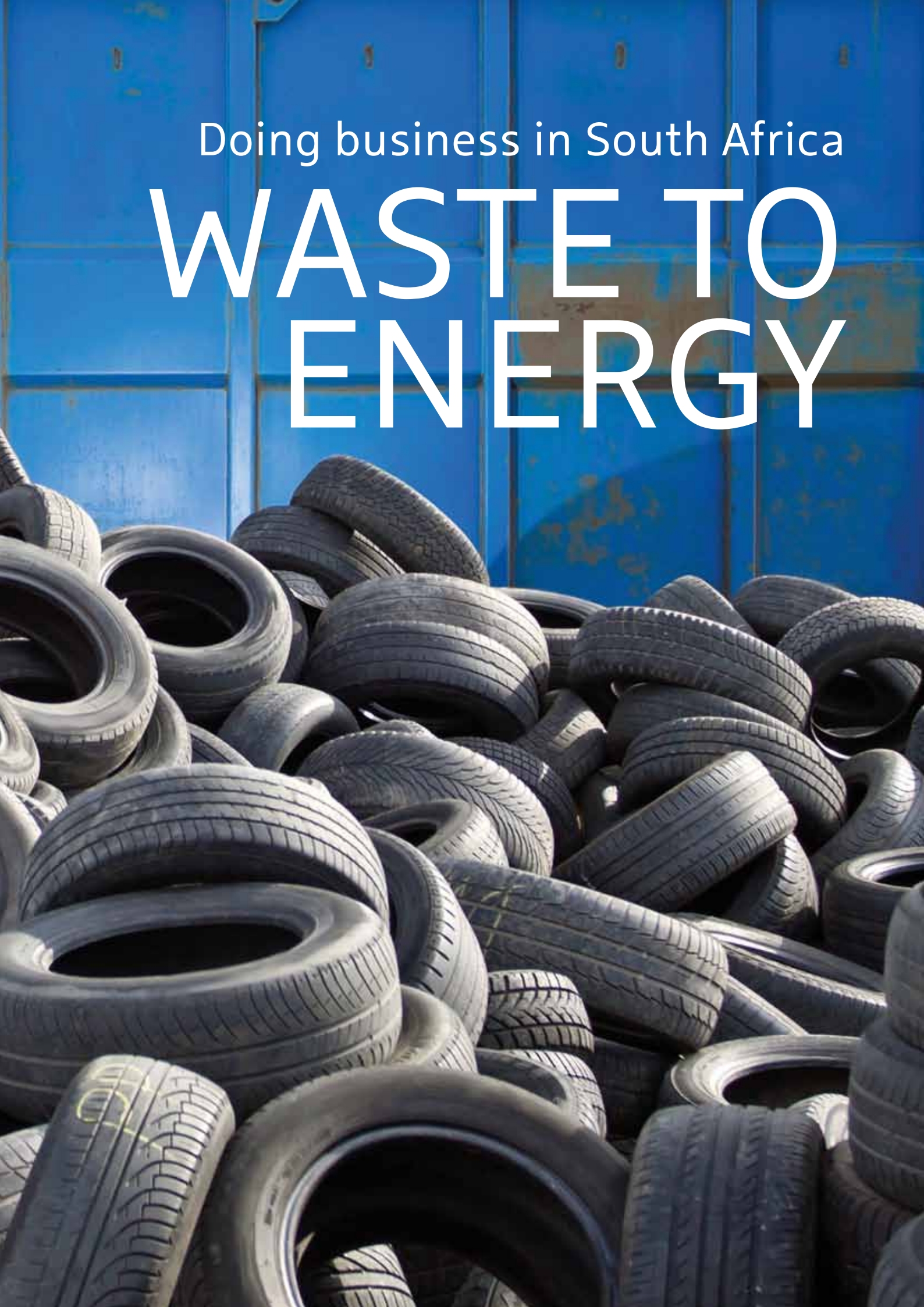
Doing business in South Africa

WASTE TO ENERGY



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FOREWORD

This market entry study provides an overview of the South African Waste-to-Energy market. The study is one of four aimed at informing the entrepreneurs in the Netherlands about the South African renewable energy market with a special focus on Green Buildings, Waste-to-Energy, Biomass-to-Energy and Wind energy.

The South African demand for energy is growing and renewable energy is part and parcel of government policy. This offers interesting market opportunities for the Netherlands. The Embassy of the Kingdom of the Netherlands welcomes this development and sees potential for bilateral cooperation to strengthen the renewable energy sector in South Africa with active participation of the Dutch private sector. The Dutch renewable energy and energy efficiency industry has significant expertise in several fields of clean energy, with a high degree of knowledge, reputable research institutes and innovative industry players. The Embassy believes that cooperation between South Africa and the Netherlands could benefit both countries, as it will allow for technology and knowledge transfer and exploring new market segments.

The Embassy in Pretoria and the Consulate General in Cape Town – in cooperation with Agency NL the implementing agency of the ministry of Economic Affairs- offer support to Dutch companies that are already active or want to become active in South Africa. For more information about doing business in South Africa, our services and financial support please visit: zuidafrika.nlambassade.org or www.agentschapnl.nl.

We hope this study will assist you in exploring South Africa or expand your activities in this interesting and beautiful country. If based on this information you would like to further discuss then please contact us through pre-ea@minbuza.nl

June, 2013
André Haspels
AMBASSADOR
of the Kingdom of
the Netherlands
to South Africa.

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ACRONYMS

B-BBEE	Broad-Based Black Economic Empowerment
BRICS	Brazil, Russia, India, China and South Africa
CEF	Central Energy Fund
CER	Certified Emissions Reductions
CO	Carbon Monoxide
CPI	Consumer Price Index
CSIR	Counsel for Scientific and Industrial Research
DBSA	Development Bank of South Africa
DEA	Department of Environmental Affairs
DoE	Department of Energy
DST	Department of Science and Technology
DTI	Department of Trade and Industry
EGI-SA	Electricity Governance Initiative of South Africa
EIA	Environmental Impact Assessment
EPC	Engineering, Procurement, and Construction
ESETA	Energy Skills Education Training Authority
FET	Further Education and Training
GEF	Global Environment Facility
GEEF	Green Energy Efficiency Fund
GHG	Green House Gas
GMT	Greenwich Mean Time
ICBC	Industrial and Commercial Bank of China
IDC	Industrial Development Corporation
IDM	Integrated Demand Management
IPAP	Industrial Policy Action Plan
IPP	Independent Power Producer
LGSETA	Local Government Skills Education Training Authority
LRED	Local and Regional Economic Development
MCEP	Manufacturing Competitiveness Enhancement Programmes
MERSETA	Manufacturing, Engineering and Related Services Skills Education Training Authority
MFMA	Municipal Finance Management Act (56 of 2003)
MQA SETA	Mining and Minerals Sector Skills Education Training Authority
MRF	Materials Recovery Facility
MSA	Municipal Systems Act (32 of 2000)
NCV	Net Calorific Value
NDP	National Development Plan
NECSA	South African Nuclear Energy Corporation Ltd.
NERSA	National Energy Regulator of South Africa
NGP	New Growth Path
NSSD	National Strategy for Sustainable Development
NWMS	National Waste Management Strategy
PFMA	Public Finance Management Act (1 of 1999)
PPA	Power Purchase Agreement
PPP	Private Public Partnership

EXECUTIVE **SUMMARY**

THE WASTE INDUSTRY IN SA IS DOMINATED BY THREE TRENDS NAMELY:

- **Increased generation of waste through high urbanisation rate.**
- **Increased generation of waste due to economic growth in commercial, industrial and services sectors.**
- **Increased reduction, recycling and recovering of waste.**

The recent developments in the South African policy environment give a strong notion of the acknowledgement of the needs and benefits that transformation into the integrated green economy can bring. South Africa (SA) generates millions of tonnes of waste annually, with the primary method of waste disposal being landfilling. Less than 10% of South African municipalities generate electricity from landfill gas Waste-to-Energy (WtE) processes, and only the larger municipalities that realised the economies of scale have so far implemented WtE projects. SA is still in its infancy when it comes to WtE, but shows definite interest which will be raised to a necessity with increased environmental pressure and regulations.
The landfill-only culture of SA is disappearing and giving way to "green technologies" comprising an array of waste management methods and technologies. There is a high demand for waste recycling, reduction in volumes of waste to landfill, as well as more economical solutions that reduce waste disposal while providing energy in the large urban conurbations.

This ultimately leads to greater volumes of municipal, commercial and industrial waste; waste of a different complexity and composition, such as different types of plastics, and increased opportunity for waste management and recovery technologies.

Social and economic factors followed by government regulations are the key drivers behind the development of the WtE industry in SA. The available surface space of landfill sites in the more densely populated urban areas are declining. Furthermore, skills shortage and lack of Research and Development (R&D) investment in the industry are additional barriers to growth of the sector. Despite these constraining factors, there are numerous opportunities to be captured.

CONSIDERING THE EXPERTISE OF THE DUTCH COMPANIES, THE AREAS THAT OFFER THE GREATEST POTENTIAL FOR GROWTH AND SUBSEQUENT OPPORTUNITIES FOR MARKET ENTRY INCLUDE, INTER ALIA:

- **Variety of urban waste management technologies.**
- **Waste separation/recycling and waste conversion technologies (e.g. refuse derived fuel).**
- **WtE skills transfer.**
- **WtE solutions for industries (agro processing; automotive and components manufacture; plastics; chemicals; pulp and paper; bio-fuels; and extractive industries).**
- **Out-of-the-box WtE solutions for:**
  - **Remote and industrial areas, e.g. in the forestry sector and mining industries.**
  - **Small and medium-scale farming activities.**

The Dutch WtE sector is already advanced and equipped with the necessary experience and know-how. Therefore the opportunity exists for these Dutch companies to implement their WtE applications in SA. Dutch companies could potentially form a partnership with South African companies in the form of a Public Private Partnership (PPP).
The SWOT analysis of the WtE industry in SA is evaluated below:

STRENGTHS	WEAKNESSES/ THREATS	OPPORTUNITIES
• **Significant quantities of landfilled waste and untapped waste resources.** • **Access to relatively advanced banking and financial institutions.** • **A developing regulatory and legislative system.** • **Declining air space of landfill sites in the metropolitan municipal areas.** • **Shortages in electricity supply.** • **Greenhouse gas reduction initiatives.** • **Policy including the National Waste Management Strategy (NWMS) and the Department of Energy (DoE) Independent Power Producer (IPP) programmes that allocated 25MW to electricity to be derived from landfill gas and 12.5MW to be derived from biomass.**[1]	• **Bureaucratic challenges when dealing with national, provincial and local government.** • **Opposition from environmental and citizen groups that can lead to delays in issuing of environmental authorisations and licences.** • **WtE systems require large investments.**	• **Supply of waste concentrated mainly in the larger municipalities (Cape Town, Pretoria, Johannesburg, etc.)** • **Increasing cost of coal and electricity creating a demand for alternative energy sources.** • **Households and light commercial waste equal to more than 5 million tonnes per annum (2012).** • **Small-scale out-of-the-box WtE solutions implemented on farms/ remote areas or in the forestry and mining industries.**

[1] Figures from http://www.ippre-newables.co.za/#page/303

1 DEVELOPMENT FRAMEWORK

SA was ranked 14th in the world in 2011 for Green House Gas (GHG) emissions, emitting a total of 369.4 million tonnes for that year (3). This large quantity of emissions is due to the relatively high energy intensity of the national economy and its reliance on coal as the primary energy source. The energy crisis in 2008 fuelled public awareness of the need to use energy efficiently. In light of this, SA recognised the need for transformation and the shift towards a more resource efficient low-carbon economy that can lead to new sources of growth and compliment economic reforms that support greater competitiveness (4). Government has become increasingly committed to a more environmentally sustainable economy in all sectors through a range of policies and programmes to minimise emissions and maximise the efficient use of energy. The following sections outline the prominent policies and regulations that directly or indirectly promote the development of the WtE industry in the country.

1.1 General Policies

The overall WtE trend in the country stems from government's focus on greening the economy and improving energy efficiencies. The most important general policies that will have a direct or indirect influence on WtE in SA include the following:

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TABLE 1: GENERAL GOVERNMENT POLICIES APPLICABLE TO THE WTE INDUSTRY

THE NATIONAL DEVELOPMENT PLAN (NDP) 2030, 2011

- **The NDP is a long-term economic strategy encompassing political and social development objectives.**
- **The NDP sets out steps that aim to transform the South African energy system and reduce greenhouse emissions. The target is set up to procure 20 000MW of electricity from renewable energy by 2030 and entrench an economy-wide carbon price by 2030.**

THE ENERGY EFFICIENCY STRATEGY, 2008 – FIRST REVIEW[2]

- **The Energy Efficiency Strategy is the first governmental document that guides the development and implementation of energy efficiency practices in the country. The strategy is aimed at reducing the energy demands of industrial and residential locations through education and rollout of novel technologies that could be used onsite to supplement their energy demands. On-site energy production could fall into this classification especially if it uses waste already present or produced on site.**

2. The Draft Second National Energy Efficiency Strategy Review was published on 27 July 2012 but has not yet been finalised and gazetted.

NEW GROWTH PATH (NGP) FRAMEWORK, 2010

- **The NGP is a policy aimed at enhancing growth, employment creation and ensuring that the country's benefits are shared equitably by all citizens.**
- **The development of the green economy is identified as a facilitator for employment creation, whereby 400 000 additional jobs are targeted to be created in the green economy by 2030.**
- **The NGP Framework asked for the development of codes for commercial buildings to reduce energy use and waste and called for the promotion of greater investment by the private sector in green technologies.**

NEW GROWTH PATH: ACCORD 4. GREEN ECONOMY ACCORD, 2011

- **The Green Economy Accord is an outcome of the social dialogue on the NGP Framework and is a commitment signed by government, organised labour, business, and community constituents.**

NATIONAL STRATEGY FOR SUSTAINABLE DEVELOPMENT AND ACTION PLAN (NSSD), 2011 – 2014

- **The NSSD is a proactive strategy that regard sustainable development as a long-term commitment, combining environmental protection, social equity and economic efficiency with the vision and values of the country. The strategy calls for the diversification of energy sources and implementation of energy efficiency programmes, encouraging investment in renewable energy.**
- **The strategy promotes the implementation of green cities and towns, event greening and tourism.**

MUNICIPAL SYSTEMS ACT 2000 (ACT NO. 32 OF 2000) (MSA)

- **To provide for the core principles, mechanisms and processes that are necessary to enable municipalities to move progressively towards the social and economic enhancement of local communities, and ensure universal access to essential services that are affordable to all.**
- **The MSA involves the planning and implementing of municipal service delivery, that include waste management, as well as the upgrading, extension and improvement of these services.**

MUNICIPAL FINANCE MANAGEMENT ACT NO. 56 OF 2003 (MFMA)

- **National Treasury's primary objective is to secure sound and sustainable management of the financial affairs of government, national, provincial and local, and to lead such policies and reforms. This entails supporting the development of a coherent approach that assists in the improvement of delivery of services to communities.**
- **The MFMA states that a municipality may enter into a PPP agreement, only if the municipality can demonstrate that the agreement will, a) provide value for money to the municipality; b) be affordable for the municipality; and c) transfer appropriate technical, operational and financial risk to the private party.**

Management for non-hazardous residential and institutional waste in metropolitan areas is the responsibility of local government authorities, while management for non-hazardous commercial and industrial waste is the responsibility of the generator. In certain rural areas waste management is not available and is therefore the responsibility of the residents.

1.2 Industry Regulations

The rules and regulations that (foreign) parties who wish to enter the SA market must be aware of and adhere to are specified in this section.

1.2.1 General Socio-Economic Policies

POLICY	OVERVIEW
ENVIRONMENTAL	
The National Environmental Management Act (NEMA) 107 of 1998 The National Environmental Management: Waste Management (NEM:WA) Act 59 of 2008 The National Environmental Management: Air Quality Act (NEM: AQA), 2008	• These acts are for the requirements of all environmental legislation in SA, covering air quality, waste, water use, and general environmental impacts. The focus is on environmental responsibility and steps to take with operating facilities that pose a potential risk to the environment.
Minimum Requirements for Handling, Classification and Disposal of Hazardous Waste, 1998	• Any hazardous waste classification, handling and disposal will have to comply with the steps listed in the requirements stated in this series of documents. • One of the suggested treatment options includes incineration that could be combined with power generation.
White Paper on Integrated Pollution and Waste Management, GN 227 March 2000	• The White Paper focuses on pollution prevention at the source so as to minimise the impact on the receiving environment and rehabilitation of degraded environments.
ECONOMIC	
Industrial Policy Action Plan (IPAP), 2012/2013	• An overall policy to guide industrial development and focus resources on identified critical sectors to improve the local economy and job market. • Under green industries, waste management and the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) exist.
ENERGY AND ELECTRICITY	
REIPPPP, 2011	• REIPPPP replaced the Renewable Energy Feed in Tariff programme where prospective producers of sites with capacity over 5MW must bid and the producer with the lowest feed in tariff wins. The bidding is done bi-annually. This could provide a potential source of financial and operational support for certain technologies (onshore wind, concentrated solar thermal, solar photovoltaic, biomass, biogas, landfill gas, small hydro, and small projects). • A separate programme called The Small Projects IPP Procurement Programme is currently being developed for projects under 5MW. The DoE issued Request for Information documents for small-scale renewable energy projects (15 June 2012).
The Integrated Resource Plan, 2011	• A long-term planning framework to supply SA's power needs at the lowest cost. One of the listed potential sources for energy production is Municipal Solid Waste (MSW).
Electricity Regulations on New Generation Capacity, 2010	• Sets frameworks from negotiations between IPP's and buyers which will have to be adhered to by renewable energy producers. • To facilitate planning of new power generation facilities, regulation of entry into a power purchase agreement and to set minimum standards for such agreements.
Amended Electricity Regulations Act, 2006	• To establish a national regulatory framework for the electricity supply industry; to make the National Energy Regulator of South Africa (NERSA) the custodian and enforcer of the national electricity regulatory framework; to provide for licences and registration as the manner in which generation, transmission, distribution, trading and the import and export of electricity are regulated; and to provide for matters connected therewith. • Also aims to diversify energy sources.
White Paper on the Renewable Energy Policy, 2004	• The purpose of this White Paper is to set out government's principles, goals and objectives for renewable energy. It furthermore commits government to a number of enabling actions to ensure that renewable energy becomes a significant part of its energy portfolio over the next ten years. • Government intends to strategically develop the renewable energy resources in the future in a systematic way. The challenge for the Government will be to provide sufficient incentives for the renewable energy-based industries to develop, grow and to be sustainable in the long-term.
WASTE MANAGEMENT	
South Africa's National Policy on the Thermal Treatment of General and Hazardous Waste, GN. R. 777 of 24 July 2009	• This policy document presents government's position on thermal waste treatment as an acceptable waste management option in SA, and provides the framework within which the following thermal waste treatment technologies shall be implemented in the country: (i) The incineration of general and hazardous waste in dedicated incinerators or other high temperature thermal treatment technologies, including but not limited to pyrolysis and gasification.

National Waste Management Strategy (NWMS), 2012	(ii) The co-processing of selected general and hazardous wastes as alternative fuels and/or raw materials in cement production. • NWMS is a legislative requirement of the NEM:WA. The purpose of the NWMS is to achieve the objects of the NEM:WA. Organs of state and affected persons are obliged to give effect to the NWMS. • Waste management in SA faces numerous challenges and the NWMS provides a plan to address them.

Although SA has a developing policy and regulatory framework, the South African Government does not promote the waste management hierarchy. The implementation of significant components of policy and laws are lacking. This is mainly due to limited government capacity.

1.3 Regulatory Environment - Licensing

The South African environmental legislation is well developed and comprehensive, regulating both the natural as well as the spatial and social aspects of the environment. More pertinently to the recovery of waste, SA legislation regulates every single aspect of WtE including water and effluent, waste recovery and disposal, emissions to air and air quality, biodiversity and land-use compatibility, visual impact and sense of place. The NEMA prescribes the over-arching environmental legal framework within which inter alia industry, waste managers and all spheres of government in SA operate. Several specific environmental acts (SEMAs) have subsequently been promulgated under NEMA to specifically regulate among other the air quality and waste management. The most pertinent of the SEMAs to the WtE sector are NEM:AQA and the NEM:WA.

Regulations published under the NEMA, NEM:AQA and NEM:WA respectively provides guidance to would-be investors and waste managers on their environmental legal obligations towards potentially establishing a WtE facility in SA. The said regulations contain inclusive lists of activity descriptions and associated thresholds that provide the trigger mechanism as to whether a proposed projects or any aspect thereof requires environmental authorisation from a competent authority to proceed.

DEPENDING ON THE PROPOSED TECHNOLOGY, GENERATION CAPACITY AND WASTE STREAM CONCERNED, ANY PROPOSED WTE FACILITY IN SA MAY TYPICALLY REQUIRE ONE OR MORE OF THE FOLLOWING THREE AUTHORISATIONS/LICENCES:

- **NEMA EIA Regulation Environmental Authorisation: triggered by various activities potentially associated with significant impacts. In the case of the WtE sector these triggers relate to electricity generation capacity, combustion/ thermal processes and emissions to atmosphere and changes in land use amongst others.**
- **NEM:WA Waste Activity Regulation Waste Management License: required for various activities concerning handling storage recovery or treatment of waste created on the producer's site or elsewhere.**
- **NEM:AQA Air Emission License: required for any air emissions from the combustion or thermal process and/ or recovery of wastes.**

With respect to the EIA requirements, projects applying non-thermal technologies to general waste streams (e.g. digestion) and producing less than 10MW of electricity will not require a basic assessment. Facilities producing between 10MW and 20MW will require a basic assessment. However, in the case where more than 20MW of electricity is generated a full Scoping and EIA process is essential. Basic assessment pertains to smaller-scale activities that are considered less likely to have significant environmental impacts and, therefore, do not require a full-blown and detailed Scoping and EIA. Scoping and EIA requires a thorough environmental assessment of activities that, due to their nature and/ or extent, are likely to have significant impacts that cannot be easily predicted.[3]

A Scoping Report requires a description of the proposed activity and any feasible and reasonable alternatives, a description of the property and the environment that may be affected and the manner in which the biological, social, economic and cultural aspects of the environment may be impacted upon by the proposed activity. It comprises of a description of environmental issues and potential impacts, including cumulative impacts that have been identified and details of the public participation process undertaken. The Scoping and EIA process culminates in the development and submission of the EIA report and the Draft Environmental Management Plan to the Department of Environmental Affairs (DEA) for hazardous waste treatment and power generation projects participating in the REIPPPP or provincial environmental authorities for general waste and power projects not participating in REIPPPP.

3. For more details on activities that require EIA authorisation refer to the NEMA EIA Regulations (GN. R. 543 of 18 June 2010.


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The Scoping and EIA process would typically take 12 to 18 months to conclude and require funding in the order of R500 000 to R1 750 000 to complete (including professional fees and disbursements). The cost depends on both the size and complexity of the project as well as the sensitivity of the receiving environment. Actual expenditure on the EIA process would ultimately depend on the level of complexity in the air dispersion modelling/assessment. This is required to determine a proposed project's potential impacts on existing ambient air quality in the area of influence, as well as the nature and extent of public participation required to ensure that potentially interested and affected parties are afforded due opportunity to participate in the EIA process. WtE projects may bring about the need for specialist hydrogeological and/ or soil impact studies that requires an application for a Water Use Licence (WULA) in terms of the provisions of the National Water Act, 1998 (Act No. 36 of 1998)[NWA].

In instances where WtE projects concerns combustion or thermal treatment of waste, the so called NEM:AQA stack emission limit regulations will apply.[4] These regulations outline the regulated stack emission limits for the specified pollutants. These limits may be made more conservative at the licensing authority's discretion, in instances where ambient air quality is already poor. Government Notice 1210 of 2009 and 486 of 2012 gives the regulated ambient air quality limits in SA for the stated pollutants. The performance of any proposed facility/ technology would need to be demonstrated/ modelled to comply with these limits; where stack emissions would typically be modelled at regulated limits.

4. For more details one stack emission limits refer to NEM:AQA stack emission limit regulations as set out in Government Notice 248 of 2010, 31st March.

2 WASTE-TO-ENERGY IN SOUTH AFRICA

Waste management practice in SA historically has had access to freely available land, characterised by low density settlements and arid conditions with abundant supplies of coal. This has translated into very limited incentives to divert commercial, industrial and municipal waste streams away from landfill and towards waste management alternatives. This is in contrast with countries such as the Netherlands. The landfill-only culture of SA is no longer sustainable and SA is now slowly taking up "green technologies" and hereby comprising an array of waste management methods and technologies. Although waste management practices are starkly contrasted between urban and rural local authorities, there is a high demand for waste recycling, reduction in volumes of waste to landfill, as well as more economical solutions that reduce waste disposal while providing energy in the large urban conurbations. Materials Recovery Facilities (MRFs) already gaining ground in SA and the next step is certainly the introduction of appropriate and sustainable WtE plants that incorporate Mechanical Biological Treatment, composting or anaerobic digestion with separate collection and recycling.

WtE projects are enabled by various push and pull factors, most notably by land availability and landfill space. Both typically causing increases in landfill gate costs. Pull factors are typically electricity sales and avoided disposal costs. This has translated into very limited incentives to divert waste streams away from landfill and towards waste management alternatives. Furthermore, despite advances in emission control and stricter emission regulations, public perception is that anything that requires combustion still produces significant emissions and may be opposed as incineration of waste. In the case of incineration activities there is opposition from certain environmental groups arguing that the only real sustainable solution is zero waste which is only achievable through minimisation and recovery practises.

In the case of municipal waste management, both waste collection and disposal is largely implemented by the local municipalities with private waste management undertaken in commercial and industrial sectors. Waste from commercial and industrial sectors may be accessed through private waste supply agreements. A PPP with the municipalities is necessary in all instances where a private developer will engage with a local authority to source waste over a long-term period and also where the local authority is to take equity in the project. However, such a PPP is not required if only a technology is supplied or advisory services are offered to a local authority.

The volume of MSW gathered annually and that is currently disposed of to landfill is given in Table 7. When the current electricity constraints and the potential for waste to be used to generate energy are considered there is a substantial scope for the development of WtE plants. However, it is only recently that landfill space has become scarcer, competition for land more intense and electricity more expensive that the WtE projects have become feasible. A case in point is landfill gas power generation projects that have only recently become viable with Cleaner Development Mechanism (CDM) credits.

Eskom generates approximately 95% of electricity used in South Africa and approximately 45% of electricity used in Africa. Eskom generates, transmits and distributes electricity to industrial, mining, commercial, agricultural, residential customers and redistributors. Additional power stations and major power lines are being built to meet rising electricity demand in South Africa. Eskom will continue to focus on improving and strengthening its core business of electricity generation, transmission, trading and distribution (5).

Delays in the construction of new power stations have left Eskom with a generation deficit and the economy constrained by electricity shortages. Eskom is currently under pressure to generate sufficient electricity to the increasing demand brought about by economic development and continued urbanisation.

COMPANIES WISHING TO IMPLEMENT WTE TECHNOLOGIES IN SA HAVE VARIOUS OPTIONS TO SELL ELECTRICITY GENERATED INTO THE SA ECONOMY, NAMELY:

- **To the national electricity grid controlled and operated by Eskom which supplies:**
  - **The public through either national and/ or municipal grids by competitive bids in the REIPPPP (where municipal waste is deemed as biomass in terms of the DoE REIPPPP) and the off-take agreement being secured by successfully bidding in this programme.**
  - **To a third party by means of an electricity off-take power purchase agreement (PPA) and a wheeling agreement (with Eskom).**
- **To a municipal electricity grid which supplies:**
  - **The public municipal grids by off-take and PPA being secured by successfully negotiating a PPP.**
  - **A third party by means of an electricity off-take PPA and a wheeling agreement with municipalities that would normally be serving a third party.**
- **For own/ internal use or by off-take and PPA over the fence to a third party in a so called energy island at industrial complexes served with internal electrical reticulation.**

IN SUMMARY:

- **The primary method of waste disposal of municipal as well as commercial and industrial waste in SA is landfilling. Increasingly commercial and industrial wastes are being recovered. The extent to which this is taking place however, is not certain as the reporting of waste handled, transported, recycled and/or recovered is not currently legislated.**
- **At present incineration is applied in specific industries for the destruction of hazardous waste but not always directly linked to WtE. This happens either through mass burn incineration or through refuses derived fuel projects.**
- **Less than 10% of South African municipalities generate electricity from landfill gas WtE processes, and only the larger metro municipalities that realise economies of scale have so far implemented WtE projects. These include Johannesburg, Tshwane, eThekwini and Ekurhuleni that have projects in various stages of planning, construction and implementation.**
- **SA thermal WtE is still in its infancy stage and the majority of projects are undertaken by a few private companies with a number of local authorities having undertaken pre-feasibility studies to investigate the potential for WtE projects through PPP projects.**
- **Biological WtE technology in SA is currently limited to the extraction of methane gas from landfills, agricultural waste and water treatment facilities.**

2.1 SA Waste

According to the DEA, the third national waste baseline assessment indicated that SA generated approximately 108 million tonnes of waste in 2011 of which 59 million tonnes was general waste and 49 million tonnes was hazardous waste. 97 million tonnes (89.9%) was disposed at landfills (6).

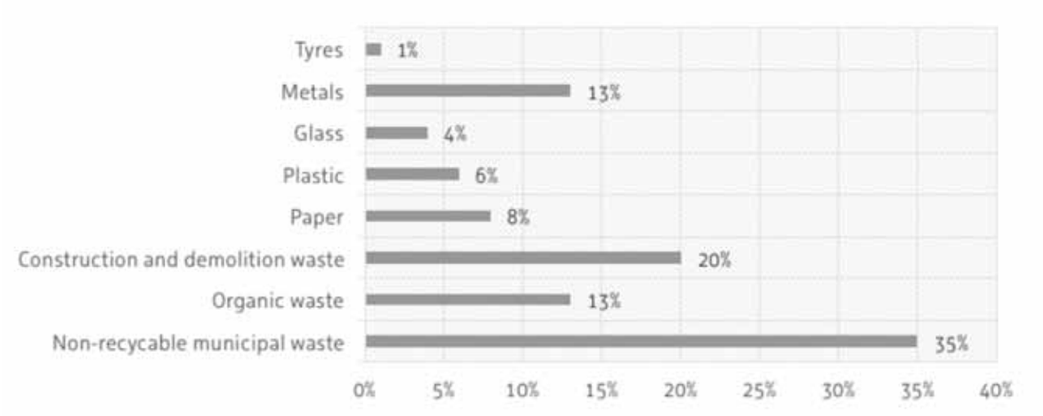
Only 5.8 million tonnes of general waste was recycled in 2011, with 53.2 million tonnes of general waste being landfilled. Waste categorisation in terms of the waste baseline assessment is categorised in general/ municipal, unclassified and hazardous waste streams. Each of these categories is handled differently due to the different legislative requirements as well as the potential hazardous substances typical of each waste category. The items that fall under each of the different categories are:

GENERAL WASTE

General waste comprises of the items illustrated in Figure 1 with non-recyclable municipal waste (20.6 million tonnes), organic waste (7.6 million tonnes) and construction and demolition waste (11.8 million tonnes) making up 68% of the general waste generated in SA in 2011. The non-recyclable municipal waste and organic waste components may be amenable to recovery through WtE as can be seen (refer Figure 1).

hr_Bollegraaf Recycling Machinery

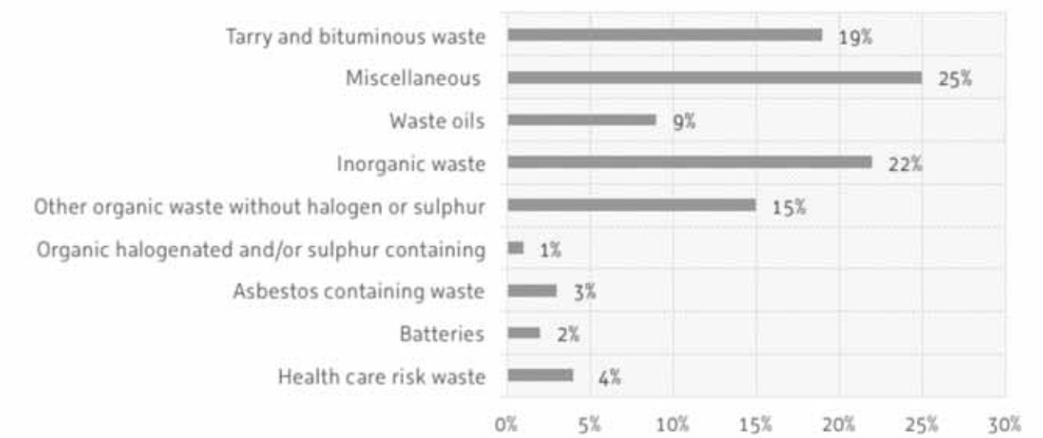
FIGURE 1: GENERAL WASTE COMPOSITION, 2011 (PERCENTAGE BY MASS)



HAZARDOUS WASTE

Hazardous waste falls under various strict legislative measures as to the collection; storage; transport; processing; treatment; and/ or disposal of the waste. The hazardous waste categories as well as their input to the composition are illustrated in Figure 2. There are various categories of hazardous waste arising in SA that may be targeted with WtE recovery including tarry and bituminous waste, waste oils and other organics (both with and without sulphur and halogenated compounds).

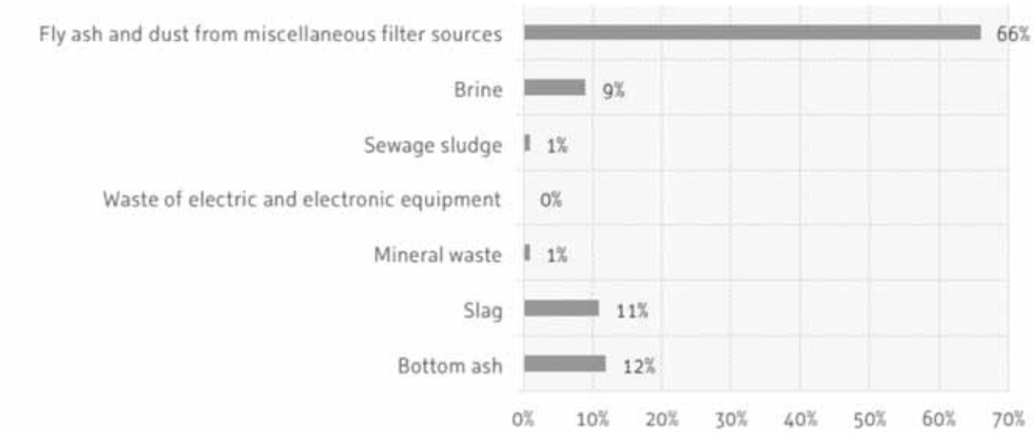
FIGURE 2: HAZARDOUS WASTE COMPOSITION, 2011 (PERCENTAGE BY MASS)



UNCLASSIFIED WASTE

Unclassified waste contributed 44% to the total waste generated in 2011. Fly ash and dust from miscellaneous filter sources contributed 66% to unclassified waste, with bottom ash (12%); slag (11%); and brine (9%) also contributing quite significantly.

FIGURE 3: UNCLASSIFIED WASTE COMPOSITION, 2011 (PERCENTAGE BY MASS)

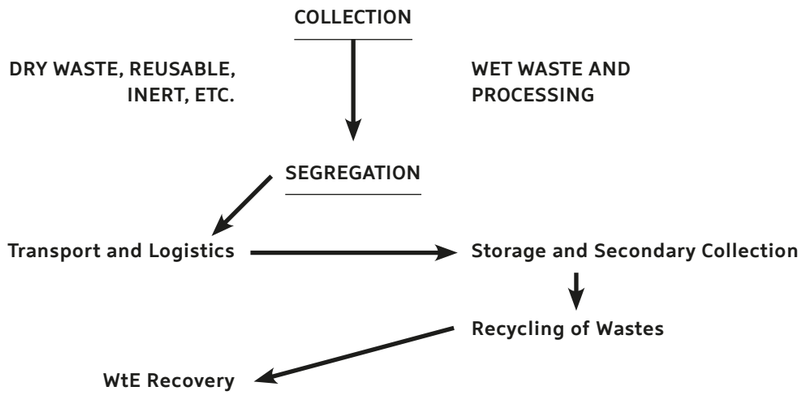


2.2 Waste-to-Energy Industry Value Chain

This section presents information that includes the collection and segregation of waste as well as each of the different technologies. The backward and forward linkages are also identified in this section.

The value chain consists of a few actions that fall under the waste hierarchy, of which the WtE process forms part of. It is however essential to analyse the entire waste hierarchy in order to understand the backward and forward linkages involved.

DIAGRAM 1: WtE VALUE CHAIN



THE DEA REQUIRES THAT:

- The volume of waste generated is reduced.
- Waste that cannot be reduced is reused or recycled.
- Waste that cannot be reused or recycled should be treated or the energy should be recovered before landfilling (7).

THE WASTE HIERARCHY:

Collection	Due to variations in community structures and geographical distribution, the same type of waste collection service will not be appropriate and sustainable across areas/ municipalities (i.e. one size does not fit all) (8). Service levels may vary between: • Kerbside collection. • Organised transport to central collection points. • Community transfer to central collection points e.g. medium density settlements. • On-site and regularly supervised disposal which is applicable mainly to remote rural areas with low density settlements and farms. Waste collection systems must provide for the collection of separated waste as required by the Waste Act (Act No. 59 of 2008).
Segregation/ Treatment	Waste separation at the source or at receiving destinations is important to improve the logistics and processes that follow. The value added is not easily monetised but wastes which are more valuable to recover for recycling are excluded from the process.
Waste Storage	• Waste is stored at points of generation before collection. Waste storage systems must allow for separation at source. • Waste is stored at collection points for recyclables. These facilities include clean MRF's, garden sites, drop-off and buy-back centres. • Waste is stored at other intermediate facilities prior to final disposal to landfill or prior to the waste being treated or recycled. These intermediate facilities are also known as transfer stations, which are strategically located (8).
Logistics	To ensure an effective Waste Value Chain, sophisticated approaches to issues such as route design and collection frequency as well as vehicle maintenance are required. The purpose of collection points and transfer stations is to concentrate the waste (recycling and volume reduction can also be carried out as required). Concentration and temporary storage make it possible to design a system for more cost effective movement of the waste to the point of final disposal.
Recovery, Re-use & Recycle	Besides saving resources and reducing the environmental impact of waste, recycling also has the potential for job creation and is a viable alternative to informal salvaging at landfills. (7)

The WtE process described in the value chain is based on a waste incineration/ thermal energy technology process. Pyrolysis and gasification, however, follow a similar basic structure to waste incineration and subcomponents used in the plants are to a greater or lesser extent interchangeable.

2.3 Current Status of the Industry

The industry is dominated by three overall trends namely, increased generation of waste firstly through a high urbanisation rate and secondly through economic growth in the commercial, industrial and services sectors coupled to the trend to gradually reduce, recycle and recover waste. Less than 10% of South African municipalities generate electricity from WtE processes. South African thermal WtE is still in its infancy stage and is undertaken by few private companies while Biological WtE Technology in SA involves the extraction of methane gas from landfills, agricultural waste and water treatment facilities. The time-consuming process of registering a project for carbon financing, the lengthy EIA process and local government approval processes coupled with

MFMA constraints as well as the cheaper and easier option of landfilling have led most cities to hold back on the WtE project implementation.

2.4 Landfill Gate Fees and Lifespans

A large number of municipalities and project developers are showing increasing interest as energy costs rise and landfill space constraints loom. Increased competition for land in larger metropolitan areas provides a significant driving force for the implementation of WtE technologies. Currently, WtE projects are still hampered by various factors including low gate fees at landfills, low electricity prices, limited opportunity for combined heat and power (no district heating requirements due to mild climate and sprawling urban development) and the complexity of waste supply and electricity off-take agreements involving municipalities (the contracting of waste supply and off-take of electricity is regulated by MFMA and MSA and requires complex PPPs). It is thus reasonable to expect the large metropolitan municipalities that control large waste streams, and that are running out of landfill air space to be the first movers to implement WtE projects. However most metropolitan municipalities have new landfill construction projects in the pipeline, such as Shongweni and Cato Ridge landfills in eThekwini, Zesfontein in Ekurhuleni, and the City of Cape Town considering sites near Atlantis and Kalbaskraal. Gate fees vary significantly between municipalities and there is no set minimum, apart from knowing that these fees will increase over time as pressure mounts to find disposal alternatives both through legal measures as well as landfill space constraints. Landfill space constraints will impact municipalities differently depending on availability of land for expansion, urban growth rates and effect of waste recovery and recycling initiatives.

5. Obtained through telephonic interviews with different municipalities.

TABLE 2: LANDFILL GATE FEES IN THE LARGE METROPOLITAN MUNICIPALITIES[5]

	LANDFILL GATE FEES (RAND/ TON)				
	EKURHULENI	TSHWANE	JOHANNESBURG	CAPE TOWN	ETHEKWINI
General waste	R118.75	R121.00	R141.72	R333.20	R228.00
Garden refuse	R61.34	R0.00	R151.82	R0.00	R71.60

The gate fees per ton for municipalities are already minimal, however there are certain municipalities that allow up to a certain weight of waste to be disposed for free as a service to tax payers (in part also undertaken to minimise illegal dumping by members of the public). For example, Ekurhuleni and Cape Town only charge for loads in excess of 1 tonne and 1.3 tonne respectively. eThekwini allows loads of up to 100kg to be disposed of for free and Tshwane allows the free disposal of garden refuse.

TABLE 3: LIFESPANS OF LANDFILLS WITHIN THE LARGE METROPOLITAN MUNICIPALITIES

LANDFILL LIFESPAN FROM 2013 (ESTIMATED YEARS)										
EKURHULENI		TSHWANE		JOHANNESBURG		CAPE TOWN		ETHEKWINI	
Platkop	23	Kwaggasrand	0	Robinson deep	15	Coastal Park	6	Bisasar	1.5
Simmer & Jack	4.3	Soshanguve	8	Ennerdale	0	Bellville	0	La Mercy	0
Weltevreden	11	Onderstepoort	1	Marie Louise	0	Visserhoek North	6	Marianhill	5
Rietfontein	7	Hatherley	18	Goudkoppies	4	Visserhoek South	1	Lovu	18
Rooikraal	15	Ga-Rankuwa	8					Buffelsdraai	55
		Bronkhorst-spruit	13						
		Temba	0						
		Garstkloof	0						

2.5 Government Initiatives to Minimise Landfilling

The South African Government has developed The National Waste Management Strategy in order to achieve the objectives of NEM:WA. The first goal of this strategy is to promote waste minimisation, re-use, recycling and recovery.

TO PROMOTE WASTE MINIMISATION THE GOVERNMENT HAS INITIATED THE FOLLOWING:

- **A 150% Research and Development tax rebate for the implementation of design principles that incorporate re-use and recycling.**
- **The National Cleaner Production Centre is responsible for reducing the quantity and toxicity of waste during manufacturing processes.**
- **The Industry Waste Management Plans (formal plans developed by industry in consultation with DEA in terms of NEM:WA) are being prepared by the paper and packaging industry, the pesticide industry, the lighting industry and the tyres industry.**

A NUMBER OF INITIATIVES ARE TO BE IMPLEMENTED IN ORDER TO PROMOTE RE-USE AND RECYCLING INCLUDING:

- **The improvement of recycling infrastructure, such as MRF's and buy-back centres as well as implementing recyclable waste collection systems.**
- **Awareness campaigns that will promote the separation of recyclables from domestic waste in households and organisations.**
- **The diversion of certain waste streams from landfills such as organic waste that can be used for compost or biogas digesters.**
- **Certain waste management activities that promote re-use and recycling of waste will be listed as activities that do not require a waste management licence and will simplify those activities by removing regulatory constraints.**
- **Certain waste management activities that promote re-use and recycling of waste may be listed as activities that do not require a waste management license in terms of NEM:WA; and will simplify those activities by removing regulatory constraints.**
- **Mechanisms that will facilitate the use of waste that cannot be re-used or recycled in energy recovery projects.**

The NEM:WA Draft Waste Classification and Management Regulations propose the banning of certain wastes in landfills. This is expected to create significant opportunities in the future, with the expected date of promulgation being later in 2013. The proposed schedule for implementation of the said regulations is as follows:

TABLE 4: PROPOSED BANNING SCHEDULE OF NEM:WA REGULATIONS

Hazardous waste with a calorific value of > 25 MJ/kg	**Four years**
Hazardous waste with a calorific value of > 20 MJ/kg	**Six years**
Hazardous waste with a calorific value of > 10 MJ/kg	**Eight years**
Hazardous waste with a calorific value of > 6% total organic content	**Ten years**
Reclaimable or recyclable used lubricating mineral oils, as well as oil filters, but excluding other oils containing waste.	**Four years**
Reclaimable or recyclable used/spent solvents.	**Five years**
Waste tyres – whole.	**Immediate**
Waste tyres – quartered.	**Five years**

SA has WtE projects in the cement industry (waste material fuel replacement or so-called alternative fuels), fluidised bed co-combustion of waste streams, landfill gas to energy, as well as small-scale digestion and biogas generation projects. There are currently a number of municipal WtE projects in the planning stage with EIAs for MSW WtE projects being launched by, amongst others, Enviroserve and Interwaste. It is worth noting that these initiatives are led by private sector waste companies that collect commercial and industrial waste and operate landfills of their own.

Although South African municipalities do not have WtE projects (other than landfill gas projects of large metropolitan municipalities), many have a number of other initiatives whereby significant volumes of municipal waste are being recovered through various initiatives ranging from household recycling to MRF's. A few municipalities in SA have already implemented such facilities. Furthermore, the majority of municipalities require the separate disposal of garden waste from household refuse. Accordingly, waste recovery in SA is tending less in the direction of mass burn incineration and more to include composting, anaerobic digestion and refuse derived fuel processes. Processing of remaining waste-to-fuel (for use on or off-site) is a natural extension to existing pre-recovery processes (including MRF's) that are already in place in the waste management systems of many municipalities. This however does not preclude mass burn incinerators but may make them less attractive.

The opportunity for Dutch WtE companies is to enter the market in the larger municipalities (Tshwane, Johannesburg, Durban and Cape Town) and to start with small-scale projects at landfill sites. The larger municipalities have the capacity to set up WtE plants.

2.6 Waste-to-Energy Industry Technology Groups in SA

Though there is growing interest in WtE technologies, the few facilities that exist in SA are smaller on-site operations that contribute to the on-site power needs utilising their own waste streams (Table 5).

TABLE 5: BASIC OVERVIEW OF SA WTE TECHNOLOGY LANDSCAPE

TECHNOLOGY	EXAMPLES	CURRENT APPLICATION IN SA
CURRENT TECHNOLOGICAL LANDSCAPE		
Cement Kiln Co-Combustion	Cement kilns using old tires as an alternative fuel source.	Some kilns have been converted to take advantage of this technology.
Fluidised bed Co-Combustion	Co-combustion of site specific process wastes.	Two paper companies currently operate fluidised bed boilers where paper recycling sludge and waste bark are disposed off and energy is captured. The best known example is the atmospheric fluidised bed boiler at Mondi Merebank. Another project concerns the conversion of the Sappi Tugela Pulp and a Paper Mill from a coal fired boiler to a biomass and coal co-fired boiler.
Landfill Gas Utilisation	Methane of gasses from landfills are captured and combusted to generate electricity.	Landfill gas from the Bisasar Road and Marianhill landfill sites in KwaZulu Natal (KZN). In Johannesburg a project was completed in 2011 that produced 11MW of energy from five landfill sites. Ekurhuleni has installed landfill gas capture systems at Simmer and Jack, Weltevreden, Rietfontein and Rooikraal landfill sites that are currently only used for the flaring of methane gas. However the municipality is in the process of operating pilot projects to test the feasibility of electricity generation.
Bio-Digestion	Sewage sludge, small-scale farm wastes, digested to combustible gas.	Some small-scale off grid applications used on farms as well demonstration plants.
Bagasse Boilers (sugar industry waste)	Bagasse cogeneration of steam and electricity.	In general, sugar mills in SA use the bagasse they produce as a fuel source to operate boilers. A number of sugar producers including Tongaat Hulett, TSB and Ilovo have bagasse energy recovery projects planned.
NEAR FUTURE IMPLEMENTATION		
Fluidised Bed Boilers	Refuse or processed municipal WtE via combustion.	Used by paper industries for on-site wastes. Other industries, including the agro-processing and cement sectors are becoming increasingly aware of its benefits for on-site waste management.
Mass Burn Incinerators	Municipal WtE via combustion.	Feasibility studies done, interest shown by private investment companies and municipalities alike (Blue IQ undertook a feasibility study on mass burn in the Gauteng province).
Plasma-Gasification	Beautifuels, research done by the South African Nuclear Energy Corporation (NECSA).	Laboratory research performed, pilot-scale required. Afro Energy has shown interest in implementing larger sites.
Pyrolysis	Pyrolysis of plant wastes from the Working for Water Programme.	Interest shown by various municipalities where high intensity deforestation of invasive species are or will be done e.g. the Western Cape and KZN.
POTENTIALLY APPLICABLE		
Thermal Waste Gasification	Municipal waste and bio-wastes gasification from various sources.	No commercial or demonstration plants have been constructed and bankability of the technology has not been demonstrated in SA.

Typically, the smaller on-site operations are industry specific, e.g. the largest proportion of these on-site operations utilise waste gas streams to generate steam, such as those from closed furnaces used in steel making which are high in carbon monoxide. Fluidised bed boilers have also been used and some companies are considering installing Organic Rankine Cycle heat engines to extract latent heat from their flue gasses showing that the industry is aware of more recent developments and options.

There are also adaptable technologies available in the cement industry. Some cement kilns have already been converted to process alternative fuels and resources such as old tyres.

Interest has been shown for more centralised or at least non-industry specific operations. This is shown in the NECSA waste-to-fuel plasma research called “Beautifuels” (refer to section 2.7). Additionally, both local and district municipalities have shown interest in WtE on a larger-scale with research focussing on feasibility studies and opportunity identification for renewables and WtE.

On-site power generation from solid, liquid and gaseous wastes are more common, though this rarely supplies power back to the grid due to lower tariffs from such operations. Instead they provide power for their own operations or to neighbouring sites. Small third-party operators sometimes identify opportunities to utilise waste streams for energy generation and operate on-site independent of the site owner and sell the generated energy back to them. The technologies used in these cases are site dependent simple gas fired boilers, internal combustion engines and gas turbines or even Organic Rankine Cycle energy recovery units. These are either purpose built or packaged units and can be obtained from a number of suppliers, both local and international.

TABLE 6: PRODUCTION AND LANDFILLING QUANTITIES OF SELECTED WASTES IN SA (ADAPTED FROM DEA) (6)

WASTE TYPE	GENERATED (TONNES/ ANNUM)	RECYCLED (TONNES/ ANNUM)	LANDFILLED (TONNES/ ANNUM)
Municipal Waste (Non-Recyclable)	8 062 934	0	8 062 934
Commercial and Industrial Waste	4 233 040	359 441	973 599
Organic Waste	3 023 600	1 058 260	1 965 340
Sewage Sludge	637 360	130 160	500 508
Paper	1 734 411	988 614	745 797
Plastic	1 308 637	235 555	1 073 082
Tyres	246 631	9 865	326 766
Other	36 171 127	0	3 6171 127

2.7 Research and Development in SA

There is novel research from NECSA aimed at creating a mobile waste processing platform capable of treating almost any waste stream that generates liquid fuels (See Table 5). The modular design will allow for upgrading of various components as new innovative designs or technologies that become available giving the units a longer lifetime and greater flexibility.

Laboratory scale experiments have proven to be successful and the project, called “Beautifuels” is currently in the pilot scale development with funding being the primary limiting factor. The unit is expected to cost R4.5million and has a running cost of R 500 000 per annum. Waste consumption rates are highly dependent on the fuel type which is used to generate energy. Virtually any type of waste can be used due to the sealed processing unit and the diverse capability of a plasma torch (9).

THE UNIT IS DESIGNED FOR:

- **Waste preparation: shreds waste in a contained unit allowing for processing of hazardous waste.**
- **Plasma gasification: converts the waste stream into slag, metals and gas which is cooled with a patented design to reduce nitrogen oxide and PCCD/f formation.**
- **Gas clean-up: removing sulphur and other contaminants that could damage the Fischer Tropsch catalysts.**
- **Fischer Tropsch converter: converts the gas products into a synthetic diesel to power the unit’s generator thereby making it self-sufficient.**

The Department of Science and Technology (DST) conducted a National Waste R&D and Innovation Roadmap for SA that examines the current and required institutional mechanisms to support waste innovation. This is however still in the infancy phase of WtE and a future phase of this roadmap might focus mainly on the different implementation measures of that WtE is one (11). The IDC is also busy with R&D in the WtE market.

THE CSIR HAS ALSO DONE EXTENSIVE R&D IN THE WTE FIELD. THEIR R&D INCLUDES THE FOLLOWING:

- Wastewater and sludge management with a view to assess the potential use of domestic wastewater in energy generation in rural communities in SA.
- Review of local and international development and trends in the field of wastewater and sludge management with a view of assessing the potential use of domestic wastewater in energy generation with particular emphasis on low-income communities, informal settlements and remote and displaced rural areas in SA.
- Converting WtE through fluidised bed processing.[6]
- Integrated energy and waste water solutions to solve small town municipal service delivery problems in SA.[8]
- Cleantech Small Medium Enterprise Accelerator Programmes (12).
- Unlocking the resource potential of organic waste: a SA perspective.[9]

R&D CONDUCTED BY GOLDER ASSOCIATES IN SA INCLUDES (13):

- A cellulosic ethanol bio-refinery prefeasibility and feasibility study funded by the National Empowerment Fund.
- A study for assessing the municipal wastes of Gauteng and the potential for recycling and the WtE conversion for the Gauteng Growth and Development Agency.
- A due diligence study for landfill gas resource assessments, environmental authorisations and technical commission and performance testing of nine landfills in SA for landfill gas to energy conversion for EnerG Systems (partnership local energy management company and a UK-based renewable energy company).

The Electricity Governance Initiative of South Africa (EGI-SA) research reveals that renewable energy infrastructure creates more short and long-term jobs than coal and nuclear, which is an important factor in the SA context.

6. http://www.techtransfer.csir.co.za/2013/02/converting-waste-to-energy-through-fluidised-bed-processing/
7. http://playpen.meraka.csir.co.za/~acdc/education/CSIR%20conference%202008/Proceedings/CPA-0017.pdf
8. http://hdl.handle.net/10204/4163
9. http://researchspace.csir.co.za/dspace/bitstream/10204/3910/1/Greben2_2009.pdf

3 MARKET POTENTIAL

It is evident that there is an abundance of untapped resources available for a WtE industry in SA. The majority of this will come from municipal waste (newly generated waste or landfills).

3.1 Potential Energy from Municipal Waste Generation

Estimated energy values from waste figures were generated using the waste generation model from EScience Associates, census and waste generation data. The total waste originating from densely populated areas (>125 people per km2) were compared to income levels to determine the most likely waste stream distribution of plastics, paper and organics (Table 7). According to the DEA Waste Baseline Report the total industrial waste would be equal to 21% of the municipal waste generated (6).

The overall energy content was estimated for both collected and total generated waste with the energy content of each stream estimated from literature values.

TABLE 7: POTENTIAL ENERGY FROM MUNICIPAL WASTE ORIGINATING IN DENSELY POPULATED DISTRICT MUNICIPALITIES

PROVINCES AND DISTRICT MUNICIPALITIES	WASTE GENERATED (TONNES PER ANNUM)	ENERGY FROM TOTAL WASTE (GJ/ANNUM)
EASTERN CAPE PROVINCE	677 322	994 188
Alfred Nzo	47 713	144 915
Amathole	167 942	223 246
Cacadu	53 984	13 993
Chris Hani	75 683	141 982
Nelson Mandela Bay Metro	172 568	34 383
O.R.Tambo	125 610	369 989
Ukhahlamba	33 823	65 679
FREE STATE PROVINCE	367 813	368 009
Fezile Dabi	61 258	28 125
Lejweleputswa	81 898	37 040
Motheo	11 4232	138 365
Thabo Mofutsanyane	98 738	162 521
Xhariep	11 687	1 958
GAUTENG PROVINCE	1 361 038	530 065
City of Johannesburg	442 061	82 188
City of Tshwane	340 788	195 649
Ekurhuleni	372 573	100 409
Metsweding	21 747	15 024
Sedibeng	103 463	121 004
West Rand	80 406	15 792
KZN PROVINCE	761 535	546 769
Amajuba	51 142	47 043
eThekwini	428 020	186 309
iLembe	29 082	42 100
Sisonke	5 708	4 021
Ugu	35 882	55 166
UMgungundlovu	92 518	104 598
Umkhanyakude	6 962	11 358
Umzinyathi	11 659	4 581
Uthukela	34 417	31 749
Uthungulu	36 589	30 759
Zululand	29 557	29 085
LIMPOPO PROVINCE	805 738	2 026 775
Capricorn	190 753	472 945
Greater Sekhukhune	139 585	385 414
Mopani	197 689	511 792
Vhembe	187 273	482 728
Waterberg	90 438	173 897

MPUMALANGA PROVINCE	499 220	915 061
Ehlanzeni	235 927	557 429
Gert Sibande	97 656	88 994
Nkangala	165 637	268 638
NORTH WEST PROVINCE	441 216	740 511
Bojanala	214 123	443 562
Dr Kenneth Kaunda	84 803	15 519
Dr Ruth Segomotsi Mompati	55 866	106 908
Ngaka Modiri Molema	86 425	174 523
NORTHERN CAPE PROVINCE	120 128	66 835
Frances Baard	49 091	17 611
John Taolo Gaetsewe	19 695	38 942
Namakwa	14 875	2 861
Pixley ka Seme	12 669	1 847
Siyanda	23 798	5 574
WESTERN CAPE PROVINCE	772 298	66 695
Boland	68 566	6 525
Central Karoo	7 907	229
City of Cape Town	542 808	48 986
Eden	77 417	5 846
Overberg	31 866	2 070
West Coast	43 733	3 039
GRAND TOTAL	5 806 309	6 254 908 (14)

A general nationwide breakdown of combustible wastes from the Baseline Report is indicated in Table 8.

TABLE 8: GENERAL WASTE GENERATION AND USAGE FIGURES (TONNES) FROM THE DEA WASTE BASELINE REPORT (DEA, 2012)

WASTE STREAM	GENERATED	RECYCLED	LANDFILLED	RECYCLED%
Municipal Waste (non-recyclable portion)	8 062 934	-	8 062 934	0
Commercial and Industrial Waste	433 040	359 441	973 599	77
Organic Waste	3 023 600	1 058 260	1 965 340	35
Sewage Sludge	673 360	172 784	500 508	26
Paper	1 734 411	988 614	745 797	57
Plastic	1 308 637	235 555	1 073 082	18
Tyres	246 631	9 865	236 766	4

Table 8 indicates that 100% of municipal waste in SA is landfilled at the current stage. The majority of organic waste, sewage sludge, plastic and tyres are also landfilled. There is a vast potential for WtE conversion if only the volumes of waste currently landfilled are considered.

END-USER ANALYSIS
TYPICAL AND POTENTIAL WTE END-USERS INCLUDE INDUSTRIES, MEDICAL INSTITUTIONS AND MUNICIPALITIES:

- **Industrial End Users: sugar mills and pulp and paper mills are becoming increasingly inclined to reduce operational costs by alternative energy processes. These are WtE technologies in processing their waste products to generate electricity which can be implemented rapidly.**
- **Institutional End-Users: medical facilities generally process hazardous waste material. The incineration of hazardous waste material is currently being fiercely opposed by environmentalists. However, with the relevant equipment, medical waste material can be utilised to generate energy.**
- **Municipal End-Users: recent and impending changes to environmental, energy and land-use legislation along with energy-based operational costs may incline municipalities to become the most active market end-user. Municipalities have currently demonstrated a preference to biological WtE technologies.**

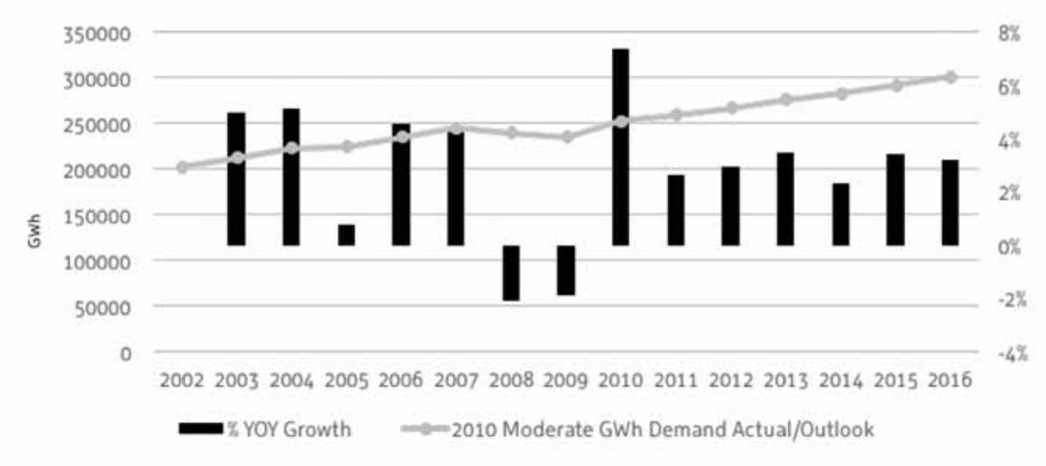
3.2 Market Segmentation

The market segmentation focuses on the market that can be derived from the WtE industry. The primary output conceptually prioritised for WtE is electricity. The electricity market can be summarised as follows:

ELECTRICITY:

- **Household, industrial, infrastructural and economic growth result in an increasing demand for electricity and reliance on reliable energy sources.**
- **Eskom cannot meet these demands.**

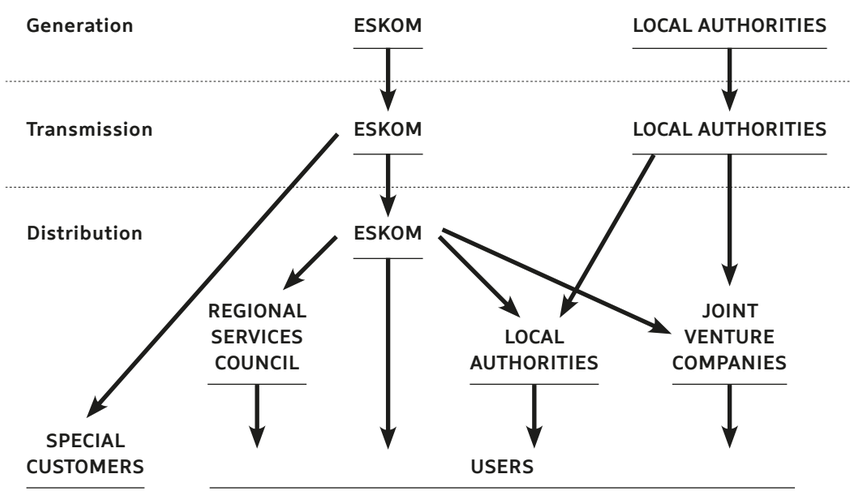
FIGURE 4: ANNUAL ELECTRICITY SUPPLY AND CONSUMPTION, SA, 1980-2010



Source: Eskom System Operations and Planning Division, 2011

Figure 4 demonstrates that electricity demand in SA has consistently increased from 2010 onwards. Currently, SA is in the situation where annual consumption roughly equals annual generation, however the current MW utilised during peak consumption times exceeds the current MW produced with black outs as a consequence.

DIAGRAM 2: ELECTRICITY GENERATION AND DISTRIBUTION IN SA[10]



Decades of robust economic growth, low electricity prices and lack of investment in power generation in SA have placed the national electricity supply grid under severe pressure. The increasing focus on industrialisation, together with SA's mass electrification programme to take power into deep rural areas also adds to the higher demand. Electricity supply can hardly meet the growing demand for energy (15). In fact, SA's energy demand is expected to be twice the current levels by 2030.

The DoE estimates that R 107 billion was needed between 2005 and 2009 to meet the country's growing energy needs. Eskom has already put forward R 84 billion for this purpose, while the remainder should come from IPP entrants.

In an attempt to finance the cost of major infrastructural projects, Eskom proposed an increase in tariffs. NERSA is, however, concerned about the negative impact that such a rapid increase in tariffs would have on inflation in SA. Eskom has raised the tariffs with more than 20% each year from 2008 onwards. NERSA announced in February 2013 that Eskom can raise its tariffs by 8% over five years, half of the 16% the power utility proposed (16).

It must be noted that further increases would affect both the input costs (energy purchased to operate the plant) as well as output gains (energy sold back to Eskom). As can be seen, there is immense opportunities within the South African electricity sector. SA could use the additional energy generated through WtE to market the area as a "city of energy" in support of local industrial expansion projects.

10. More info on the Electricity Generation and Distribution in South Africa on www.ises.org

3.3 Distribution Methods

The diverse products of a WtE facility would need to be distributed to the respective markets in a cost-efficient manner. Various options exist, and are discussed briefly in this section.

ELECTRICITY:
A partnership and/or sales agreement is the simplest means of distributing electricity from the WtE facility. Thus, the options for electricity distribution include:

- **The energy generated can be sold to Eskom to be added to the municipal grid, and distributed to households and industries.[11] This is a viable and realistic option for Dutch companies.**
- **Alternatively, the WtE company could apply for a distributor's license from the DoE and NERSA and become an energy provider within a certain jurisdiction, selling electricity at rates that support the local development objectives and are aligned with NERSA recommendations.[12, 13]**

Initially, however, the preferred option is to enter into an equity partnership with Eskom.[14]

METHANOL:
Currently, methanol produced in SA is sold on the global market. Once a local market for methanol is established, the plant could be expanded to include methanol production. Various distribution options would then exist for methanol. These options include, among other, the following:

- **sales of methanol to companies such as Ethanol Africa, SASOL or PetroSA**
- **establishing a company that sources the needed oils from local farmers and produces its own bio-diesel.**

Initially, sales to established bio-fuels operations will be preferred.

STEAM:
Steam can be transferred to the neighbouring factories via piping systems. This option is only suitable if the additional heat-to-energy converter is not adopted and piping systems are in place.

OTHER PRODUCTS:
The metals, minerals and slag can be distributed via road and rail transport. The advantage here is that the purchasers of such products are industries and will, likely be situated near major road and rail routes as most existing industries would have existing mechanisms for obtaining materials.

3.4 Future Developments and Local Interest

Local and district municipalities are particularly interested in processing municipal waste, an avenue also investigated by the private sector. The Gauteng Growth and Development Agency investigated the feasibility of operating a WtE plant in the Gauteng province (17). The waste would feed from two of SA's largest cities, Johannesburg and Pretoria. An estimated 300 to 400 tonne/annum of waste could be processed generating approximately 114GW of thermal energy (45.6GW electrical).

SA also possesses some unique resources such as biomass waste from the Working for Water Programme to remove invasive and alien vegetation. This has been identified as a fuel source for WtE fuels specifically by district and provincial municipalities with the focus on having mobile treatment or processing plants that can relocate with the deforestation group. Typically pyrolysis is focussed on in these applications as it is a simple process to produce fuels usable by either local communities or the logging camps where there may not be sufficient infrastructure to utilise electricity.

Typical centralised WtE developments are feasible in and around larger metropolitan areas. Significant opportunity also still remains in more remote or on-site applications (typical out-of-the-box applications). In these cases smaller capacity units that generate fuels and energy are used as it is quite attractive to local companies.

It is unlikely that cities will pursue other WtE technologies in the short-term, given the viability of and support for landfill gas projects from the REIPPPP. However, should the REIPPPP be made available to these technologies, it is anticipated that they too will enjoy mass implementation in the country. These WtE technologies will most likely be exploited in the medium term by cities in order to promote their renewable energy profiles.

11. More info on selling electricity to Eskom: http://eskom.ensight-cdn.com/content/Sellingenergy-toEskom.pdf
12. More info on Distributors license : http://www.nersa.org.za/Admin/Document/Editor/file/Electricity/Licences/Licence%20under%20procedure/Electricity%20Distribution%20Licensing%20procedure.pdf
13. Application form for a distributor license: http://www.nersa.org.za/Admin/Document/Editor/file/Electricity/Licences/Application%20form/Distribution%20Licence%20Application%20Form%20-%202007.pdf
14. http://www.eskom.co.za/c/64/tender-process/

4 WASTE-TO-ENERGY **IMPLEMENTATION** IN SOUTH AFRICA

4.1 Possible WtE Private Public Partnership (PPP) Projects in SA

Projects in preparation, registered in terms of Treasury Regulation 16 and municipal projects registered under the MFMA and MSA, March 2013, are outline below.[15]

TABLE 9: NATIONAL TREASURY WTE RELATED PPP PROJECTS, 2011

DEPARTMENT NAME	PROJECT OFFICER	PROJECT	TRANSACTION ADVISORS	STATUS
Free State Provincial Government	N/A	WtE Processing Plant	Not yet appointed	Inception
City of Johannesburg	Makhosazana Baker +27 11 587 4215	Alternative Waste Treatment Technology	Vela VKE; Golder & Assoc. & SPP Solutions	Procurement
Elundini Municipality	Chuleza Qotoyi +27 45 932 1085	Solid Waste Management	Ardemus Consulting	Negotiations
Greater Tubatse Municipality	Marcia Mahlase +27 13 231 7331	Solid Waste Management.	Themba Sidondi Consulting	PPP Agreement Signed
Overstrand Municipality	John van Taak +27 28 316 3724	Solid Waste Management.	Jan Palm Consulting Engineers	Financial Closure
City of Cape Town	Barry Coetzee +27 21 400 2992	Alternative Service Delivery Mechanisms for Council's Composting Plants in Cape Town.	Internal	Feasibility Study
Drakenstein Municipality	Mr Ronald Brown +27 21 807 4725	WtE	Jan Palm Consulting Engineers	Feasibility Study
DEA	Christo Marais +27 82 551 8316	Bio-Renewable Energy Project Southern Cape Coastal Plains.	Not yet appointed	Inception
		Bio-Renewable Energy Project West Coast Coastal Plains.	Not yet appointed	Inception
		Bio-Renewable Energy Project North-Eastern Cape.	Not yet appointed	Inception
		Bio-Renewable Energy Project South-Eastern Cape.	Not yet appointed	Inception
Thaba Chweu Municipality	Sakhile Mashaba +27 13 235 7333	132KV/40MVA Duma Substation.	Tsebolo	Procurement
Malutu-A-Phufung Municipality	Moeti Moloi +27 58 713 2471	Management & operation of electricity.	Internal	Negotiations
Ngwathe Local Municipality	Adv. Thabo Mokoena	Upgrade of Electricity Infrastructure.	Not yet appointed	Inception

15. The info is available online at: http://www.ppp.gov.za/Lists/PPP%20Project%20List%20Master/Energy1.aspx

4.2 Local Training Opportunities

SOME OF THE SETAS THAT COULD BECOME INVOLVED INCLUDE:

- **ESETA (Energy SETA)**
- **LGSETA (Local Government SETA)**
- **MERSETA (Manufacturing, Engineering and Related Services)**
- **MQA SETA (Mining and Minerals Sector)**

Establishing WtE plants will directly result into opportunities for training in association with appropriate Skills Education Training Authorities (SETAs) and local institutions.

The different SETAs are concerned with education and training and their aim is to help implement the National Skills Development Strategy and to increase the skills of people in their sector. SETAs would provide an ideal opportunity for individuals to obtain training and knowledge in/ about the WtE sector.

Expansion opportunities could potentially involve other SETAs, for example Transport (TETA), Tourism and Hospitality (THETA) and other industry-specific SETAs. The various SETAs can assist plant management in developing a Workplace Skills Plan that identifies skills as well as shortfalls in the workplace. Further, if accredited training programmes are utilised by, for instance Dutch companies, a WtE plant can claim a grant (funded by the Skills Development Levy Fund) to cover costs of training.[16] In this way Dutch businesses can contribute to skills development and employment in South Africa.

Interested companies should determine which of the SETAs they would fall under, depending on the main focus area of the company and the training it wishes to provide. The next step is to source a training provider who has the relevant accreditation with the SETA to develop the apprentice or learner. These could be a Further Education and Training (FET) college or a university preferably within the location that the company would like to implement a WtE facility.

16. More info on: http://www.seta-southafrica.com/about/ and http://www.dhet.gov.za/Structure/SkillsDevelopment/SETAS/tabid/361/Default.aspx

4.3 Small, Medium and Micro Enterprises (SMME) Opportunities

SMME opportunities will be developed specifically in the waste collection; transport; construction; and manufacturing industries. SMME opportunities might arise in the waste-collection field, for example SMMEs specialising in the collection of specific waste such as e-waste, tyres or mining waste.

Some of these business opportunities are described on the next page (18):

PRIMARY COLLECTION AND SEGREGATION OF DRY ORGANICS AND OTHERS

- **Collection of reusable plastics and metals etc. for sale in local market.**
- **Waste processing and sales of refused derived fuel pellets to biomass power plants.**
- **Mobilising construction debris for the production of tiles and bricks.**
- **Informal sector participants could collect the waste as a form of income.**

SEPARATION OF WET ORGANIC WASTES

- **Production and sale of compost to bio fertiliser firms.**
- **Biogas based power generation from sludge for selling it to the grid.**

SECONDARY COLLECTION AND STORAGE

- **Maintenance of transfer stations.**
- **High throughput screening of materials for recycling, energy recovery and landfill disposals.**

RECYCLING OF WASTES

- **Recyclable commodity transactions from transfer stations.**
- **Sale of recycled plastic or metal granules.**
- **Conversion of processed waste to industrial commodities.**

TRANSPORTATION LOGISTICS

- **Transporting solid waste from the source to the landfill or to the processing centres for energy recovery.**
- **Revenues from automobile manufacturing and sales to corporate bodies and contract holders etc.**

MSW TO ENERGY RECOVERY

- **Production of machineries and equipment for energy recovery technologies.**
- **Decentralized technology installations.**
- **Power generation and sale of power.**
- **Production and sale of processed organic feed stocks from MSW.**
- **Income from Certified Emission Reductions (CER's).**

MANAGEMENT OF WASTES AT DUMPSITE

- **Design and construction of secured landfills.**
- **Urban landscape development at abandoned landfills.**

4.4 SWOT Analysis

STRENGTHS:
- Significant quantities of landfilled waste and untapped waste resources.
- Access to relatively advanced banking and financial institutions.
- A developing regulatory and legislative system.
- Declining air space of landfill sites in the metropolitan municipal areas.
- Shortages in electricity supply.
- Greenhouse gas reduction initiatives.
- Policy including the NWMS and the DoE IPP programmes that allocated 25MW to electricity to be derived from Landfill gas and 12.5MW to be derived from biomass.[17]

WEAKNESSES/ THREATS:
- Bureaucratic challenges when dealing with national, provincial and local government.
- Opposition from environmental and citizen groups that can lead to delays in issuing of environmental authorisations and licences.
- WtE systems require large investments.

OPPORTUNITIES:
- Supply of waste concentrated mainly in the larger municipalities (Cape Town, Pretoria, Johannesburg, etc.).
- Increasing cost of coal and electricity creating a demand for alternative energy sources.
- Households and light commercial waste equal to more than 5 million tonnes per annum (2012).
- Small-scale out-of-the-box WtE solutions implemented on farms/ remote areas or in the forestry and mining industries.

The biggest challenge for companies entering the WtE market is the resistance they are likely to face from local communities that are opposed to having a plant located near their settlement (19). The key concerns for communities are the effects of emissions on public health, the odour and pollution associated with transporting waste for incineration.

The challenges for WtE in SA are analysed on the next page:

17. Figures from http://www.ippre-newables.co.za/#page/303

CHALLENGE	OPPORTUNITY FOR THE DUTCH SECTOR
TECHNOLOGY CHALLENGES	
• Lack of versatility: many WtE technologies are designed to handle only one or a few types of waste. • Waste-gas clean-up: the gas generated by processes like pyrolysis and thermal gasification must be cleaned of tars and particulates in order to produce clean, efficient fuel gas. • Conversion efficiency: some WtE pilot plants, particularly those using energy-intensive techniques like plasma, have functioned with low efficiency or actually consumed more energy than they were able to produce.	• Introduce a versatile WtE solution for SA. • The Dutch sector could possibly introduce a technology to SA which will process waste-gas which does not produce tars and particulates. • Dutch companies could bring tested technologies which will allow for efficient production of energy from waste.
STRATEGIC CHALLENGES	
• Regulatory hurdles: the regulatory climate for WtE technologies can be complex. Firstly there are regulations that may prohibit a particular method of WtE. The electrical grid is also still protected by yet more regulations, presenting obstacles to waste-energy producers. • High capital costs for large scale applications due to unavailable know-how. • Complex PPP: arrangements required to secure long term agreement to source waste stream. • Delays in issuing of Environmental authorisations and licenses: due to pressure from environmental groupings opposing incineration. • Zoning and land ownership issues: relating to PPP arrangements. • Procurement Processes: within municipalities.	• Dutch companies may provide cheaper options due to the fact that the WtE industry in the Netherlands is further advanced.
GENERAL CHALLENGES	
• Opposition from environmental and citizen groups, because traditional incineration-based WtE technologies can produce significant pollution from the burning of waste, environmental and citizen groups have often opposed such systems. • Securing long-term power purchase agreements with municipalities. • Landfill disposal is still the cheapest and easiest option but not the most sustainable.	• Dutch companies could introduce their WtE clean technologies. Public relations will be required to raise awareness about advanced technologies.

DUTCH COMPANIES INTERESTED IN SA SHOULD CONSIDER THE FOLLOWING:
- Determine whether to pursue a small installation on farms or factories or a larger installation as part of a clean-up at landfill sites.
- Get more information on the legislations and regulation with regard to the specific installations.
- Plan according to the strategic challenges with regard to WtE in SA, and allow time for the possible delays.

5 TENDER PROCESS

A tender is an offer to do work or supply goods at a fixed price. The tender or bid process in both public and private sectors are designed to ensure that future projects are directed to entities in an impartial manner. Although price is a very important factor in the decision with respect to which tender or bid to accept, it is not the only aspect taken into account. This particularly concerns the SA tender environment whereby political rapport has a vast influence.

The following sections outline the tender process followed in the private and public sectors. They also provide background to the Broad-Based Black Economic Empowerment (B-BBEE) policy and Code of Good Practice that firms need to adhere to if they want to participate in the public sector procurement process. The private sector is also increasingly demanding the B-BBEE compliance from their sub-contractors as it directly affects their B-BBEE scorecards.

5.1 Private Sector Procurement Process

The private sector in SA is not obliged to follow a tendering procedure; therefore, the process is relatively flexible. The tender procedures for private entities may differ slightly from one to the other as they are not governed by any legislation and are subject to the tendering processes approved by businesses themselves. The private sector rarely advertises tenders in the media. In most scenarios, either specific companies are invited to tender for a certain project/study/service, or an individual company is selected disregarding the tendering process. In this instance, the companies seeking to tender for projects advertised by the private sector should directly communicate with the local engineering and consulting companies, as well as property developers and management companies or check their respective websites.[18]

5.2 Public Sector Procurement Process

Government in SA uses the public procurement process as one of the instruments to achieve its socio-economic objectives. As such, this process is governed by the legislative environment primarily through the promulgated Preferential Procurement Regulations[19] in terms of section 5 of the Preferential Procurement Policy Framework Act (PPPFA) 2000.[20] These Regulations are applicable to public entities listed in Section 2 and 3 of the Public Finance Management Act (PFMA) 1999,[21] which include major public entities, national public entities, national government business enterprises, provincial public entities, and provincial government business enterprises. Government has also released detailed guidelines that outlined the approach followed in the evaluation of tenders.[22]

On local government level, public procurement is governed by the Local Government: Municipal Finance Management Act No. 56 of 2003 (MFMA).[23] Each municipality needs to formulate and implement the supply chain management policy, which prescribes among others the process of tendering and other competitive type bidding.

GENERALLY, THE FOLLOWING SHOULD THOUGH BE CONSIDERED:

- **Goods and services between R10 000 and R200 000 (VAT included) can be procured by municipalities through formal written quotations from a list of prospective providers of goods and qualities maintained by municipalities.**
- **Goods and services for over R200 000 (VAT included) and long-term contracts must follow a competitive bidding process.**

The outline of the tender procedures provided in Table 10 is applicable to tender applications for the public sector. Importantly, these processes will be similar within the private sector tendering procedure whereby entities are progressively emulating government processes.

18. See www.gbcsa.org.za/membership/member_list.php for the list of GBCSA members and industry participants
19. More information on the Regulations: www.treasury.gov.za/divisions/sf/sc/PPPFA/default.aspx
20. Electronic copy of the Act: www.treasury.gov.za/legislation/acts/2000/a05-00.pdf
21. More information of the Act: www.treasury.gov.za/legislation/PFMA/default.aspx
22. These can be viewed here:www.treasury.gov.za/divisions/sf/sc/Circulars/GUIDELINES%20PPPFA%20REGS%20-%201%20December%202011.pdf
23. More information on the Act: http://mfma.treasury

TABLE 10: TENDER PROCEDURES WITHIN THE SA BUSINESS ENVIRONMENT

INVITATION TO TENDER

An invitation for tenders is made to the public by means of an advertisement in local and/ or national newspapers. Public Sector contracts can be identified by the following sources:

- Following up contract notices published in newspapers and trade magazines.
- Receiving the government tender bulletin.
- Searching department websites.
- Other online tender notification systems.

A number of websites provide information on construction tender opportunities. These include www.12b.co.za, www.sa-tenders.co.za, www.tendertree.co.za, sa.ask.com/Sa+Tenders+Construction, and www.cwctenders.com/construction_tenders_south_africa.htm.

REQUIREMENTS FOR THE SUBMISSION OF TENDERS

- The tender must include applicable information substantiating the requirements as set out in the advertisement.
- Tender documents must be typed, printed and/ or completed in black ink.
- All tender documents with annexes must be signed by a properly authorised signatory of the tenderer.
- The tenderer must confirm that its signatory has the authority of the legal entity to sign the applicable documents by attaching a certified copy of the relevant resolution of the legal entity. Completion of the Supplier Application Form is compulsory. Failure to complete this form will disqualify a bid.

SPECIFICATIONS AND PRICES

- No tender will be considered unless it is accompanied by adequate or certified documentation indicating that the goods/ services offered comply with the specifications.
- Tenderer must indicate clearly whether prices are firm, are subject to escalation or subject to a particular rate or exchange. In the absence of such information, prices will be regarded as fixed for the full duration of the contract.
- All prices must be quoted in SA currency and must be in accordance with VAT legislation.

DELIVERING A TENDER

- Completed tender documents must be submitted in a sealed envelope.
- Tender documents must be posted in the tender box as stipulated in the advertisement, on or before the stipulated cut-off time and date.
- At the delivery point, tenders are opened and respondents are allowed to join the tender opening process. All business tenders in SA are opened in public where the name of the company is announced with the tender prices and associated costs.

EVALUATION PROCEDURE

- The tender evaluation criteria and point allocation process are approved by the Tender Committee prior to advertising of the tender.

CONTRACT AWARDED

- If awarded the tender, the business is required to respond to the client by confirming their letter of appointment.
- If not awarded the project, the entity can query the reasons against their selection.

WITHDRAWAL OF A TENDER

- Tenders must be valid for 60 calendar days, calculated from the closing date of the tender. During this period, a tender may not be withdrawn by the company.
- If a tender accepted by the Tender Committee is withdrawn, the tenderer will be liable for the difference between his/ her tender price and that of the next tender that is accepted.
- Any contract awarded on account of false information furnished by the tenderer in order to secure a tender may be cancelled at the sole discretion of the company, without prejudice to other remedies the company may have.

5.3 Broad Based Black Economic Empowerment

In dealing with the public sector and often in cases with the private sector, companies tendering for projects need to comply with the Broad-Based Black Economic Empowerment (B-BBEE) policy. B-BBEE is an important policy instrument aimed at broadening the economic base of the country and subsequently at stimulating further economic growth and creating employment. The Code of Good Practice that emerged in 2007 provides a standard framework for measuring Black Economic Empowerment (BEE) and requires all entities operating in SA to make a contribution towards BEE objectives.[24]

In general, private companies wishing to do business with any government enterprise or organ of state (i.e. tender for business, apply for licences and concessions, enter into public-private partnerships, or buy state-owned assets) are required to apply the codes and thus obtain a B-BBEE certification. The areas which are measureable for the scorecard of the Code of Good Practice are Ownership, Management, Employment Equity, Skills Development, Preferential Procurement, Enterprise Development and Socio-Economic Development. Each of these is assigned a set of points which are used to determine the B-BBEE rating. A higher number of points assure a higher B-BBEE rating.

The Broad-Based Black Economic Empowerment Act No. 53, 2003 does not contain any specific exemptions for foreign companies doing business in SA. Foreign companies that plan to do business with the South African Government will need to do so through a registered branch office or through a subsidiary. In such a case, the local branch or subsidiary will be subject to B-BBEE legislative and regulatory requirements. When dealing with SA private firms, foreign companies might also experience an increasing pressure to be B-BBEE accredited.

ALTHOUGH NO SPECIFIC EXEMPTIONS ARE AVAILABLE TO FOREIGN COMPANIES, THE FOLLOWING SHOULD BE NOTED:

- **Enterprises with annual revenues of less than R5 million automatically count at a Level 4 B-BBEE contributor.**
- **Enterprises that earn between R5 and R35 million may rate themselves using only four out of seven scorecard criteria. This means that foreign companies can still score highly in B-BBEE by focusing on human resource development and employment equity, affirmative procurement and social development.**

Companies with annual revenue of more than R35 million per annum will be subject to all seven criteria. However, some flexibility is allowed for foreign multinational companies that do business in the country. The Code of Good Practice acknowledges that global practices of some foreign multinational companies might prevent them from complying with the ownership element of the scorecard through the traditional sale of shares to black SA citizens.[25] In this case, the Codes allow for "equity equivalent" contributions that then count towards the ownership element of B-BBEE. Equity equivalents are approved public programmes or schemes initiated and implemented by the multinational companies, which have been approved by the Minister of Trade and Industry as entitling the multinational companies to indicative points under the ownership segment of the balanced scorecard.[26]

24. The difference between B-BBEE and BEE is that while BEE sought to right the wrongs of the past, B-BBEE aims at distributing the wealth of SA across all race and gender groups. (46)
25. According to the B-BBEE Act of 2003, "black people" is a generic term which means Africans, Coloureds and Indians.
26. More information: www.bee.thedti.gov.za/ and www.cscc.org.za/index.php/documents

6 FUNDING OPTIONS AND SUPPORT

A number of funding and support programmes are provided by the SA Government and various organisations. A range of these can be viewed on www.investmentincentives.co.za. The ones that are most applicable to the WtE industry are outlined below.

TABLE 11: FUNDING OPTIONS

KZN GROWTH FUND	
A debt-fund, structured as a unique public-private partnership between the provincial government, and DBSA, Standard Bank and the Infrastructure Fund of SA.	PO Box 1817, Durban 4000 T: +27 (0) 31 372 3720 F: +27 (0) 31 306 2547 www.kzngrowthfund.co.za info@kzngrowthfund.co.za
LOCAL AND REGIONAL ECONOMIC DEVELOPMENT (LRED) FUND	
The aim of the LRED fund is to provide support to local entrepreneurial partnerships, working in collaboration with local government and other support institutions, to create new economic opportunity that will enable new and better jobs, as well as the promotion of an environment for innovation and enterprise development in the local economy.	www.dedae.gov.za
SA GREEN FUND	
Lay the basis for the SA economy to make a transition to a low carbon, resource efficient and climate resilient development path delivering high impact economic, environmental and social benefits.	T: +27 11 313 5050 www.sagreenfund.org.za enquiries@sagreenfund.org.za
GREEN TECHNOLOGY AND RESOURCE EFFICIENCY IMPROVEMENT	
One of the production incentive grants offered under the Manufacturing Competitiveness Enhancement Programmes (MCEP). The incentive offers a cost-sharing grant of 30%, 40% and 50% of the investment to be payable at production up to a maximum of R50-million.	www.investmentincentives.co.za TMakgothi@thedti.gov.za T: +27 12 394 1644
GREEN ENERGY EFFICIENCY FUND (GEEF)	
The GEEF supports the introduction of energy efficiency and renewable energy technologies and will ultimately continue contributing to global climate protection while supporting SA economic development and growth.	www.idc.co.za/development-funds/geef geef@idc.co.za T: +27 11 313 5050
PUBLIC PRIVATE PARTNERSHIPS (THE NATIONAL TREASURY)	
A contract between a public sector institution/ municipality and a private party, in which the private party assumes substantial financial, technical and operational risk in the design, financing, building and operation of a project.	www.ppp.gov.za Bridget.Morake@treasury.gov.za T: +27 12 315 5176
CENTRAL ENERGY FUND (CEF)	
The CEF includes financing for appropriate energy solutions to meet the future energy needs of SA.	www.cef.org.za T: +27 11 201 4700
REIPPPP	
The REIPPPP has been designed to contribute towards the target of 3 725MW and towards socio-economic and environmentally sustainable growth, and to start and stimulate the renewable industry in SA. In terms of this Procurement Programme, the bidders will be required to bid on tariff and the identified socio-economic development objectives of the DoE. The tariff will be payable by the buyer pursuant to the PPA to be entered into between the buyer and the project company of a preferred bidder.[27]	www.ipprenewables.co.za

27. More info on: http://www.ipprenewables.co.za/#page/303

SOUTH AFRICAN RENEWABLES INITIATIVE (SARi)	
SARi has been established to support the rapid and ambitious scaling up of renewables in a manner that delivers economic, social and environmental benefits without incurring unacceptable domestic cost burdens. SARi was launched as an International Partnership by the Government of SA together with the Governments of Denmark, Germany, Norway and the UK, and the European Investment Bank on 7 December 2011 in Durban, during UNFCCC COP17.	sarenewablesinitiative.wordpress.com Adele Faasen info@sari.org.za T: +27 21 657 6600

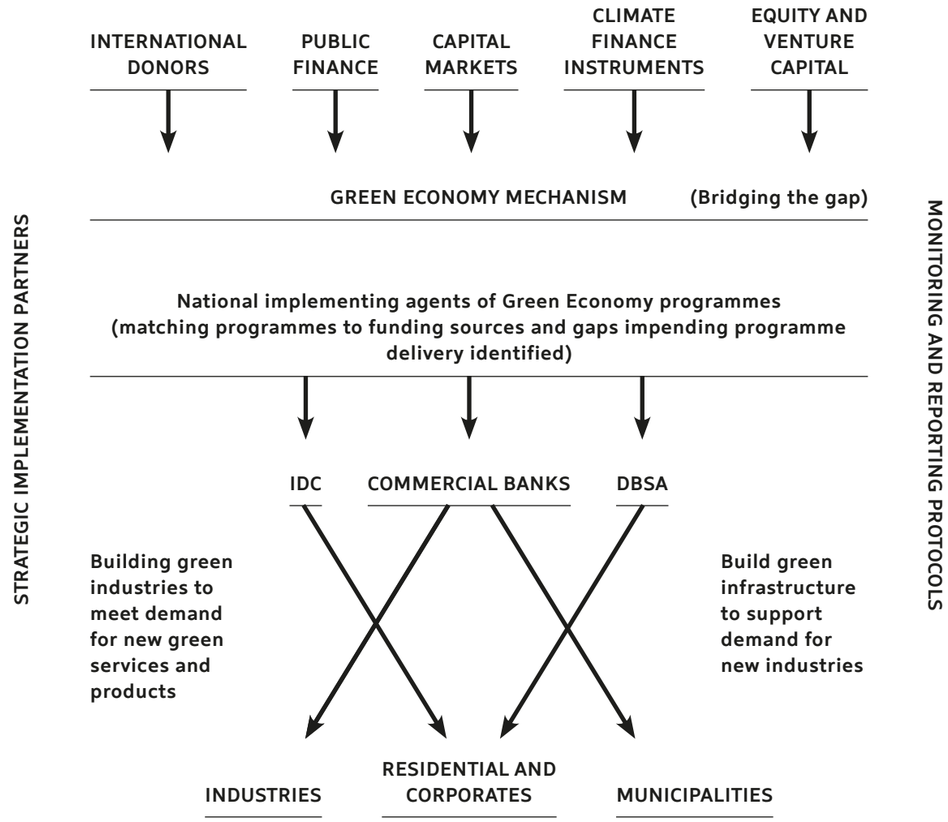
THE RENEWABLE ENERGY MARKET TRANSFORMATION PROJECT (REMT)	
REMT is a GEF/ World Bank funded project launched to help SA eliminate barriers to renewable energy development as it strives to reduce the country's GHG emissions and reach the renewable energy target of at least 10.000GWh contributions to final energy consumption by 2013. The DoE is responsible for implementing this project and has designated the Development Bank of South Africa (DBSA) as the implementing agent.	www.energy.gov.za/files/remt_overview.html Mr Moeketsi Thobela (Project Coordinator) Ms Fatima Collins (Business Development Specialist) Ms Tracy Nkosi (Project Administrator) T: +27 11 313 3589 TracyN@dbsa.org

THE MANUFACTURING COMPETITIVENESS ENHANCEMENT PROGRAMME (MCEP)	
The Manufacturing Competitiveness Enhancement Programme (MCEP) offers a new suite of incentives for existing manufacturers that is designed not only to promote competitiveness in the manufacturing arena, but to ensure job retention in this sector.	www.idc.co.za/development-funds/manufacturing-competitiveness-enhancement-programme

ESKOM INTEGRATED DEMAND MANAGEMENT (IDM) SMALL-SCALE RENEWABLE ENERGY PROGRAMME	
Small-scale renewable energy interventions have been successfully implemented internationally to promote efficient and sustainable use of energy. The Eskom IDM programme in consultation with NERSA, is piloting the inclusion of small-scale renewable energy solutions to further broaden the scope of optimal energy usage.	www.eskomidm.co.za/industrial/sop Mr Arend Louw T: +27 11 711 2659 arend.louw@eskom.co.za

Detailed programme resource plan matched to existing resources and gaps impeding programme delivery identified is illustrated in Diagram 3:

DIAGRAM 3: GREEN ECONOMY MECHANISM[28]



28. More info on: http://www.dbsa.org/Research/DPD%20Working%20papers%20documents/DPD%20No24.pdf? AspxAutoDetectCookieSupport=1

The Dutch Government also offers support to Dutch businesses interested in exploring the SA market. Detailed information can be found on the website of the Embassy of the Kingdom of the Netherlands[29] or on the website of Agency NL.[30]

29. Contact pre-ea@minbuza.nl
30. Contact zuid-afrika@info.agentschapnl.nl.

6.1 Type of Business Venture

PARTNERSHIPS COULD BE FORMED ON TWO LEVELS:

- **Larger stakeholders are included as partners in the holding company, a WtE company in SA.**
- **Smaller stakeholders could be included as partners on individual plants, for example local municipalities, waste-management companies and local development agencies would be brought in to finance and help manage local plants as the technology is replicated.**

TWO TYPES OF PPPS ARE SPECIFICALLY DEFINED:

- **The private party performs an institutional/ municipal function.**
- **The private party acquires the use of state/ municipal property for its own commercial purpose.**

A PPP may also be a hybrid of these types.

PPP (MANAGED BY NATIONAL TREASURY WWW.PPP.GOV.ZA)
SA law defines a PPP as a contract between a public sector institution/municipality and a private party, in which the private party assumes substantial financial, technical and operational risk in the design, financing, building and operation of a project.[31]

OBJECTIVE: encouragement of the private sector to invest in infrastructure in partnership with the public sector.

APPLICABILITY: grants received by the Government and utilised by the tax-payer to effect improvements to state owned property, in pursuance of the terms of the relevant lease agreement with the state.

BENEFIT: the receipt of qualifying government grants is exempt from tax. In addition, a tax allowance is available in respect of such improvements actually effected by the tax-payer. The allowances are 25 years or spread over the period of the project.

31. More information on PPP's can be found at http://www.ppp.gov.za/Pages/default.aspx

7.2 Bankability of Renewable Energy Projects

The various role-players in the renewable energy market seem to agree on the importance of bankability but there is no common understanding of its meaning. While banks typically emphasise the impact of stable cash flows on the project's long-term debt service, equity investors tend to focus on their expectations on investment returns, possible tax incentives and their portfolio strategies. Yet, to ensure a project's soundness, diligence in legal, technical and economic matters is imperative for both stakeholders.

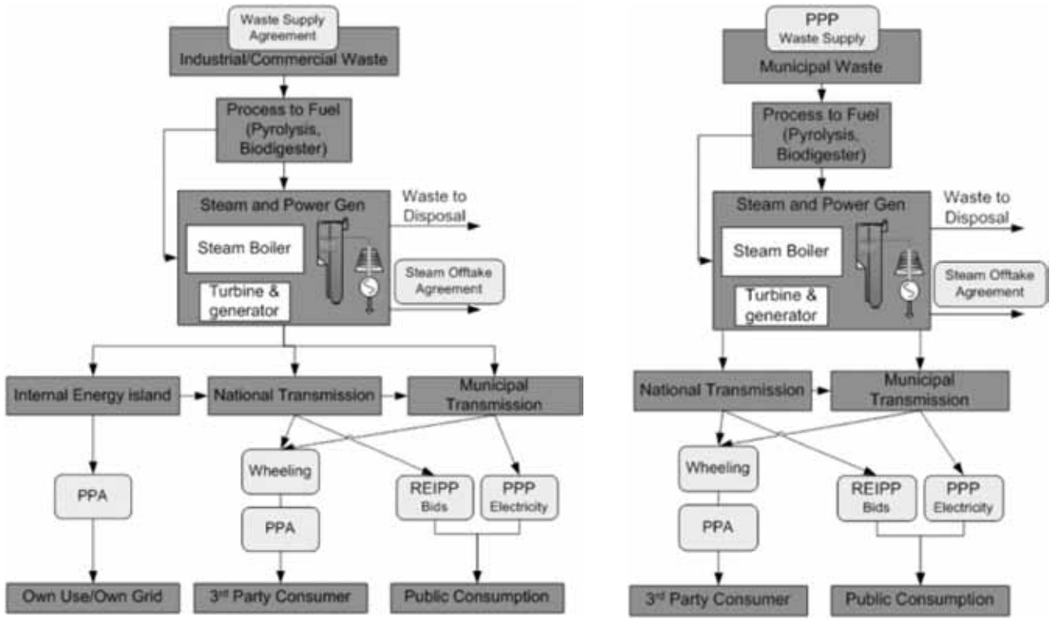
FOUR KEY FEATURES OF A BANKABLE RENEWABLE ENERGY PROJECT:

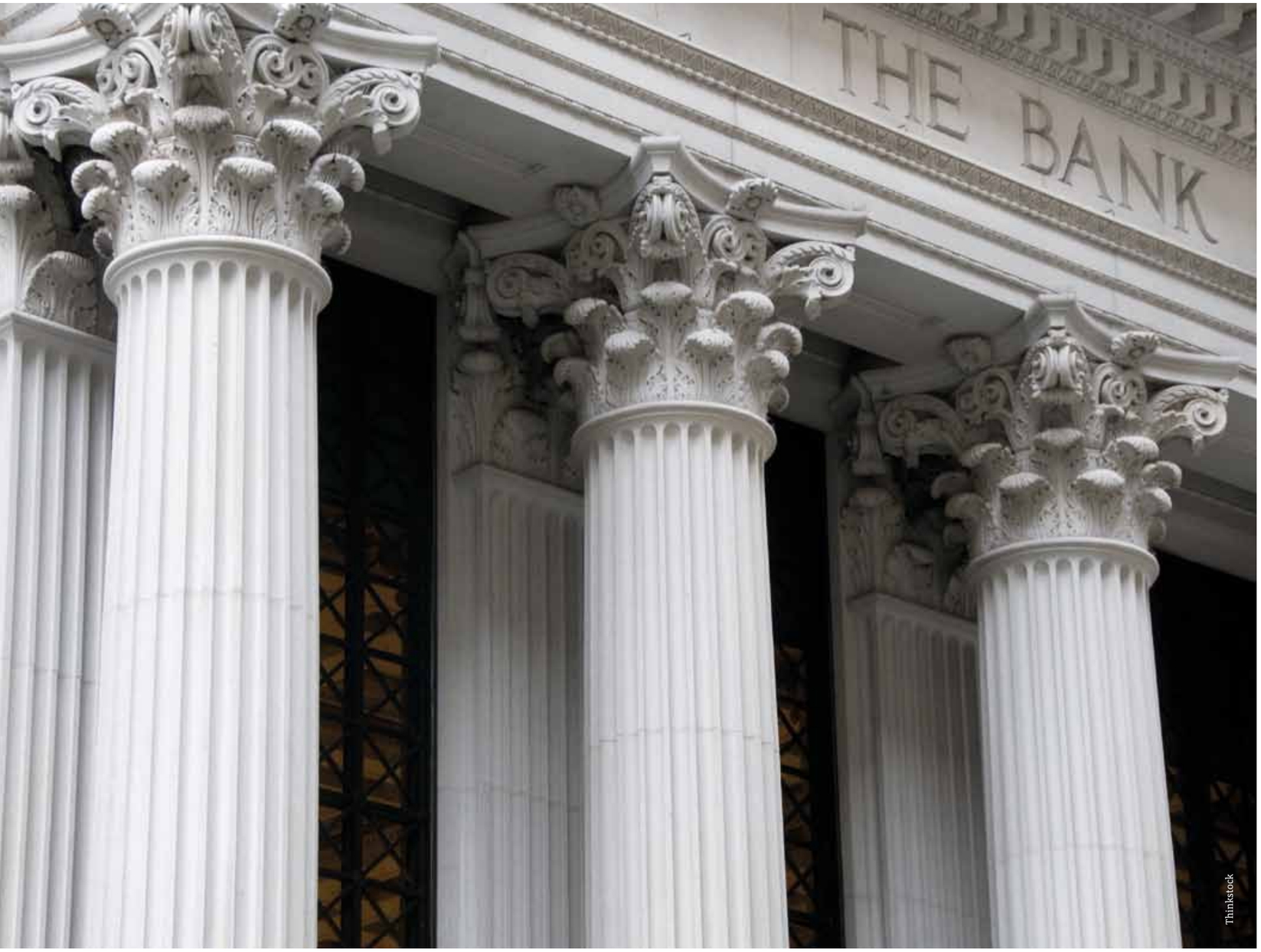
- **Proven technology.**
- **Reliable fuel supply.**
- **Revenue certainty.**
- **Grid connection on reasonable terms.**

THE BANKABILITY OF PROJECTS IN TERMS OF THE KEY FEATURES ARE SUMMARISED BELOW:

- **Key commercial and legal requirements including fuel/waste supply agreements (requiring a PPP where local authorities are involved).**
- **Off-take power purchase agreements (PPAs).**
- **Steam off-take agreements in the case of combined heat.**
- **Power projects and electricity wheeling arrangements where electricity is sold to a third party via national or municipal grids.**

DIAGRAM 4: REQUIREMENTS FOR BANKABILITY AGREEMENTS ESSENTIAL FOR THE SUPPLY AND DISTRIBUTION OF PRODUCED ELECTRICITY/STEAM





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Financial backing from a renowned bank usually signals dependability to installers and commercial investors and it also gives companies financial security. However, to achieve this greater degree of financial security, manufacturers have to be considered as 'bankable', ideally not only by one financial institution, but by a number of banks. The risk focus of banks is rightfully on each product brand and that brand's ability to manufacture a high-quality product, not on the industry as a whole or a specific category.

BANK	INTENTION TO INVEST IN RENEWABLE ENERGY
Investec	**Investec's sector specialists and credit committee will evaluate projects in accordance with additional investment criteria set by the European Investment Bank to ensure that projects deliver environmental benefits and abide by certain businesses, environmental, social and labour practices.**
Nedbank	**Nedbank is committed to funding several renewable energy projects from landfill gas, to solar and wind turbine power. Nedbank provided the financial backing for approximately 37% of the more than 1.200MW worth of energy capacity represented by all the bids submitted in the first phase of South Africa's Renewable Energy IPP programme.**
ABSA	**According to local banks are looking to put together R40bn to R50bn to fund projects for both round one and two of the South African Renewable Energy initiative (SARi). While Standard Bank gave an underwriting commitment of R19.1bn for the renewable project, Absa Bank also decided to give an underwriting commitment of R10.1bn.**
Standard Bank	**Standard Bank Group has signed an R20bn funding support agreement for renewable energy projects in SA with the Industrial and Commercial Bank of China (ICBC) in March 2013 (16).**

7 MAJOR **ROLE-PLAYERS** WITHIN THE INDUSTRY (MARKET PARTICIPANTS)

The major role-players are envisioned to be the waste management sector that currently undertake landfilling and treatment operations and are thereby best situated to take advantage from WtE projects. The three largest waste management companies in SA are Enviroserv, Interwaste Holdings and Wasteman.

Government role-players are the DEA that sets environmental and waste legislation, the DoE who governs the energy policy and the DTI who promotes more energy efficient programmes within various industries. Metro and district municipalities with large population groups could also be included due to the large volumes of waste these municipalities generate. These include for example, Cape Town, Johannesburg, Durban, Pretoria, etc.

THE FOLLOWING FORM PART OF THE ROLE-PLAYERS IN THE WTE DOMAIN:

- **INTERNATIONAL SUPPLIERS: international suppliers of WtE technologies play a very crucial role in the SA WtE market. Most technologies are manufactured by international companies which are in high demand. Especially the cleaner technologies considering the opposition from a number of environmental groups and SA's climate ambitions.**
- **LOCAL SUPPLIERS: local suppliers of WtE technologies in SA have yet to establish or distinguish themselves in the growing market. Existing local suppliers are incidental suppliers of WtE technologies and do not consider themselves or market their products and services as part of the WtE systems market. As the market begins to grow and most projects get developed, local suppliers are expected to play a very important role in the provision of maintenance services and after-sales support.**
- **PROJECT DEVELOPERS: project developers play an integral role in the SA WtE market. Acting as intermediaries between end-users and suppliers, they provide consultative expertise and have the potential to foster and enhance market growth. Project developers are typically international or local engineering and or project management firms. Initiatives in international carbon emissions accords have consolidated the position and impact of project developers on the SA WtE market.**
- **LOCAL DISTRIBUTORS: local WtE distributors have yet to become significant participants in the SA WtE market. This is mainly because most of the equipment used in WtE projects is imported directly from suppliers by project developers. However, local distributors are expected to play a vital role with respect to servicing and system maintenance as the market grows.**

There are also numerous smaller role-players involved in on-site WtE generation, general environmental and waste management services provided from feasibility studies up to implementation. The contact details of some of these role-players are listed in an annex which can be obtained through the Netherlands Embassy in Pretoria.

8 CONCLUSIONS

The WtE market is still in its infancy stage in SA due to low landfill costs and high capital investment required for WtE plants. Opportunities exist for Dutch businesses that offer advanced clean technologies that correspond well with the SA context. Differentiation needs to be made between public and private sector WtE projects as waste types, technologies, project structuring and drivers to implement WtE differs.

PPPs are important in developing WtE projects that involve municipal waste typically collected by local authorities. SA has advanced environmental legislation that governs WtE both in terms of waste management requirements as well as air emissions requirements. WtE initiatives, however, still face challenges such as public opposition due to a fairly strong anti-incineration lobby. The Netherlands is a world leader in WtE technologies, with experience and know-how in offering environmentally friendly and clean WtE solutions.

Anaerobic digestion of waste materials and other biomass streams are becoming more conventional in the SA market. Thermal treatment coupled to energy recovery is currently dominated by private sector initiatives that generate suitable volumes of waste. As landfill space continues to decline, land suitable for development of landfills are increasingly sought after by other economic activities, an increased shift towards recycling and thermal treatment is clear. WtE is an ideal solution to generate energy from the waste currently in landfills, and the Dutch companies with their relevant experience and know-how should partner with relevant SA companies to implement WtE in large South African municipalities.

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