitan municipalities have experienced the highest vacancy rates at 15 to 17 per cent (National Treasury 2008).

13.2.2 Municipal revenue

The waste management service function within municipalities contributes significantly towards municipal revenue due to the user-pays principle applied for waste management. Of the total annual income received by municipalities in 2007 and 2008 (Table 13.2), income from waste (refuse and sanitation) accounted for seven per cent and 6.5 per cent respectively (StatsSA 2009).

According to StatsSA's non-financial census of municipalities, there has been an eight per cent increase in revenue collected from refuse removal charges in South African municipalities between 2007 and 2008 (StatsSA 2009).

Table 13. 2: Financial census of municipalities

Income	2007		2008	
	R million	Contribution	R million	Contribution
Refuse removal charges	3,225	2.9	3,476	2.7
Sewerage and sanitation charges	4,474	4.1	4,875	3.8
Property rates received	18,331	16.6	20,956	16.4
Grants and subsidies received	29,244	26.6	35,535	27.8
Water sales	11,595	10.5	12,562	9.8
Electricity and gas sales	25,589	23.2	27,880	21.8
Other income	17,666	16.0	22,347	17.5
TOTAL	**110,123**	**100.0**	**127,630**	**100.0**

Source: StatsSA (2009)

13.2.3 Capital investment in the waste sector

Capital investment into the waste sector is important in order to enhance and sustain waste services. For now, there are no full-cost accounting measures in place to justify investment in the input costs of the waste services, e.g. the return on investment, the quality improvement of the service, or the accuracy of what the service actually costs.

Table 13.3 provides estimations of the capital investment required to support landfilling of waste. It can be seen that licenced landfill sites in average cost R50 million, licencing un-licenced landfill sites around R20 million, and hazardous waste disposal sites around R200 million.

Table 13. 3: Estimates of capital investment in the waste sector

Indicator	Value
Estimated value of licenced landfill sites	500 sites @ R50 million/site
Estimated cost of licencenced un-licencenced landfill sites	1,500 sites @ R20 million/site
Estimated value of hazardous waste disposal sites	30 sites @ R200 million/site

Source: Adapted from Goldblatt (2009)

Table 13.4 provides estimates of capital investments made in support of improved waste management services in selected municipalities between 2005 and 2009. Available data on the capital costs associated with landfills and vehicles suggests that these costs vary significantly from municipality to municipality, and are strongly influenced by contextual local factors. Generating average cost therefore proves difficult (Goldblatt 2009).

Table 13. 4: Cost estimates for capital investments in solid waste

Type of capital investment	Municipality	Estimated cost/ budget (R)	Year
New landfill (to replace three existing landfills)	City of Cape Town (metro)	433,000,000	2008/09
Investigate and develop new general landfill	Emfuleni LM (Category B1 municipality)	895,000	2006/07
New landfill	Mbombela LM (Category B1 municipality)	732,462	2005/06
Compactor truck	Umhlathuze (Category B1 municipality)	1,400,000	2006/07
Compactor truck	Thaba Chweu Municipality (Category B3 municipality)	760,000	2006/07

Source: Goldblatt (2009)

13.3 LEGAL MANDATES AND FUNCTIONAL RESPONSIBILITIES

13.3.1 Constitutional and legal framework

South Africa's legal framework on waste management is one of the most progressive on the continent. There is a clear division of roles, responsibilities, and mandatory obligations for the three spheres of government. This legislative alignment between various spheres of government governing waste, demonstrates the country's ambition towards a clean environment and healthy society.

According to Section 24 of the Constitution (RSA 1996), everyone has the right to an environment that is not harmful to health or well-being. This fundamental right underpins all environmental policies and legislations, in particular the

framework environmental legislation established by the NEMA.

The NEM:WA places considerable emphasis on the development of an integrated waste planning system, through the development of integrated waste management plans (IWMPs) by all spheres of government, and identified industries must develop industry waste management.

13.3.2 Roles and responsibilities

13.3.2.1 National government

All spheres of government are legally responsible for waste management in the country. The NEM:WA specifies various mandatory and discretionary provisions that the DEA must address. In terms of mandatory provisions, the DEA is responsible for:

- Establishing the NWMS;
- Setting national norms and standards;
- Establishing and maintaining a National Contaminated Land Register;
- Establishing and maintaining a National Waste Information System; and,
- Preparing and implementing a National IWMP.

The Minister of the DEA is the licencing authority for hazardous waste activities. The DEA must promote and ensure the implementation of the NWMS and national norms and standards.

The specific roles of all the spheres of government are clearly outlined in the 2011 Municipal Waste Sector Plan. The DEA is the lead agent for waste management-related functions including:

- Development of policy, strategy and legislation;
- Co-ordination;
- Enforcement;
- Dissemination of information;
- Participation in appeals (against government decisions, authorizations, etc.);
- Monitoring, auditing and review; and,
- Capacity building.

Other national departments with some waste-related responsibilities include:

- DWS being responsible for the protection of the water resources also from the effects of waste management practices;
- The DMR being responsible for the management of 'residue stockpiles' i.e. mining waste;
- Department of Health sets regulations and guidelines for medical waste and treatment facilities;
- DAFF develops the necessary guidelines for all agricultural waste;
- DoE has an interest in waste as alternative energy and Clean Development Mechanisms; and,
- Department of Co-operative Governance and Traditional Affairs (COGTA) are responsible for municipal service delivery and addressing service backlogs.

13.3.2.2 Provincial government

Specific functions to be carried out by provincial government include:

- Development of provincial environmental implementation plans;
- Reviewing the first-generation IWMPs received from the municipalities and where necessary, assisting with the drafting of these;
- Monitor compliance with provincial implementation plans and intervene if necessary;
- Develop provincial guidelines and standards;
- Develop and enforce provincial regulations for general waste collection, and supporting local government in the implementation of waste collection services;
- Act on environmental hazards as required;
- Ensure that all industries have access to appropriate waste disposal facilities;
- Quality assurance of the Waste Information System;
- Implementing and enforcing waste minimization and recycling initiatives, and in particular, promoting the development of voluntary partnerships with industry;
- Registration and certification of hazardous waste transporters, the waste manifest system and the establishment and control of hazardous waste collection facilities; and,
- Supporting the DEA in planning for a system of medical waste treatment facilities, and investigating the feasibility of centralized (regional) waste treatment facilities.

Provinces are also, in terms of the Constitution (Section 155 (6)), required to provide for the monitoring and support of local government in the province and promote the development of local government capacity to enable municipalities to perform their functions and manage their own affairs. In terms of the Presidential Delivery Agreement (COGTA 2010), provinces are responsible for the allocation of more and appropriate resources towards the local government function to improve spending and outcomes in municipalities. Alignment and resource commitments of provincial departments must be included in IDPs. Provinces are further also required to improve support and oversight of municipalities.

The management of radioactive waste produced in South Africa is covered in the DoE's 2005 radioactive waste management policy and strategy for South Africa. It requires the DOE, as the government's lead agent for nuclear matters, to consult with other government departments and regulatory bodies to develop and maintain a national action plan. Whilst the Nuclear Energy Act (No 46 of 1999) is the leading legislation with regard to the governance of radioactive waste it is recognized that waste containing un-concentrated naturally occurring radioactive materials from the mining industry, minerals processing industries and the combustion of coal will also be managed as set out in the Integrated Pollution and Waste Management policy of the DEA and other relevant legislation i.e. Nuclear Energy Act, National Nuclear Regulator Act, Hazardous Substances Act (No 15 of 1973), Mine Health and Safety Act (No 29 of 1996), Mineral and Petroleum Resources Development Act, National Water Act, and Dumping at Sea Control Act (No 73 of 1980).

The Constitution assigns the responsibility for refuse removal, refuse dumps and solid waste disposal to local government. Municipalities (district and local) are called to function using the principles of corporative governance to avoid conflict between overlapping functions in order to achieve better results (CSIR 2011). According to the CSIR report on municipal waste management, good practices, the roles of district and local municipalities in waste management are presented in the following sections.

13.3.2.3 District municipalities

- Ensuring integrated development planning for the district as a whole. This includes the development of a framework for IDPs and ensuring that IWMPs inform the IDP process;
- Promoting bulk infrastructure development and services for the district as a whole. The infrastructure refer to the establishment of regional waste disposal sites and bulk waste transfer stations that can be used by more than one local municipality within the district;
- Building local municipality capacity. Where a local municipality fails to perform its management functions, the district municipality can enter into a Service Level Agreement with the local municipality to provide the service for a stipulated period until such time that the local municipality can offer the service; and,
- Promoting the equitable distribution of resources between the local municipalities in its area, for example, ensuring that resources are deployed in municipalities within their area of jurisdiction, where it is most needed.

13.3.2.4 Local municipalities

- Compiling and implementing IWMPs and integrating these into IDPs;
- Running public awareness campaigns;
- Collecting data and reporting to the Waste Information System;
- Providing waste management services, including waste removal, waste storage and waste disposal services, in line with national norms and standards. Municipality specific standards for separation, compacting and storage of solid waste that is collected as part of the municipal service, may be set and enforced by the municipality; and,
- Implementing and enforcing waste minimization and recycling (including the encouraging of voluntary partnerships with industry and waste minimization clubs).

The success of waste management services depends on issues other than where the function is housed within the municipality:

- Political stability and support;
- A functional integrated planning process;
- Rigorous financial management and procurement;
- Senior managers and councillors with a good understanding of waste management issues;
- Competent and dedicated waste managers implementing innovative schemes including reward schemes; and,
- A dedicated and motivated workforce.

It is important to have a dedicated section dealing with waste management issues irrespective of where in the municipality the waste management function resides.

13.3.3 South Africa's international obligations

South Africa recognizes the importance of international co-operation in dealing with complex waste management issues, particularly as it applies to highly dangerous materials and internationally prioritized waste streams. As such, the country is party to various international agreements related to chemicals and waste, non-binding conventions and protocols relevant to chemicals and waste including:

- The Basel Convention, 1992, dealing with the controlling the trans boundary movement of hazardous waste;
- The Montreal Protocol, 1989, which focuses on phasing out ozone depleting substances (many of which can be classified as waste);
- The Rotterdam Convention, 1998, which provides for prior informed consent regarding the importation of hazardous chemicals;
- The international community through the International Atomic Energy Agency has developed a comprehensive set of principles for the safe management of radioactive waste;
- The UNFCCC, which deals with greenhouse gas emissions; and,
- The Stockholm Convention, 2004, on persistent organic pollutants.

Since the NWMS does not cover chemical waste South African government must give effect to the relevant provisions of these conventions.

13.4 DRIVERS OF AND PRESSURES ON WASTE GENERATION IN SOUTH AFRICA

Waste generation globally by societies is viewed as a manifestation of the inefficient use of resources, and is the root cause of pollution and the associated environmental degradation. In essence, increased waste generation is an unavoidable consequence of economic development. The effective global management of waste is thus vital in order to conserve resources and protect the environment. The main drivers of waste generation are essentially expanding economies, increased goods production and expanding populations (DEA 2012a).

As a developing economy, this is equally true for South Africa. There are numerous challenges faced by South Africa that impact on the efficient and proper management of wastes. The key drivers that steer the direction of waste management legislations and policies in South Africa are listed in the NWMS as below. They are separated into three categories namely socio-economic-, environmental- and institutional drivers.

13.4.1 Socio-economic drivers

- A growing population and economy, which means increased volumes of waste generated. This puts pressure on waste management facilities, which are already in short supply;
- Increased complexity of waste streams because of urbanization and industrialization;
- A historical backlog of waste services for, especially, urban informal areas, tribal areas and rural formal areas. Although 61 per cent of all South African households had access to kerbside domestic waste collection services

in 2007, this access remains highly skewed in favour of more affluent and urban communities. Inadequate waste services lead to unpleasant living conditions and a contaminated, unhealthy environment;
- Absence of a recycling infrastructure which will enable separation of waste at source and diversion of waste streams to material recovery and buy-back facilities; and,
- Few waste treatment options are available and so they are more expensive than landfill costs.

13.4.2 Environmental drivers

- The complexity of the waste stream directly affects the complexity of its management, which is compounded by the mixing of hazardous wastes with general waste; and,
- Limited understanding of the main waste flows and national waste balance because the submission of waste data is not obligatory and where available is often unreliable and contradictory.

13.4.3 Institutional drivers

- A policy and regulatory environment that does not actively promote the waste management hierarchy. This has limited the economic potential of the waste management sector, which has an estimated turnover of approximately R10 billion per annum. Both waste collection and the recycling industry make meaningful contributions to job creation and GDP, and they can expand further;
- Growing pressure on outdated waste management infrastructure, with declining levels of capital investment and maintenance;
- Waste management suffers from a pervasive under-pricing, which means that the costs of waste management are not fully appreciated by consumers and industry, and waste disposal is preferred over other options; and,
- Too few adequate, compliant landfills and hazardous waste management facilities, which hinders the safe disposal of all waste streams. Although estimates put the number of waste handling facilities at more than 2,000, a significant number of these are unlicenced.

13.5 WASTE DISPOSAL AND TREATMENT IN SOUTH AFRICA

Waste management services rely heavily on landfills for the disposal of waste, which account for the majority of licenced waste facilities. Over 90 per cent of all South Africa's waste is disposed of at landfill sites (DEA 2011). This is despite the existence of a range of alternative managment options, including waste recycling facilities. Table 13.5 illustrates the number of licenced waste management facilities in the country.

Table 13. 5: Waste management facilities licence status in South Africa

Type of facility	Number of facilities	Number of licenced facilities	% of unlicenced facilities
General waste landfill site	1,203	432	56.4
Hazardous waste landfill site	77	86	46.8
Health care risk waste storage facility	25	25	100.0
Recycling facilities	9	44	77.8
Transfer stations	35	88	65.7
TOTAL	**1,336**	**675**	**56.4**

Source: DEA (2011)

Waste disposal by landfill remains the most dominant method of disposal in South Africa, and the reliance on which, coupled with the relative low pricing for landfilling, has limited the incentive to devise alternative methods of dealing with waste. Furthermore, there is an urgent need to address the licencing status of landfill sites and where licences are in place, compliance to licence conditions must be enforced. There are many landfill sites that are operating whilst non-compliant with licence conditions, resulting in poor levels of operation and negative impacts on the environment. It is critical that all waste management facilities are licenced in order to avoid potential negative environmental impacts, as it is through the licencing process that any significant impacts are identified, and mitigation actions prescribed.

13.5.1 Waste management trends in South Africa

Environmental issues linked to the increased use of landfill sites as the dominant means of waste disposal and treatment have in recent years become a matter of public concern and environmental awareness is growing as a result of the pressure to change this behaviour. The third National Waste Information Baseline Report (NWIBR) (DEA 2012b) estimated that South Africa generated approximately 108 million tonnes of waste in 2011, of which 98 million tonnes was disposed of at landfill. It was estimated that 59 million tonnes was general waste, 48 million tonnes currently unclassified waste and the remaining one million tonnes hazardous waste. In the order of ten per cent of all waste generated in South Africa was recycled in 2011.

The waste definitions as defined in NEM:WA are presented below:

'general waste' means waste that does not pose an immediate hazard or threat to health or the environment, and includes:
(a) Domestic waste;
(b) Building and demolition waste;
(c) Business waste; and,
(d) Inert waste.

'hazardous waste' means any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment.

'building and demolition waste' means waste, excluding hazardous waste, produced during the construction, alteration, repair or demolition of any structure, and includes rubble, earth, rock and wood displaced during that construction, alteration, repair or demolition.

In this section, status is made on generation rates, trends and risks for the classes of waste. The general impacts of increasing waste generation are significant at social, environmental and economic levels. Long term environmental impacts of increased waste generation are likely to involve the following:

- Increasing generation of waste places pressure on land resources available for disposal, which will lead to transformation of natural habitats and the loss of biodiversity;
- Water resources have limited capacity to assimilate and breakdown waste and pollutants enter a river or wetland through runoff within a catchment area. Increased waste generation can lead to pollution of surface and groundwater resources and soil especially at poorly managed waste sites;
- Air pollution by dust or wind blown litter as well as emissions such as methane gas from landfill sites will increase with increasing waste generation; and,
- An increase in odours and a loss of aesthetic values from an expansion in solid waste.

13.5.1.1 General waste

13.5.1.1.1 Municipal solid waste

Municipal waste is not the largest waste category by volume in South Africa (the largest waste category is industrial and mining waste), but it is the most significant in terms of public financing and the impact that it has on the day-to-day lives of ordinary citizens (DEA 2009c). The classification of general waste as per the Waste Classification Regulations are presented in Table 13.6.

Table 13. 6: General waste categories

GW01	Municipal waste
GW10	Commercial and industrial waste
GW13	Brine
GW14	Fly ash and dust from miscellaneous filter sources
GW15	Bottom ash
GW16	Slag
GW17	Mineral waste
GW18	Waste of Electric and Electronic Equipment (WEEE)
GW20	Organic waste
GW21	Sewage sludge
GW30	Construction and demolition waste
GW50	Paper
GW51	Plastic
GW52	Glass
GW53	Metals
GW54	Tyres
GW99	Other

According to the NWIBR (DEA 2012b), South Africa generated 59 million tonnes of general waste in 2011. An estimated 5.9 million tonnes of general waste was recycled (ten per cent) with the remaining 53.5 million tonnes of general waste being landfilled. Municipal (GW01) and commercial and industrial waste (GW10), generated within municipalities represents a total of 20,157,335 tonnes when the recyclables (reported under GW30, GW50, GW51, GW52, GW53 and GW54) are included. The percentage contribution of each waste stream to the composition of general waste is illustrated in Figure 13.3. Non-recyclable municipal waste contributes 35 per cent (by weight) of the overall general waste, construction and demolition waste, 20 per cent, followed by metals (13 per cent), organic waste 13 per cent and mainline recyclables (including paper, plastics, glass and tyres (19 per cent).

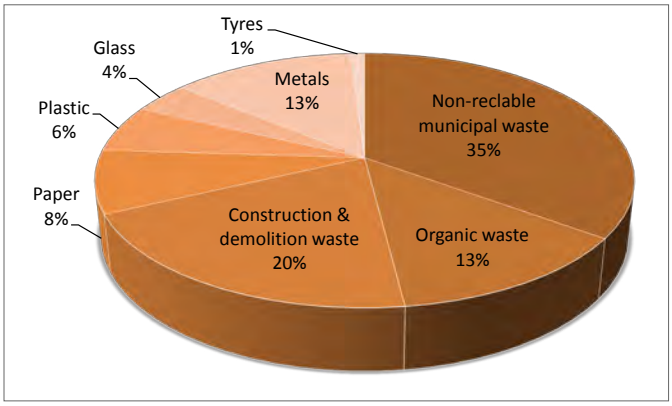

Figure 13. 3: Waste composition for general waste in 2011 shown as percentage by mass
This excludes GW99-Other which is mainly biomass waste from industrial sources.
Source: DEA (2012b)

Municipal waste conisists mostly of mainline recyclables, organics (putrescibles, greens and garden waste), building rubble and non-recyclables (DEA 2012b). The total general waste generated in South Africa was estimated at the sum of 40 per cent of GW01 and all the GW-waste streams excluding GW10 (DEA 2012b). The contribution of municipal wastes per province in the country are shown in Table 13.7 below.

Table 13. 7: Percentage municipal waste contribution by province in South Africa for 2011

Province	kg/capita/annum	Waste generated as % of total waste
Eastern Cape	113	4
Free State	199	3
Gauteng	761	45
KwaZulu Natal	158	9
Limpopo	103	3
Mpumalanga	518	10
Northern Cape	547	3
North West	68	1
Western Cape	675	20

Source: DEA (2012b)

Municipal solid waste constitutes a large percentage of the total waste generated in urban and rural areas. Municipalities are the key players in dealing with general waste. The data since 2005 suggests that solid waste functions are more successfully implemented by municipalities and therefore have a greater impact on the number of households serviced year-on-year (DEA 2012a).

There is a clear indication that municipalities' revenue income from solid waste services has been growing rapidly in the last decade (Table 13.8). Municial revenue from waste collection is important as this money is used to maintain and increase waste services within municipalities and pay for municipal service provision. Some of this growth can be attributed to more complete reporting of this category of revenue as municipalities move towards identifying the streams of revenue associated with their respective services. Metropolitan municipal revenue related to solid waste services are budgeted to grow by 27 per cent over the next decade (National Treasury 2011).

Estimates predicted that South Africa would experience rapid growth in waste volumes, associated with a prolonged period of economic growth. It is estimated that current general waste volumes are increasing at a level of between two to three per cent per annum, although this does vary between municipalities and cities (DEA 2012a). Figure 13.4 shows modeled trends in the growth of general waste using data from DEA and then DWAF.

Table 13. 8: Operating revenue for solid waste function by category municipality for the period 2006/07 to 2012/13

	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	Average annual growth	
R Million	Outcome			Preliminary estimates	Medium-term estimates			2006/07-2009/10	2009/10-2012/13
Metros	1,280	2,465	2,965	2,841	4,909	5,343	5,794	30.4	26.8
Local municipalities	673	731	1,268	2,256	30	2,895	3,064	49.6	10.7
Secondary cities	476	506	737	1,115	1,540	1,396	1,522	33.6	10.9
Large Towns	142	142	311	444	640	655	644	46.0	13.3
Small Towns	50	57	130	581	653	628	662	126.7	4.4
Mostly rural	14	25	90	116	217	217	235	104.0	26.6
Districts	8	11	9	34	37	37	35	65.3	0.9
TOTAL	**1,960**	**3,206**	**4,243**	**5,131**	**7,996**	**8,275**	**8,893**	**37.8**	**20.1**

Source: National Treasury (2011)

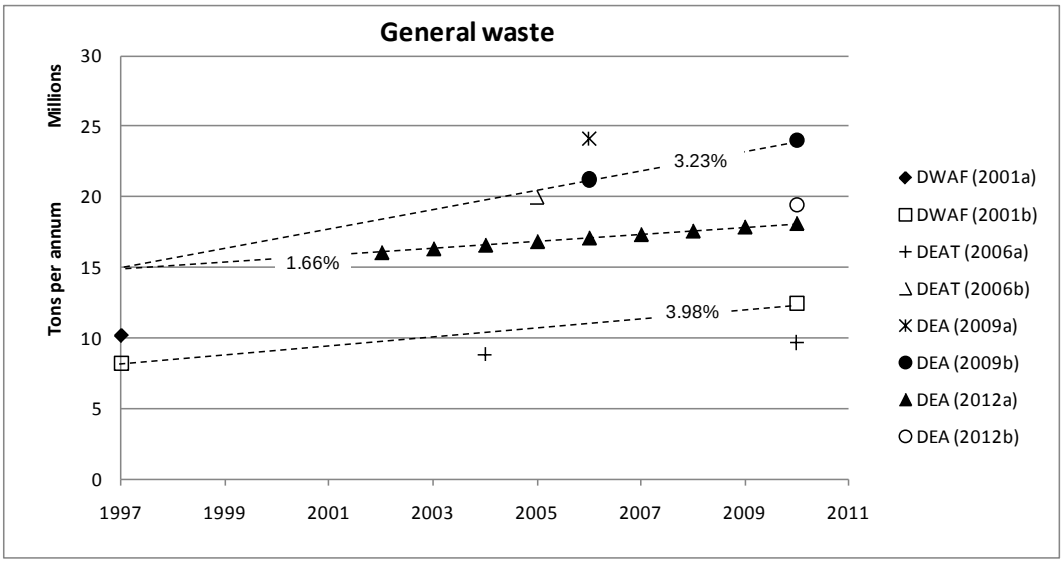

Figure 13. 4: Analysis of available general waste data (from municipalities) for South Africa
Source: DEA (2012a)

Concurrently there has been a growing financial resource allocation to waste services, which can be attributed to growth in demand for service due to urban population growth, urban expansion, and increased economic activity.

Demographics, socio-economic conditions and land uses are of particular importance, as the community wealth level directly influences the type and amount of waste generated (DEA 2009a). As standards of living increase, it is to be expected that waste generation rates will also increase. Furthermore, improving service levels in many municipalities may also result in increased collection quantities. Current estimations of the general waste disposal capacities of landfills at municipals are shown in Table 13.9 below.

Table 13. 9: Estimated general waste disposal capacity of at 'general' landfills in 2006/07

Municipality category	Number of landfills	Average waste disposed (tonnes / annum)	Total waste disposed (tonnes / annum)
A Metropolitan municipalities	6	2,419,000	14,514,400
B1 Municipalities with the largest budgets	21	155,684	3,269,364
B2 Municipal with larger populations and towns	29	65,410	1,896,890
B3 Municipalities with relatively small population	111	29,478	3,272,058
B4 Municipalities which are mainly rural	70	16,607	1,162,490
Total general waste disposed (2006/07)			24,115,402

Source Data: DEAT (2007)

The majority of domestic waste is collected by municipal services and transported either directly or via a transfer station to landfills which remain the main method of disposal in South Africa. Collection services include the use of purpose compactor equipped vehicles, tractors, trailers, small trucks or utility vehicles.

Only a few waste characterization studies on municipal waste have been undertaken to date in South Africa. Comparable data for Gauteng (GDACE 2008) and Cape Town (Gibb 2008) are presented in Figure 13.5.

There are no significant differences in the findings between Gauteng and Cape Town. Therefore, it was assumed that the municipal waste composition for Gauteng could be extrapolated to fairly represent the composition of municipal waste in South Africa (DEA 2012b). The municipal waste composition for Gauteng was therefore applied to calculate GW20 (organic waste, 15 per cent) and GW30 (construction and demolition waste, 20 per cent). The waste reported as mainline recyclables include paper, plastics, glass, tins and tyres (Gibb 2008; GDACE 2008) were already reported under GW20, GW30, GW50, GW51, GW52, GW53 and GW54 since these waste streams includes the recyclables from municipal waste as well as recyclables collected directly from industrial sources (DEA 2012b).

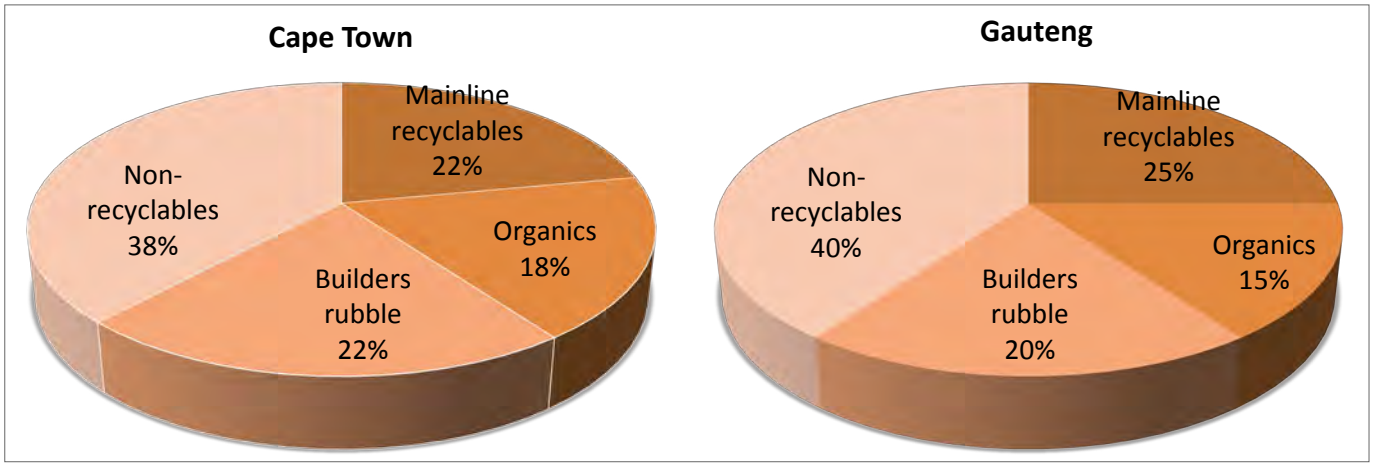

Figure 13. 5: Municipal waste composition (percentage by mass)
Source: DEA (2012b)

Commercial and industrial waste (GW10) was assumed to contribute about 21 per cent of the municipal waste stream in South Africa. Household waste was estimated at about 44 per cent, organics 15 per cent and contruction and demolition waste at 20 per cent (DEA 2012b).

The finalization of the Policy on Basic Refuse Removal Services for Indigent Households has brought some relief to those who cannot afford to pay for the basic services. Some municipalities have already begun the implementation of measures outlined in the policy, such as free basic refuse service subsidies, in order

to accommodate the poor (National Treasury 2011) (Box 13.1). Table 13.10 provides the percentage of households receiving Free Basic Service (FBS). Adoption and implementation rates were lowest in largely rural municipalities in 2007. It will be important to monitor changes in these rates in response to the policy implementation.

Box 13. 1: Modelling domestic waste collection methods: The case of Mafikeng

Background: Waste management remains a challenge for most municipalities in the country. The problem is aggravated by the lack of strategies, financial resources, materials and equipment, and skills required for waste management. Local communities are therefore in a dilemma in keeping their surroundings clean. Communities and their municipalities find it difficult to address this problem without support from other stakeholders. This calls for partnership interventions to address the problem. The DEA, through its Social Responsibility Programme, is piloting a domestic waste collection project in partnership with the Mafikeng Local Municipality (MLM).

Partnership: The Department entered into a three-year Service Level Agreement with the Mafikeng Municipality for the provision of waste collection services to the unserviced rural communities of Mafikeng. The Service Level Agreement makes provision for the Department to fund 75% of the project budget, and the municipality funds 25% for the project which it pays on *pro rata* basis. After the duration of the agreement, the municipality will take full responsibility for the operation and sustainability of the project. The Department further entered into a memorandum of agreement with a service provider to manage the implementation of the project for the period of three years.

Technical Support: Despite the waste collection services rendered by the project to 31,231 households, the project is assisting the municipality to develop an IWMP as well as to develop and implement a strategy for collecting payments for the service, waste reduction and recycling programme, build human resource capacity and systems to manage waste collection service, and provide sufficient landfill capacity.

Waste Collection Methods: Since this is the pilot, investigating and testing efficient, effective, economical and labour intensive methods of waste collection is part of the project. The first method that is being tested is separation at source. This method will test the willingness of residents to separate waste, quality of separated waste and recyclables, volume of waste and recyclables, market value of collected recyclables, and cost saving from reduction of waste entering the landfill. Testing of this method has opened up a business opportunity for a group of local young people who have been put together to establish a co-operative that will collect recyclables to the Material Recovery Facility,and sort, weigh and sell them to recycling companies. They have been assisted through the project to put together a business plan.

Small Business Development: The project has created and developed five local small businesses. Five local people with drivers licences were identified and assisted through the project to access finance for purchasing the required vehicles and equipment for waste collection. They are further subcontracted as small-, medium- and micro-sized enterprises (SMMEs) to provide waste collection services for a period of three years. Training on small business management was facilitated in order to provide them with business management skills.

Employment Opportunities: The project created work opportunities for 70 local people. Each SMME has appointed 14 people from the local communities as labourers for the period of three years to collect waste from the households. They were provided with training on community and environmental development as well as waste management.

Project Management and Oversight: The appointed implementing agency is responsible for the day-to-day management of the project and subcontractors and accounting to the Project Steering Committee which is made up of five stakeholders i.e. local municipality, district municipality, traditional authority, provincial department and national department. This committee sits once a month to review operational progress and resolve operational challenges facing the project. Strategic decisions of the project are made at the Project Review Committee which sits quarterly and is composed of senior managers of major project stakeholders, i.e. municipally, implementing agency and the Department.

Challenges: The project is faced with two major challenges, i.e. political and administrative instability and financial sustainability. Political and administrative instability in the municipality is paralyzing the project in a sense that the municipality is currently unable to meet its obligations in terms of service level agreement. Its overall commitment to the project is therefore inconsistent. Financial sustainability is a serious threat to the project. From the survey of households conducted, it has been found that the residents are not prepared to pay for the waste collection services. On the other hand, the municipality has no financial muscles to finance this service.

Conclusion: The model employed for waste collection has proved to be effective and can be replicated in other municipalities. It is helping to keep the area clean at all times. It has created small businesses, employment and training opportunities for local people. However, the challenges posed by political and administrative instability and lack of financial sustainability strategy has a potential to wipe off all the benefits and assets created by the Project.

Author: Nhlanhla Khumalo
Source: DEA Social Responsibility Program News

Table 13. 10: Coverage of free basic refuse services

	% consumers receiving FBS			% FBS consumers with policy	% consumers implementing FBS
	2005	2006	2007		
Metro's	70.8	54.9	41.2	100.0	100.0
Secondary cities	33.8	30.8	25.2	100.0	100.0
Large towns	25.4	26.4	33.2	93.1	82.8
Small towns	32.4	47.6	53.6	90.9	89.1
Largely rural	43.4	43.1	44.3	71.4	58.7
Districts	25.4	63.9	76.9	91.7	66.7
TOTAL	**52.5**	**46.8**	**39.9**	**87.4**	**80.8**

Source: StatsSA (2007)

13.5.1.1.2 Building and demolition waste

Construction and demolition waste is defined as non-hazardous waste resulting from the construction, remodelling, repair or renovation and demolition of built structures or physical infrastructure. These wastes include concrete, bricks, masonry, ceramics, metals, plastic, paper, cardboard, gypsum drywall, timber, insulation, asphalt, glass, carpeting, roofing, site clearance and sweepings and excavation materials (DEA 2009a).

The limited amount of published material makes it difficult to estimate the composition and amounts of construction and demolition waste. Observations indicate that building sites generate significant amounts of mixed wastes, i.e. mixture of concrete, masonry, ceramics, metals, etc. (DEA 2009a). The NWIBR (DEA 2012b) estimated that building and demolition waste contributed 20 per cent of general waste, 16 per cent of which was recycled. Contaminants released from metals disposed at landfills have been shown to be toxic to terrestrial and freshwater ecosystems.

13.5.1.1.3 Tyres

In an assessment of the National Waste Quantification and Waste Information System, one of the waste streams assessed was waste tyres (DEA 2009a). The findings indicate that "*the total mass of new pneumatic tyres entering the South African market is approximately 175,000 tonnes per annum. Used tyres entering the waste stream amount to approximately 150,000 tons per annum, a yearly amount that requires recycling, treatment or disposal*." According to the NWIBR (DEA 2012b), mainline recyclables (i.e. paper, plastics, glass, metals and tyres) contribute 25 per cent to total general waste generated in the country.

This statistic is in agreement with the 1998 South African Tyre Manufacturing Conference study. According to a feasibility study undertaken for the South African Tyre Manufacturing Conference (SAMTC 1998), 160,000 tonnes of scrap tyre were generated each year. More than 28 million used tyres were reported to be dumped illegally or burned to recover the steel wire annually, a figure that is thought to increase by 9,3 million annually (DEAT 2005). Air emissions from tyre burning include uncontrolled and controlled emissions. Uncontrolled sources are open tyre fires, which produce many products of incomplete combustion and release them directly into the atmosphere. Controlled combustion sources include incineration in boilers and kilns specifically designed for efficient combustion of solid fuel. Emissions from controlled combustion sources are much lower and more often than not, these sources also have appropriate air pollution control equipment for the control of particulate emissions. Open tyre burning emissions include significant quantities of fine black carbon (classified for control purposes as PM_{10} and $PM_{2.5}$). The impacts of emissions from burning tyres can lead to the pollution of soil, surface water, and ground water and an integrated approach must be applied to manage these impacts.

Tyre recycling currently is limited to one recycling plant in Cape Town producing rubber crumb, and approximately 11 other smaller recycling operators who produce cut, stamped and punched items, such as sandals, mats, etc., but this is limited as they can only use waste tyres that do not contain steel belts (DEA 2009a). Some waste tyre collectors are accumulating stockpiles of waste tyres.

This means that vast numbers of waste tyres are being disposed of illegally. The majority are illegally dumped, while some are 'refurbished' by repairing or re-grooving tyres for sale as part-worn tyres. Illegal burning of waste tyres is also common in winter or in remote open fields. This imposes serious atmospheric impact, particularly in areas declared as air quality priority areas according to the Air Quality Act.

The DEA has developed the Waste Tyre Regulations (Government Gazette No R9032), which came into effect in 2009. Since its promulgation, tyre dealers in South Africa had

to sort all used tyres into retreadable casings, part worn tyres (complying with road regulations), and the balance as waste tyres (all passenger and light commercial waste tyres must be rendered unusable). Waste tyres may only be disposed of to end users for recycling, or to landfills. The regulations further require tyre producers to develop plans on how they will deal with waste tyres. This regulated mechanism will go a long way in addressing the concern of toxic emissions from tyre burning and it will facilitate beneficial and safe recovery of energy and materials from the process.

13.5.2 Hazardous waste

The NEM:WA provides for the following definition of hazardous waste:

"*Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have detrimental impact on health and environment*."

Hazardous wastes can cause death, illness or injury to people and destruction of the environment if not properly treated, stored, transported or discarded. Hazardous wastes may pollute soil, air, surface water or underground water, which will in turn affect people who use these resources. Toxic substances contained in municipal sewage waste that is used as fertilizer may contaminate the fields on which it is used and may be absorbed by growing plants thereon. Animals who feed on these plants may also be negatively affected indirectly. Emissions of hazardous wastes are also a source of air pollution.

Various types of hazardous waste can be identified, e.g. organic and inorganic chemicals, oily wastes, general waste, high volume wastes with a low concentration of hazardous substances such as heavy metals and oils. According to the Waste Information Regulations, hazardous wastes are divided into 23 categories based on the level of risk (Table 13.11).

Table 13. 11: Hazardous waste categorization

Category	Waste type
HW01	Gaseous waste
HW02	Mercury containing waste
HW03	Batteries
HW04	POP waste
HW05	Pesticide containing waste
HW06	Inorganic chemical waste
HW07	Asbestos containing waste
HW08	Waste oils
HW09	Organic halogenated and/ or sulphur containing solvents
HW10	Organic halogenated solids and compounds with sulphur
HW11	Organic solvents without halogens and sulphur
HW12	Other organic waste without halogens and sulphur
HW13	Tarry and bituminous waste
HW14	Brine
HW15	Fly ash and dust from miscellaneous filter sources
HW16	Bottom ash
HW17	Slag
HW18	Mineral waste
HW19	Waste of electric and electronic equipment (WEEE)
HW20	Metal scrap
HW21	Health care risk waste (HCRW)
HW22	Sewage sludge
HW99	Miscellaneous

Source: DEA (2009c)

The NEM:WA emphasizes the importance of avoidance and reduction of hazardous wastes due to their potential harm to health and the environment. Where hazardous wastes cannot be avoided, it is emphasized that measures be developed to encourage reuse and recycling and also to manage treatment. Disposal should be the last option. In addition to being regulated by the NEM:WA, certain hazardous wastes are also regulated within other additional legislative frameworks, which include:

- Radioactive waste regulated by the Hazardous Substances Act, the National Nuclear Regulator Act and the Nuclear Energy Act;
- Residue deposits and stockpiles from mining regulated by the Mineral and Petroleum Resources Development Act;
- The disposal of explosives regulated by the Explosives Act (No 15 of 2003); and,
- The disposal of animal carcasses regulated by the Animal Health Act (No 7 of 2002).

Hazardous waste is graded from extreme to non-toxic in nature and this grading determines the appropriate disposal techniques. Extreme hazardous waste, such as cyanide and mercury, need to be encapsulated, stored, treated and then disposed. Hazardous waste is classified in terms of a specific set of risks that they might pose to the natural environment, human health and/or built environments, which include:

- Explosion or fire;
- Infections, pathogens, parasites or their vectors;
- Chemical instability, reactions or corrosions;
- Carcinogens and mutagens; and,
- Toxicity, including persistence in the food chain and ecological system.

According to the NWIBR (DEA 2012b), South Africa generated 1,319,096 tonnes of hazardous waste in 2011. The composition of the hazardous by mass is illustrated in Figure 13.6.

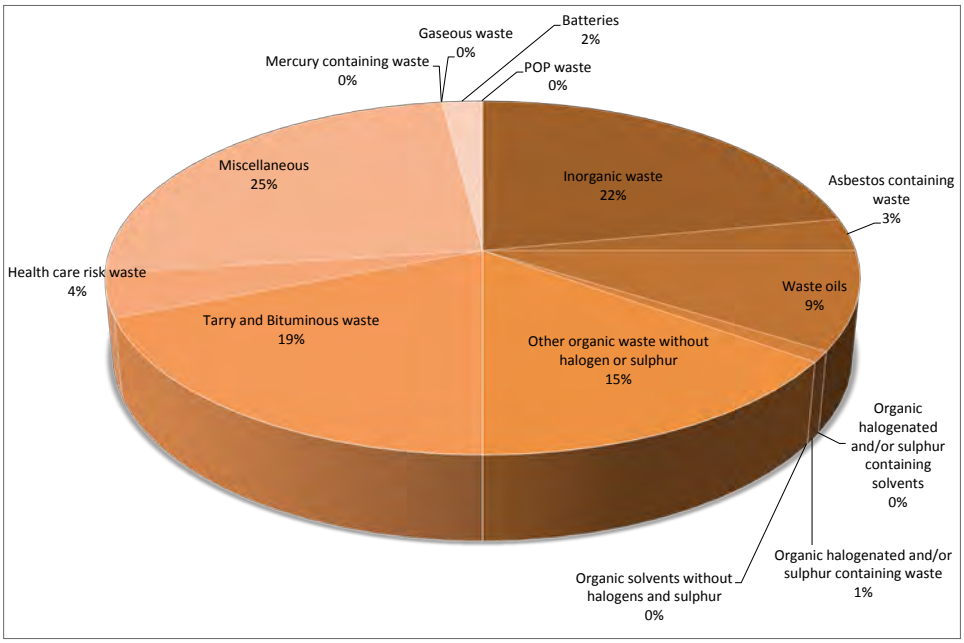

Figure 13. 6: Percentage (by mass) composition of hazardous waste in 2011
Source: DEA (2012b)

South Africa has 97 licenced hazardous waste disposal sites with either a H:H rating or H:h rating (Institute of Waste Management in Southern Africa 2010) (Table 13.12). Landfill sites with an H:H rating are those where measures have been taken to mitigate the risk of the hazardous wastes, while those with a H:h rating are those which accommodate wastes with a moderately low risk factor.

Table 13. 12: Number of licenced hazardous landfill sites in South Africa as at 2010

Province	Number of licenced hazardous waste facilities	Number of facilities with H:H rating	Number of facilities with H:h rating	Other facilities
Gauteng	20	15	5	1 HCRM & 2 no rating
KwaZulu-Natal	33	21	12	1 H:H and General
Limpopo	2	2		
Mpumalanga	16	10	6	
Northern Cape	2	2		
North West	5	4	1	
Western Cape	8	6	2	
Eastern Cape	1			No rating
Free State	1			No rating

Source: Institute of Waste Management in Southern Africa (2010)

The NWIBR (DEA 2012b) estimated that one million tonnes of hazardous waste was produced in the country in 2011. There are only three provinces that have landfills licenced to process such waste. These three provinces, together with Mpumalanga, have hazardous waste management plans in place.

Although mostly limited to chemical waste, a number of industries in Gauteng practice on site treatment of hazardous wastes prior to removal and disposal. This entails neutralization of acid and alkali wastes. In other cases the hazardous waste treatment is performed by a waste management contractor before disposal to landfills (DEA 2009a).

The following sections provide more information on specific hazardous waste streams.

13.5.2.1 Industrial packaging

According to the study conducted by the Responsible Packaging Association of Southern Africa (RPMASA) on industrial packaging in South Africa (DEA 2009a), the following manufacturers making industrial packs or containers were identified:

- Steel drums (open-end and tight head), 200, 210 and 230l - five manufacturers;
- Plastic drums, PE-HD (open end and tight head), 220 and 235l - four manufacturers;
- Intermediate bulk containers, PE-HD, 1,000l as well as 1,000l roto-moulded flow bins - two manufacturers;
- Plastic drums, PE-HD, 20 and 25l - 13 manufacturers;
- Steel drums, 20 and 25l - three manufacturers; and,
- Plastic and steel containers, odd sizes between 25l and 210l - five manufacturers (DEA 2009a).

During this reporting cycle, an industry emerged for reconditioning and reprocessing industrial packaging for reuse. Reconditioning processes vary from rinsing, inspection and dispatch for reuse, through to rinsing, pressure testing, and furnaces and coating facilities. Some of these processes are capital intensive. The reconditioning processes followed are also different for plastic and steel containers. There are 27 reconditioning and reprocessing entities listed on the RPMASA database.

There were 1,539 million tonnes of recycled packaging and paper products in 2009 (Table 13.13) (Industry Waste Management Plan 2011). The industry waste management plan of 2011 aims to increase the recycling rate for new packaging and paper from 44.5 per cent in 2009 to 51 per cent over the next five years.

Table 13. 13: The recycling targets per material stream

	2009 Actual recycling rate	Year-5 target rate
Paper	56.0	61
Metal	56.0	65
Glass	32.0	43
Plastic – PET	26.0	37
Plastic – other	28.0	35
Overall recycling rate	44.5	51

Source: PACASA (2011)

The packaging and paper industry consumed a total of 3.46 million tonnes in 2009 and avoided consumption of 1.85 million tonnes of glass that was reused (Industry and Paper Industry Waste Management Plan 2011). The plan calls for producers to balance reducing the environmental impact of the packaging industry with the need to ensure that it meets all relevant performance criteria during production, distribution, storage and use.

The production of packaging materials impacts on the environment in that it involves the use of raw materials, energy and water and results in the emissions to air, soil and water. In South Africa packaging accounts for six per cent by weight or volume of waste sent to landfills. The use of more efficient packaging would reduce these impacts significantly. The packaging sector is working toward improving its environmental impacts by:

- Progressively using light weighted packaging materials as technology has allowed, and explores innovations to use resources more efficiently and also reduce depletion of resources and pollution as well as lowering costs; and,
- Using closed-loop industrial systems that have been introduced to reduce material throughput and eliminate waste. This is already happening through recycling and reuse systems where appropriate. Some of these involve business-to-business packaging systems which the consumer does not see.

13.5.2.2 Health care risk waste

Health care risk waste (HCRW) is used to describe waste emanating from public and private health care institutions. HCRW includes infectious materials, sharps, hazardous chemicals, diagnostic drugs, human tissue and residues of a radioactive nature. Due to its infectious and hazardous properties this waste poses a threat to human health. Exposure could be caused through a variety of routes such as punctures, abrasions or cuts in the skin, inhalation through mucous membranes and ingestion. All individuals exposed to HCRW are potentially at risk, including those within health care institutions, waste contractors who collect, transport and manage this waste and those who are exposed to it as a consequence of careless management and illegal disposal (DEA 2008).

In 2007 DEA undertook a study to determine the volume of HCRW generated in the country. The study concluded that approximately 42,000 tonnes of HCRW were generated

annually in South Africa, 55 per cent of which was generated in public health care facilities. The study also included an assessment of the available treatment capacity which was approximately 31,390 tonnes per annum (excluding incinerators operating without air-emission control equipment) (DEA 2008).

In order to provide reliable statistics on treatment capacity for planning purposes, DEA keeps a database of facilities and their respective planned treatment capacities which have been provided in their licence applications. The database is updated with new facilities as they are licenced. In order to determine the actual HCRW treated, facilities are required to provide monthly reports on the tonnages of waste treated in the previous month. The reporting is a condition of the waste licences issued to the facilities and must be signed off by the Chief Executive Officer to ensure accountability. The NWIBR (DEA 2012b) reported that HCRW made up four per cent of hazardous waste generated in the country in 2011.

There are currently 11 licenced HCRW treatment facilities operating in South Africa. These 11 facilities have a combined treatment capacity of approximately 4,700 tonnes per month assuming all facilities are operating at 80 per cent capacity, providing an annual treatment capacity of approximately 56,400 tonnes per annum (Table 13.14). Noting that an annual escalation in HCRW generation of 1.5 per cent per annum has been applied to the 2007 HCRW generation figures (based on the actual population growth rate of 1.06 per cent) approximately 45,000 tonnes of HCRW is generated annually (approximately 3,770 tonnes monthly).

Table 13. 14: HCRW treatment capacity in operation

Licenced technology	Theoretical treatment capacity (tonnes/ month)
Incineration	1,660
Non-combustion	3,084
TOTAL	**4,744**

Source: DEA (2008)

Although the figures indicate an excess in treatment capacity, the information received from the facilities also indicates a high level of stoppage due to breakdowns, malfunctions and planned and unplanned maintenance. Recently the DEA has found it necessary to authorize the landfilling of substantial volumes of untreated HCRW due to breakdowns at the treatment facilities. In order to better understand the capacity availability of the treatment facilities, DEA has instituted a requirement for treatment facilities to report on planned and unplanned stoppages which interrupt operations for more than eight consecutive hours through an amendment to the facilities licence conditions. A national enforcement strategy has also been implemented to improve compliance and a policy of zero tolerance has been instituted with respect to transgressions within the sector.

Over the past eight years, a significant amount of work has been done by provincial and national government towards achieving this objective. This work includes the assessment of the feasibility of adopting a regional approach to the management of HCRW, the piloting of HCRW segregation systems in an urban and rural environment, developing a national policy and regulation on HCRW management, developing training courses for health care professionals and monitoring the generation and capacity for the management of this waste stream.

13.5.2.3 Pesticides

A steady and consistent use of fertilizers for enhancing agricultural production by most farmers has been reported in South Africa. Generally, biological pest control methods are not favoured with pesticides being preferred. "*Pesticides include herbicides, insecticides, fungicides, seed treatments and plant growth regulators. The total market in South Africa for agricultural pesticides in 2008 was approximately 49,970 tonnes. This represents the total amount of product, not the total amount of the active ingredients*". (DEA 2009a). The use of pesticides results in a number of environmental and health concerns, including obsolete or expired pesticides normally stored on farms, distributors, warehouses, and the unsafe storage and or disposal of these obsolete pesticides. Cases of pesticides containers, with no labels, being used for storage of foodstuff and water, particularly in poor communities, have been reported (DEA 2009a).

South Africa and six other African countries formed part of Project 1 of the Africa Stockpiles Programme (ASP), designed to address the accumulation of obsolete pesticide stockpiles in Africa. As very little was known on the extent of the problem in South Africa, a pilot project was launched to locate and collect obsolete pesticides in Limpopo province. As much as 80 tonnes of obsolete pesticides were collected in the province, leading to estimates of approximately 700 tonnes being stockpiled throughout South Africa (DEA 2009a).

Initiatives for collection and environmentally sound disposal of obsolete pesticides have been embarked upon in the past but there have been recurrences of these waste streams (DEA 2009a). As agricultural activities continue, there is a need for a sustainable solution for sound management of this waste stream. Following the recent implementation of the Africa Stockpiles Programme, the pesticides industry has submitted a draft Pesticides IWMP (DEA 2009a) that proposes options for sustainable environmentally sound management of pesticides wastes and their residues.

13.5.2.4 e-Waste

e-Waste is relatively new, but is growing rapidly. A DEA report (DEA 2009a), considers e-waste potentially hazardous waste. Electrical and electronic waste, which includes white goods, consumer electronics, and information technology is classified as potentially hazardous waste, and is a growing global concern. Many developed countries have taken steps to develop policy guidelines and legislation for developing e-waste management systems (DEA 2008).

The private sector in South has responded to the profit potential of recycling e-waste and leads the sector of e-waste processing. Recycling of e-waste material such scrap metal recycling, including white goods such as fridges and washing machines, has been undertaken for some time, as has the refurbishment of personal computers for use in social projects, including in schools or in disadvantaged communities. Printer

cartridges have been recycled, and *ad hoc* take-back schemes implemented (Finlay & Lietchi 2008).

DEA, through the NEM:WA, has identified some industries, among others the lighting industry, to submit IWMPs. These plans shall outline measures to be taken to minimize and manage waste emanating from this sector in an environmentally sound manner. The e-Waste Association of South Africa (eWASA) published an IWMP in 2011 which serves this function.

With the information age, e-waste will continue to grow exponentially, and will rapidly become a major waste challenge. WEEE can contain over one thousand different substances, many of which are toxic and some that have a high market value when extracted. In terms of implementing the waste hierarchy, the main challenge is the separation of e-waste from general waste to facilitate safe and economically sustainable recycling of this waste stream. Informal, private sector based, recycling of e-waste dominates the sector. Shortcomings of these recycling activities are that they are often done without safety equipment, resulting in potential harm to health, and contamination of the recycling site, as well as the release of noxious fumes through the burning of plastic to access the valuable metals inside the equipment. These emissions lead to air pollution impacts.

Formal recycling is typically a partially mechanized process, which separates materials, whilst WEEE is often dismantled by hand and then separated before shredding. Some mechanized processes do not necessarily allow for re-use or refurbishment, as the whole object is put through a shredder, and the shredded output is then mechanically separated using water, air or magnetism. The separated shredded plastics and metals are then sent for reprocessing as recycles (Finlay *et al*. 2008).

When these products are placed in landfills or incinerated, they pose health risks due to the hazardous materials they contain. Computers and display units contain significant amounts of material that are hazardous to human health if they are not disposed of properly. Monitors and televisions constitute 40 per cent of all lead and 70 per cent of all heavy metals found in landfills. These heavy metals and other toxins that can leach into the soil from landfills, evaporate into the air, and enter the air through incineration.

13.5.2.5 Mining waste

Section 4(1)(b) of NEM:WA specifically excludes mining residue deposits and stockpiles from the scope of the Act in as much as these are regulated in terms of the Mineral and Petroleum Resources Development Act. The regulatory framework for mining residue stockpiles and deposits is under review, and in terms of the amendment to the Mineral and Petroleum Resources Development Act, responsibility for the performance of environmental authorizations will revert to the DEA. It should be noted that the Act does not define residue stockpiles or deposits as 'waste'. Therefore, there is no reference to 'mining waste' in the Act. Whilst the DMR may be managing this, they are not managing it as waste, but rather a resource.

The impact of mining waste production on the environment is that it causes dysfunctional hydrology, as well as acidification and salinization of soils, groundwater and surface water bodies, resulting in breakdowns in nutrient cycling and environmental degradation. This can lead to losses in biodiversity and ecosystem services and, therefore, both tailings and contaminated water can be expected to eventually contribute to negative health impacts in humans if mitigation measures are not put in place.

13.5.2.6 Metallurgical waste

The scrap metal recycling industry is well developed, with nearly 100 scrap metal dealers belonging to the Metal Recyclers Association of South Africa, who process over 80 per cent of all scrap metal for beneficiation by the downstream industry. The World Steel Association estimated that South Africa collected a total of 3.7 million tonnes of scrap (ferrous and non-ferrous) in 2007 (DEA 2009a).

The industry is typified by:

- Peddlars – individuals who collect or purchase scrap for re-sale to bucket shops, scrap merchants or scrap processors;
- Bucket Shops – typically two to four employees who buy scrap from peddlers and transport small quantities using a bakkie, for resale;
- Scrap Merchants – purchase scrap and perform basic sorting into metal types, then sell to scrap processors; and,
- Scrap Processors – handle large volumes of scrap and sort and process them for beneficiation by local foundries, steel mills or export.

South Africa was ranked the 21st largest crude steel producing country in the world by the World Steel Association in 2010. South Africa is also the largest steel producer in Africa, producing about 47 per cent of the total crude steel production of the continent during 2010 (SAISI 2012).

The total South African crude steel production in 2008 amounted to 8,176 million tonnes. Carbon steel deliveries by the primary steel industry were 6,535 million tonnes, of which 5,415 million tonnes was sold on the local market and 1,120 million tonnes was exported. In 2006 approximately 2,58 million tonnes of scrap was collected and recycled (again approximately 0.4 million tonnes was exported). It has further been reported that the mass of ferrous scrap exported in 2008 was 1,270 million tonnes (SAISI 2012).

Total South African crude steel production amounted to 7,617 million tonnes in 2010, which was an increase of 1.8 per cent, compared with 7,484 million tonnes during 2009. This is about 0.6 per cent of world production which reached 1,4119 million tonnes in 2010 according to the World Steel Association, an increase of 14,8 per cent when compared with 2009 (SAISI 2012).

Carbon steel deliveries by the South African primary steel industry were at 5,665 million tonnes in 2009, a decreased of 13.5 per cent compared with 2008. During 2009 3,884 million tonnes of carbon steel products were sold locally, which was a decrease of 28.3 per cent compared with 2008. During 2009 1,772 million tonnes of primary carbon steel products were exported, an increase of 58.2 per cent compared with 2009 (SAISI 2012).

Imports of carbon and alloy primary steel products (excluding semis, stainless steel and drawn wire) during 2010 were 0,657 million tonnes, an increase of 36.3 per cent compared with 2009. The primary carbon steel products and semi-finished products produced in South Africa include billets, blooms, slabs, forgings, light-, medium- and heavy sections and bars, reinforcing bar, railway track material, wire rod, seamless tubes, plates, hot- and cold-rolled coils and sheets, electrolytic galvanized coils and sheets, tinplate and pre-painted coils and sheets (SAISI 2012).

13.5.2.7 Batteries

It is estimated that over 50 million batteries are consumed annually in South Africa (DEA 2009a). The vast majority of these are non-rechargeable ordinary batteries that are used once and discarded into the domestic waste stream. This equate to approximately 2,500 tonnes of batteries disposed to landfills per year. In 2011 battery waste made up two per cent of hazardous wastes produced in the country's NWIBR (DEA 2012b).

Commonly used batteries include:

- Alkaline batteries – these batteries used to contain mercury, but these have been phased out and are now generally alkaline manganese batteries. Although these can be disposed of in domestic waste, they can be recycled to recover steel and zinc, but is not actively done in the world yet;
- Rechargeable batteries – these consist of nickel-cadmium (NiCd) batteries, and the now more common nickel metal hydride (NiMH) batteries. NiCd batteries contain cadmium, hence are considered hazardous waste when disposed. Both types are recyclable for the recovery of nickel, iron, zinc and cadmium;
- Lithium-ion batteries – these high-performance rechargeable batteries are typically found in mobile phones and other specialized consumer electronics. These are recyclable to recover valuable metals; and,
- Silver oxide batteries – these are small non rechargeable button shaped batteries used in hearing aids, wristwatches etc. These may contain mercury, so are considered hazardous when being disposed of.

There are initiatives to recycle used batteries in some parts of the country, but these appear to be *ad hoc*. Recycling bins are, for example being placed at large retail outlets. The recyclers are expected to collect the bins and sort them at a designated plant. Recyclable rechargeable batteries are containerized and sent to a recycling plant outside the country, while non-recyclable batteries are to be concrete encased and disposed to landfill (UNIROSS 2012).

13.5.2.8 Fluorescent lamps

Fluorescent lamps have high mercury content, and are therefore classified as hazardous waste. Most fluorescent lamps are disposed of in the domestic/commercial waste stream that ends up in general waste landfills and not in hazardous landfills or treatment facilities. Mercury is an essential element contributing to the energy efficiency of compact fluorescent lamps. The mercury content of a CFL is typically about five milligrams, roughly the size of the tip of a ballpoint pen. This is about one-fifth of the mercury found in a watch battery and 100 times less than the mercury present in standard household thermometers (Eskom 2012).

Eskom estimates that in 2005/06 around 1,378 million-mercury lamps containing High Intensity Discharge Lamps, Linear Fluorescent Lamps and Compact Fluorescent Lamps (CFLs) were imported. It is expected that due to the energy crises, the number of CFL's imported has increased significantly (Eskom 2012).

CFLs have become an essential part of energy efficiency campaigns worldwide. Their energy saving properties constitute a simple, effective measure to help deal with energy constraints, rising energy costs and environmental concerns.

While the benefits are obvious, there have been concerns about the mercury content and other associated hazards of CFLs, particularly their mercury content. However, a CFL emits no mercury and is not dangerous to use. Even if a CFL is broken, the mercury content is not sufficient to cause any personal harm. However, the cumulative impact of millions of CFLs does present a potential environmental risk. Hence CFL disposal needs to be conscientiously managed. Under these circumstances CFLs certainly offer overwhelmingly positive environmental benefits (Eskom 2012).

13.5.2.9 Radioactive waste

Radioactive waste is defined as material that contains or is contaminated with radionuclides at concentrations or activities greater than clearance levels as established by the

National Nuclear Regulator (NNR, and has no use (DMR 2005)). In South Africa radioactive waste is produced by the nuclear fuel cycle. Necsa's nuclear fuel production facilities, i.e. the conversion, enrichment and fuel fabrication plants produced radioactive waste until 1997. After that the last of these facilities were closed. Presently this type of waste stream is produced as a result of the decommissioning of these facilities. Eskom's Koeberg nuclear power plant produces spent fuel and operational radioactive waste. Research and development facilities, e.g. Necsa's Safari research reactor at Pelindaba, produces spent fuel and operational waste. Radioactive waste is produced from radioisotope production activities at Necsa. The iThemba LABS also produce radioactive waste. Historically waste has been produced by various research activities. Naturally occurring radioactive waste materials are produced by various facilities in the mining and minerals processing industry. Radioactive wastes are also produced from various applications of radioactive materials in industry and medical sectors.

Radioactive wastes can be classified according to radiological properties (quantity and type of radioactivity), physical properties (form in which the material occurs, i.e. gas, liquid or solid) and also whether it is heat producing or not. The hazard involved as well as the final disposal methods to be used for the waste also plays an important part of classification.

The following licences have been granted by the NNR for radioactive waste disposal:

- NL-25 - Nuclear licence granted to the mines, under which licence Nuclear Liabilities Management carries out waste management/ decommissioning projects;
- NL-27 - Nuclear licence granted to Necsa for the Pelindaba site; and,
- NL-28 - Nuclear licence granted to Necsa for the Vaalspruit site.

13.6 PUBLIC AND PRIVATE SECTOR RESPONSE

Government has responded through new policy development and implementation, including alternative policy instruments to command-and-control. The private sector has responded by recognizing the potential of waste as a renewable resource and associated business opportunities, not only with treatment and disposal, but also in reuse and recycling.

13.6.1 National response

Since the 2006 SAEO a number of regulatory instruments have been developed and promulgated, or are in the process of being promulgated. This has mainly been intended to respond adequately to the country's existing waste management challenges, but also to close existing policy gaps. Most of the policy instruments, including the NEM:WA, are fairly new and their implementation is still to be fully executed. The Act provides a toolbox of waste management measures to deal with the challenges of particular waste streams. Regulations issued in terms of the Act will give effect to these measures.

The measures described in the National Waste Management Strategy 2012 are:

- Waste classification and management system - Provides a methodology for the classification of waste and provides standards for the assessment and disposal of waste for landfill disposal;
- Norms and standards - Baseline regulatory standards for managing waste at each stage of the waste management hierarchy;
- Licencing - The Act provides for a list of waste activities that require licencing and the setting of licencing conditions. The Act also provides for listing waste management activities that do not require a licence if undertaken according to specified norms and standards or requirements;
- Industry waste management plans - Enables collective planning by industry to manage their products once they become waste and to collectively set targets for waste reduction, recycling and re-use;
- Extended Producer Responsibility (EPR) - Identifies particular products that have toxic constituents or that pose waste management challenges, and regulates industry responsibility for these products beyond point of sale;
- Priority wastes - Identifies categories of waste that require special waste management measures due to the risks of these wastes to human health and the environment; and,
- Economic instruments - Encourages or discourages particular behaviour and augments other regulatory instruments.

Table 13. 15: Summary of NWMS goals and targets

	Description	Targets (2016)
Goal 1	Promote waste minimization, re-use, recycling and recovery of waste.	• 25% of recyclables diverted from landfill sites for re-use, recycling or recovery. • All metropolitan municipalities, secondary cities and large towns have initiated separation at source programmes. • Achievement of waste reduction and recycling targets set in IWMPs for paper and packaging, pesticides, lighting (CFLs) and tyres industries.
Goal 2	Ensure the effective and efficient delivery of waste services.	• 95% of urban households and 75% of rural households have access to adequate levels of waste collection services. • 80% of waste disposal sites have permits.
Goal 3	Grow the contribution of the waste sector to the green economy.	• 69,000 new jobs created in the waste sector. • 2,600 additional SMMEs and co-operatives participating in waste service delivery and recycling.
Goal 4	Ensure that people are aware of the impact of waste on their health, well-being and the environment.	• 80% of municipalities running local awareness campaigns. • 80% of schools implementing waste awareness programmes.
Goal 5	Achieve integrated waste management planning.	• All municipalities have integrated their IWMPs with their IDPs, and have met the targets set in IWMPs. • All waste management facilities required to report to report to SAWIS have waste quantification systems that report information to WIS.
Goal 6	Ensure sound budgeting and financial management for waste services.	• All municipalities that provide waste services have conducted full-cost accounting for waste services and have implemented cost reflective tariffs.
Goal 7	Provide measures to remediate contaminated land.	• Assessment complete for 80% of sites reported to the contaminated land register. • Remediation plans approved for 50% of confirmed contaminated sites.
Goal 8	Establish effective compliance with and enforcement of NEM:WA.	• 50% increase in the number of successful enforcement actions against non-compliant activities. • 800 EMIs appointed in the three spheres of government to enforce the NEM:WA.

The NWMS is structured around a framework of eight goals, which are listed in Table 13.15 together with the targets for each goal that must be met by 2016.

The National Policy for the Provision of Basic Refuse Removal Services to Indigent Households 2011 (Gazette No. 34385, Notice 413) aims to address the basic service backlog amongst the poor (indigent) households, particularly those essential services such as refuse removal. The key policy objectives are: i) establishment of a framework for the development, identification and management of indigent households within municipalities; ii) set principles for the adoption of by-laws for tariff policy implementation; and, iii) awareness raising regarding proper handling of domestic waste (e.g. minimization and recycling) within municipalities.

The National Policy in Thermal Treatment of General and Hazardous Waste, 2009 (Gazette No. 32444, Notice 777), expresses Government's intentions and commitment to allow for a range of technologies, including thermal waste treatment, for inclusion in the country's waste management system that ensures sound environmental management of waste. It also demonstrates government's commitment to continuous development and implementation of waste management options that are also consistent to the waste management hierarchy. This policy further closes the gap regarding the treatment of waste, since certain options were restricted due to lack of national policy direction on thermal treatment, dedicated incineration and co-processing in cement production.

The National Domestic Waste Collection Standards (Gazette No. 33935, Notice 21) are intended to deal with inequalities in the provision of waste collection services. They aim to set acceptable, equitable and sustainable collection services for residents to improve the quality of life within communities and ensure clean and more acceptable places to live and work in. These standards recognize the practical differences between areas based on cost efficiency of delivery of services. They are based on the principles of equity, affordability and availability of resources, practicality and community participation.

The Radioactive Waste Management Policy and Strategy for the Republic of South Africa 2005 was released by the DME to regulate and manage radioactive waste production, management and disposal in South Africa. Its purpose is to ensure the establishment of a comprehensive radioactive waste governance framework by formulating, additional to nuclear and other applicable legislation, a policy and implementation strategy in consultation with all stakeholders.

Other policy responses include introduction of various regulatory instruments such as the Waste Tyre Regulation, Regulations on Prohibition of the Use, Manufacturing, Import and Export of Asbestos and Asbestos Containing Materials, National Waste Information Regulations, standards for the regulation of radioactive wastes, conformance of quality systems to the requirements of the NNR as documented in the LD1002, and the requirements as documented in SABS ISO 9002, ISO 14001 (ISO Environmental Management Systems) and ISO 10006 (ISO for quality manamgement).

A list of legislation as well as draft documents (including policies) for public comments is available at www.sawic.org.za.

13.6.1.1 Performance monitoring

The extent to which waste management contributes to national performance targets is crucial as it provides a yardstick to measure progress and identify possible challenges with regard to waste issues. As such, the Presidency has developed a system to monitor government departments' performance in rendering services to the citizens.

Waste management is linked to Outcome 10 of the Presidential Delivery Agreement whose objectives are to ensure that "*Environmental assets and natural resources are well protected and continually enhanced*". Based on this performance system and its targets, waste management contributes to two of the outputs under this Outcome, namely:

- **Output 2**: Reduced greenhouse gas emissions, climate change and improved air quality: As waste minimization, diversion of waste from landfill, composting and reduced resource consumption will help to reduce carbon dioxide emissions; and,
- **Output 3**: Sustainable environmental management: As less and better managed waste is a key component of sustainable environmental management. Particular emphasis is placed on reduction of waste disposal to landfill sites, and the number of unlicenced waste disposal facilities.

Apart from Outcome 10, which is key in driving performance monitoring and setting clear direct outcomes for waste management, any actions taken to meet the requirements of this outcome will also indirectly support Outcome 4: Decent Employment through Inclusive Economic Growth, Outcome 8: Sustainable Human Settlements and Improved Quality of Household Life and Outcome 9: Responsive, Accountable, Effective and Efficient Local Government System.

It is evident from the outcomes set out in the Presidential Delivery Agreement that waste management is an essential sector, critical in meeting national economic and social development objectives.

13.6.1.2 Waste Management Officers

The NEM:WA provides for the designation of WMOs, whose main role is to co-ordinate waste management activities within and across the respective spheres of government to ensure implementation and co-ordination of the NWMS. In addition to this co-ordination of waste management activities, NEM:WA assigns specific regulatory powers to the National WMOs and Provincial WMOs. In terms of Section 58 (1) they may request the appointment of waste management control officers by holders of waste management licences, and in terms of Section 66(2) they may require the preparation of waste impact reports when the waste management licences are being reviewed.

13.7 PROVINCIAL AND LOCAL GOVERNMENT'S RESPONSE

Since the promulgation of NEM:WA, the development of IMWPs is now a legal requirement. IWMPs are called for by Chapter 3, Section 11 of NEM:WA wherein it stipulates that all spheres of government must develop IWMPs.

IWMPs are a tool to achieve the objects of NEM:WA as well as the NWMS and other high level government objectives for waste management. They are to be reviewed every five years in order to take stock of what has been achieved in those five years after which a municipality is required to set new priorities, goals and targets. This encourages municipalities to not only plan the immediate needs but for the future and should thereby have a plan in place of how it will improve its status with regard to waste management.

For municipalities in particular, a sphere of government where service delivery and the implementation of National policies, standards and regulations including Provincial ordinances takes place, the IWMP tool plays a vital role in giving effect to these. Section 12 of NEM:WA lists the minimum content requirement for IWMPs. Section 11(4) (a) (i) and (ii) states that:
"Each municipality must—
(i) submit its integrated waste management plan to the MEC for approval: and
(ii) include the approved integrated waste management plan in its integrated development plan (IDP) as contemplated in Chapter 5 of the Municipal Systems Act".

The integration of IWMPs to IDPs is very critical, especially since it will ensure that some of the projects highlighted in the plan might receive funding allocation and thereby be realised.

IWMPs are centered on a set of steps that are aimed at ensuring that a municipality must address all aspects of waste management, i.e. planning for infrastructure development (transfer stations and landfills sites), human resource matters, vehicles and maintenance, recycling initiatives, financing of waste management including full cost accounting, licencing status amongst others in accordance with a municipality's mandate. More importantly, IWMPs ensure that the manner in which waste should be managed in a municipality must be in accordance with the waste management hierarchy which encourages a new paradigm shift to how waste must be managed as opposed to the traditional way of managing waste that mainly focused on collection and disposal as illustrated below.

Once an IWMP has been developed, municipalities are required to produce annual performance reports which must be submitted to the Member of the Executive Council in order to indicate what they have been able to achieve in that given year.

13.7.1 Status of IWMPs in South Africa

There have been numerous 'First generation' IWMPs which were developed by provinces and municipalities as a result of the 1999 NWMS, even though IWMPs were not mandatory at that stage. The following status (Table 13.16) presents the number of IWMPs that were developed prior to NEM:WA and includes what is termed 'Second generation' IWMPs, those developed after the promulgation of the Act [1].

Table 13. 16: Number of IWMPs that were developed as a result of the 1999 NWMS

Province	Prior NEM:WA	After NEM:WA
Limpopo		
District municipalities	4	2
Local municipalities	17	-
Metros	-	-
Sub Total	21	2
TOTAL		**23**
Gauteng		
District municipalities	1	1
Local municipalities	2	4
Metros	-	1
Sub Total	3	9
TOTAL		**9**
Western Cape		
District municipalities	3	-
Local municipalities	24	2
Metros	1	-
Sub Total	28	2
TOTAL		**30**
Mpumalanga		
District municipalities	3	-
Local municipalities	5	-
Metros	-	-
Sub Total	8	0
TOTAL		**8**
North West		
District municipalities	1	3
Local municipalities	1	1
Metros	-	-
Sub Total	2	4
TOTAL		**6**
Northern Cape		
District municipalities	2	2
Local municipalities	1	11
Metros	-	-
Sub Total	3	13
TOTAL		**16**
Eastern Cape		
District municipalities	3	3
Local municipalities	29	-
Metros	1	-
Sub Total	33	3
TOTAL		**36**
Free State		
District municipality	-	5
Local municipality	5	2
Metros	-	-
Sub Total	5	7
TOTAL		**12**
KwaZulu-Natal		
District municipality	2	6
Local municipality	13	28
Metros	-	1
Sub Total	15	35
TOTAL		**50**
SUB TOTAL	***120***	***70***
TOTAL		***190***

In encouraging more municipalities to develop their IWMPs, the DEA developed a guideline for the development of IWMPs in 2012. This was aimed at assisting municipalities to develop their IWMPs and thereby comply with the provisions of NEM:WA. In addition to the guidelines, DEA also developed an IWMP webportal which is modelled against the guideline and is aimed at streamlining the IWMP development process.

13.7.2 Private sector response

Waste recycling presents an opportunity to save resources, reduce the environmental impact of waste by reducing the amount of waste disposed at landfills, and create employment opportunities.

In South Africa, the majority of commercial waste recycling initiatives have been developed on an *ad hoc* basis and have been driven by the private sector, with little or no financial inputs or support from the government (DEA 2009a). Even though government has tried to stimulate waste recycling by introducing waste buy-back centres, garden waste drop-off centres, separation of different waste streams, such as glass, paper/cardboard, cans, scrap metal, plastics and garden waste, these stimulation efforts have so far been relatively ineffective. This can be observed by the large quantities of recyclable materials in waste arriving at landfill sites, which is further confirmed by informal waste picking.

The private sector, which has responded to recycling as a business opportunity, has been a lot more effective in increasing the rates of recovery and recycling of certain waste streams. For example, industry is recycling around 40 per cent of all packaging and paper consumed (DEA 2009a). Table 13.17 provides a summary of recycling paper and packaging material during 2007.

1 Status as of October 2012

Table 13. 17: Total recycled paper and packaging material for 2007

Packaging material	Total industry (tonnes)	Paper & packaging material recycled (tonnes)	Recycle
Glass	860,000	164,685	19.1
Metal cans	240,679	171,100	71.1
Paper (pack & print)	1,914,362	1,030,445	53.8
Plastic packaging	655,052	131,677	20.1
TOTAL	**3,670,093**	**1,497,907**	**40.8**

Source: DEA (2009a)

Table 13. 18: Waste glass recycled during the period 2005/06 to 2007/08

Year	2005/06	2006/07	2007/08
Glass recycled (tonnes)	148,000	183,200	204,685
Recycling rate	21	23	24

Source: DEA (2009a)

The glass-recycling sub-sector has a yearly turnover of about R200 million, the paper sub-sector R900 million, and the plastic sub-sector a yearly turnover of about R800 million (DEA 2009a). Table 13.18 provides a percentage rate and volumes (in tonnage) of glass recycled between 2005 and 2008.

The paper recycling industry alone has in recent years invested an estimated R400 million in recycling initiatives in South Africa and large-scale investments have also been noted in the recycling of glass, cans and plastics (PACSA 2007). Figure 13.7 shows the relative scale of the main components of the recycling industry by both turnover and capital base (DEA 2009a).

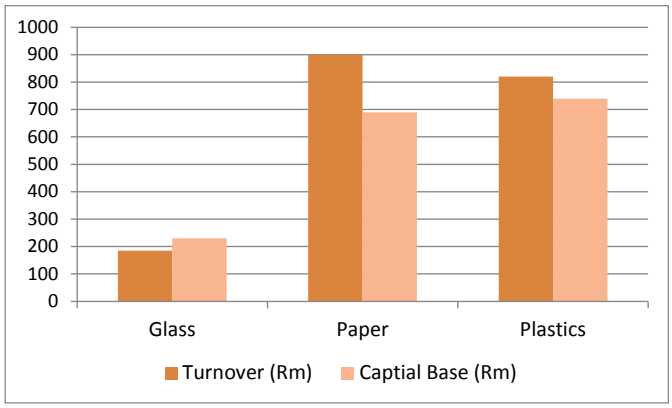

Figure 13. 7: Scale of recycling industry by product
Source: Lowitt (2008)

Recycling is seen to provide substantial opportunities for job creation within the waste sector. According to the findings by Global Insight, on behalf of the DTI, the waste plastic recycling makes up the biggest contribution, currently employing 40,000 people, followed by cans (37,000), glass (16,800) and then paper (12,600) (Figure 13.8). Aluminium cans generate the most GDP and employment per tonne recycled (Global Insights 2008).

There are significant opportunities for job creation in the recycling industry. Of particular importance is the issue of where job creation gains are the greatest in the recycling process. Given the capital intensive nature of the recycling process, however, recycling itself will never be a major job creation source (DEA 2009b), but waste material collection and sorting, and job creation via the development of new enterprizes creating alterative products from waste materials is full of potential. Waste collection is highly dependent on labour at present and while there is potential for job creation at this stage, there may be a need in future to adopt more efficient waste collection processes, which are less labour intensive, in order to increase the rate and inflow of recyclable materials into the industry (Lowitt 2008).

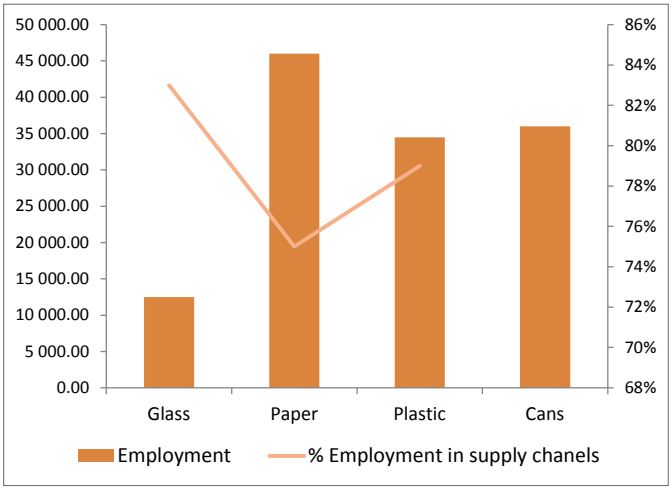

Figure 13. 8: Employment in recycling industry by product
Source: DEA (2009b)

13.8 COMPLIANCE MONITORING AND ENFORCEMENT

Waste compliance and enforcement are dealt with in Chapter 7 of the NEM:WA, which describes the compliance powers of the Minister of Water and Environmental Affairs, waste impact reports, offenses and penalties. Chapter 7 of the NEM:WA must be read in conjunction with Chapter 7 of the NEMA, as amended, which establishes a system of compliance monitoring and enforcement for all environmental legislation, including the appointment of EMIs at all levels of government. Goal 8 of the NWMS is to employ 800 EMI's at all spheres of government and to increase the number of successful enforcement actions against non-compliant activities by 50 per cent.

The NEM:WA, sets out a system of offences and penalties, and provides a list of offences identified by Section 67 as well as the associated penalties as provided by Section 68. This information is presented per sphere of government and also includes a list of compliance matters where they occur across all three spheres of government.

Waste impact reports are an additional compliance monitoring measure created by the NEM:WA that can be utilized to deal with instances of suspected non-compliance or transgression of norms and standards. Table 13.19 outlines the two circumstances in which a waste impact report may be requested.

Table 13. 19: Circumstances for requesting a waste impact report

Section	Responsible	Action
66.(1)	Environmental Management Inspector	Suspected contravention of failure to comply with the Act or any conditions of a waste management licence or exemptions, which has had a detrimental effect on health or the environment.
66.(2)	Waste Management Officer	May request the preparation of a waste impact report if a waste management licence is under review (S53).

Source: DEA (2009c)

The NEM:WA empowers the Minister to exercise the Minister's powers under Section 19, 53 and 155 of the National Water Act in regard to contraventions of the NEM:WA that impact on a water resource. Since the water legislation has now been assigned to the Minister of Water and Environmental Affairs, these powers are now vested in the same Minister. Therefore, this is read as the Minister of Water and Environmental Affairs may exercise the powers conferred to her in respect of listed waste management activities (Section 19) and review of waste management licences (Section 53). The Minister also has powers in respect of the National Water Act where a person contravenes or fails to comply with any condition of a waste management licence, a remediation order or measures specified in terms of Section 38(3) that may impact negatively on a water resource.

The primary arrangements for compliance monitoring and enforcement of NEM:WA are not covered by NEM:WA, but by an amendment to the NEMA, which came into effect on 1 May 2005 (DEAT 2005).

13.8.1 Environmental Management Inspectorate

Chapter 7 of NEMA provides for EMIs to be designated by the Minister and provincial MECs. The Environmental Management Institute is a network of environmental enforcement officials drawn from different government departments at national, provincial and local level. Officials from the DEA, provincial environment departments, other provincial organs of State, municipalities and parastatal bodies can be designated as EMIs.

EMIs must monitor compliance with and enforce the specific environmental legislation that they have been mandated to enforce. These mandates are determined when EMIs are designated by the Minister or relevant provincial MEC. The NEM:WA will form part of this assignment, and it may be assigned to dedicated EMIs responsible for its enforcement. EMIs can also be mandated to enforce a range of legislation depending on their particular functions, and it is possible for EMIs dealing with NEM:WA to also enforce related legislation such as NEMA, and the regulations promulgated under NEMA, and the Air Quality Act. EMIs are also empowered to enforce any authorizations issued under their mandated legislation, including permits, licences and EIA authorizations (records of decision).

EMIs have a number of important powers and responsibilities that enable them to enforce environmental legislation. These powers include:

- Powers of inspection, such as entering premises to check compliance, and seizing evidence of non-compliance;
- Powers of investigation, such as interrogating witnesses, seizing documents, taking samples and removing waste;
- Powers of enforcement, such as search and seizure of premises, containers, vessels, and vehicles, establishing roadblocks and making arrests; and,
- Administrative powers such as issuing compliance notices.

The above powers are awarded to EMIs based on a ranking system, depending on experience, qualifications and seniority. A Grade 1 EMI being the highest level.

13.9 CONCLUSION

A number of conclusions can be drawn from the national status reporting on waste management.

It is clear that specific focus is placed on the application of the waste hierarchy both in policies, strategies and implementation.

Since the last environmental reporting in 2006, a number of key policy and regulatory instruments, including the promulgation of NEM:WA (the first focussed legislation on waste in South Africa), has been developed.

Clear roles and responsibilities of government institutions and the legislative mandates for key spheres of government involved in waste management have been developed. South Africa remains in the forefront on waste management amongst developing countries and is committed to implement a world class system that will improve waste management in the country.

Municipal solid waste management can be identified as one of the areas of municipal functioning with the greatest potential for job creation, particularly with respect to unskilled or semi-skilled labour. The waste management service function within municipalities contributes significantly towards municipal income and revenue due to the user-pay principle applied for waste management.

The analysis of the two main waste classes, i.e. general and hazardous waste, shows a number of interesting findings:

- Municipal solid waste constitutes a large percentage of the total waste generated in urban and rural areas. Municipalities are the key players in dealing with waste. South Africa generated approximately 108 million tonnes of waste in 2011, of which 98 million was disposed of at landfill. In the order of 59 million tonnes is general waste, one million tonnes is hazardous waste and the remaining 48 million tonnes is unclassified waste, which still needs to be classified based on analytical data;
- Approximately ten per cent of all waste generated in South Africa was recycled in 2011. Waste management in South Africa is thus still heavily reliant on landfilling as a waste management option, with 90.1 per cent of waste generated being disposed of to landfill in 2011. The big metropolitan municipalities continue to allocate more budgets, appoint better qualified staff, and have well organized structures to deliver waste services. However, there is still a strong need for continued strengthening and expansion of waste services to reach people still without access to this service;
- The overall backlog in the provision of solid waste services is around two million households, with some 900,000 households not receiving any service. The service backlogs are highest in metros and secondary cities;
- Waste recycling presents an opportunity to save resources, reduce the environmental impact of waste by reducing the amount of waste disposed at landfills, and create employment opportunities. In South Africa, the majority of commercial waste recycling initiatives has been developed on an *ad hoc* basis and has been driven by the private sector, with little or no financial inputs or support from the government;
- Waste management services rely heavily on landfills for the disposal of waste, as over 90 of all South Africa's waste is disposed of at landfill sites. The reliance on waste disposal by landfills has limited the incentive to devise alternative methods of dealing with waste. Furthermore, a urgent need for addressing the backlog in the licencing of landfill sites exists; and,
- For hazardous waste, a general lack of adequate reliable information exists making quantifying mass balance for hazardous wastes difficult. An indication of the status of hazardous waste in South Africa can be sourced from Provincial Hazardous Waste Management Plans. However, only four provinces have completed Provincial Integrated Hazardous Waste Management Plans. It was found that in Gauteng, for example, almost all hazardous waste generated is disposed to landfills, and that in Western Cape and North West most hazardous waste generated is unaccounted for in relation to treatment or landfilling. There was no data for Mpumalanga.

A number of waste issues have emerged during the last years. Of particular interest are e-waste streams, waste-to-energy and the green economy. Each of these emerging issues is outlined below.

e-Waste: -E-waste is a relatively new waste category for which there is currently a lack of formal disposal mechanisms. Due to the many hazardous components and materials used in the manufacture of electronic goods, including mercury, brominated flame retardants, and cadmium, this is considered a hazardous waste stream. Used electrical goods are often imported into the country as donations, but in some cases, what is being imported is effectively WEEE. There is significant job creation potential in the recycling of e-waste, and several initiatives have and are being set up. The hazardous nature of this waste stream and the small margins of profit generated must be carefully considered when encouraging the recycling of WEEE (DEA 2012a).

Waste-to-energy - Some municipalities have begun waste-to-energy schemes. eThekwini is extracting landfill gas and generating electricity from the Marianhill and Bisasar Road landfills, and Johannesburg has piloted energy generation from incinerating health care risk waste. Energy recovery schemes are incentivised by the potential to generate carbon credits and their associated revenues. It is estimated that landfill energy plants can have a capacity of between 20 and 50 MW, with a life-of-plant of 30-years (DEA 2012a). However, disposal of organic waste to landfill should not be supported to sustain landfill gas recovery projects. Where possible organic waste should be diverted from landfill for alternative treatment options such as anaerobic digestion or composting. Landfill gas projects should be seen as a means of dealing with historic disposal of organic waste and resultant landfill gas generation. Opportunities for waste-to-energy from thermal treatment processes need to be further explored in combination with recycling as an alternative to landfilling of waste.

Green Economy - Over the last two years, the concept of a green economy has moved into the mainstream of policy discourse. Transitioning to a green economy has sound economic and social justification. For South Africa, and in the waste management sector in particular, this transition would involve levelling the playing field for greener products by reforming policies and developing incentives, strengthening market infrastructure, redirecting public investment, and greening public procurement. For the private sector, this involves responding to policy reforms and government incentives through increased financing and investment, as well as building skills and innovation capacities to take advantage of opportunities arising from a green economy in the waste management sector.

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