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<th>Acronym</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>CSIR</td>
<td>The Council for Scientific and Industrial Research</td>
</tr>
<tr>
<td>DEA</td>
<td>Department of Environmental Affairs</td>
</tr>
<tr>
<td>DST</td>
<td>Department of Science and Technology</td>
</tr>
<tr>
<td>EPR</td>
<td>Extended Producer Responsibility</td>
</tr>
<tr>
<td>EPRP</td>
<td>Extended Producer Responsibility Priority</td>
</tr>
<tr>
<td>EPWP</td>
<td>Expanded Public Works Programme</td>
</tr>
<tr>
<td>eWASA</td>
<td>e-Waste Association of South Africa</td>
</tr>
<tr>
<td>e-waste</td>
<td>Electronic waste</td>
</tr>
<tr>
<td>GCGC</td>
<td>Global Change Grand Challenge</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross domestic product</td>
</tr>
<tr>
<td>HCD</td>
<td>Human Capital Development</td>
</tr>
<tr>
<td>IDC</td>
<td>Industrial Development Corporation</td>
</tr>
<tr>
<td>IndWMP</td>
<td>Industry Waste Management Plan</td>
</tr>
<tr>
<td>IPAP</td>
<td>Industrial Policy Action Plan</td>
</tr>
<tr>
<td>IWMP</td>
<td>Integrated Waste Management Plan</td>
</tr>
<tr>
<td>JRA</td>
<td>Johannesburg Roads Agency</td>
</tr>
<tr>
<td>ME</td>
<td>Municipal Entity</td>
</tr>
<tr>
<td>MSA</td>
<td>Municipal Systems Act</td>
</tr>
<tr>
<td>MSW</td>
<td>Municipal Solid Waste</td>
</tr>
<tr>
<td>NDP</td>
<td>National Development Plan</td>
</tr>
<tr>
<td>NEM:WA</td>
<td>National Environmental Management: Waste Amendment Act</td>
</tr>
<tr>
<td>NWMS</td>
<td>National Waste Management Strategy</td>
</tr>
<tr>
<td>PE-HD</td>
<td>High-density polyethylene</td>
</tr>
<tr>
<td>PE-LD</td>
<td>Low-density polyethylene</td>
</tr>
<tr>
<td>PE-LLD</td>
<td>Linear low-density polyethylene</td>
</tr>
<tr>
<td>PET</td>
<td>Polyethylene terephthalate</td>
</tr>
<tr>
<td>PETCO</td>
<td>PET Recycling Company (Pty) Ltd</td>
</tr>
<tr>
<td>POLYCO</td>
<td>Polyolefin Recycling Company</td>
</tr>
<tr>
<td>PP</td>
<td>Polypropylene</td>
</tr>
<tr>
<td>PPP</td>
<td>Public-Private Partnerships</td>
</tr>
<tr>
<td>PRASA</td>
<td>Paper Recycling Association of South Africa</td>
</tr>
<tr>
<td>PRO</td>
<td>Producer responsibility organisation</td>
</tr>
<tr>
<td>PS</td>
<td>Polystyrene</td>
</tr>
<tr>
<td>PS-E</td>
<td>Polystyrene expanded</td>
</tr>
<tr>
<td>PSPC</td>
<td>Polystyrene Packaging Council</td>
</tr>
<tr>
<td>PVC</td>
<td>Polyvinyl chloride</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>Research and Development</td>
</tr>
<tr>
<td>RDP</td>
<td>Research, Development and Innovation</td>
</tr>
</tbody>
</table>
REDSIA  Recycling and Economic Development Initiative of South Africa
SAEWA  South African e-Waste Alliance
SALGA  South African Local Government Association
SA-NCPC  National Cleaner Production Centre
SAVA  Southern African Vinyl’s Association
SAWPA  South African Waste Pickers' Association
SIC  Standard Industrial Classification
SMME  Small, Medium and Micro-sized Enterprises
TGRC  The Glass Recycling Company
WAB  Waste Agricultural Biomass
YJW  Youth Jobs in Waste
1. Introduction

The project “Umweltechnologien in Südafrika mit dem Schwerpunkt Abfallmanagement” forms part of the pilot project programme of the “Exportinitiative Umweltechnologien” supported by the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB). The pilot projects will be launched in 8 German Chambers of Commerce worldwide. The focus of the South African pilot programme will be on Waste Management. The Southern African-German Chamber of Commerce and Industry will organize the pilot project in South Africa and the project will be co-ordinated by the DIHK Service GmbH and funded by the BMUB.

The Department of Environmental Affairs (DEA) has identified numerous challenges in waste management in South Africa. The Department has provided strategies to address these challenges in the form of the National Waste Management Strategy. This includes technical solutions for the increasing volume of waste, insufficient capacity and technical equipment of waste installations, the bad data situation and the limited understanding of the waste stream, outdated infrastructure and lack of incentives for recycling.

The project should contribute to a better understanding of recycling systems and identify opportunities and potential uses for modern technologies. In addition to site visits with relevant stakeholders, there will be working groups on the topics of technology transfer, training, financing, role of the informal sector, raising awareness for recycling, job creation and the role that German technology could play in the previous disadvantaged areas.

Methodology

Phase 1
Creation of an analysis and contacting relevant stakeholders in preparation for the event in Johannesburg, where the following issues will be addressed:

- How can an intelligent use of technology encourage job creation?
- How can new economies be developed through the implementation of modern recycling methods in previously disadvantaged areas of the country?
- How can a sustainable economy be achieved through the use of recycling technologies?
- What role does the issue of education play in the field of waste management?
- How does the informal sector contribute to recycling in South Africa?

Phase 2
Planning and implementation of 1-day site visits to various waste management companies and recycling plants with subsequent Workshop Meetings (1 day) in Johannesburg.

Phase 3 Final evaluation and preparation of a strategy paper, which on the one hand documents the results, but above all indicates possible development paths and starting points for further activities. This could, for example, be an agreement to implement a pilot project in a township1.

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1 In South Africa, the terms township and location usually refer to the underdeveloped urban living areas that were reserved for non-white residents, namely black Africans, Coloureds and Indians.
2. Introduction to Waste

2.1 Background: South African Waste

The Building and Construction Technology Department of the CSIR gives a short overview of the history of waste management in South Africa in its Guideline to Human Settlement Planning and Design Volume 2 (2000)\(^2\).

History
A formal waste collection service was first implemented in the Cape Colony in 1786, and by the 1820s a regular waste collection service was established, operating on specific days of the week, using animal-drawn carts.

It was only in the 1920s, with the advent of motor vehicles in South Africa, that the advantages of mechanical transport could be tested. The first trucks used for refuse collection were able to replace a number of carts with a significant cost saving and the advantage of easier supervision.

Social Revolution
The rapidly changing socio-political situation has meant that traditional mechanised methods of have had to be rethought to adapt to the changing times. Rapid urbanisation, population growth and the ability of people to pay for the service are major influencing factors. Improvements in community health and demands for a better service, coupled with environmental concerns, are factors that significantly impact on waste management.

Mix of well-developed and poorly developed areas
Population influx has created many informal and congested pedestrian-only settlements in open spaces and on the peripheries of towns and cities. This has provided the authorities responsible for waste management in South Africa with new challenges.

To integrate well-developed and poorly-developed areas, engineers and town planners need to provide innovative and cost-effective methods of waste collection, while maintaining a standard acceptable to both the community and the environment. This integration has created a new platform where the involvement of the communities in planning waste management systems is crucial, if sustainability and acceptance of the system are to be achieved.

Demand for land
Influx and rapid urbanisation, plus social and political pressures, have put land at a premium in the city and town areas. A city landfill once thought of as being an acceptable distance from suburban housing now sits cheek by jowl with generally low-income – but politically vocal and influential - communities. The search for acceptable disposal sites within an economically viable radius of collection operations becomes more and more problematic.

Public participation and consultation is therefore of the utmost importance.

Social upliftment and empowerment in underprivileged areas

With about half the potentially economically active population unemployed, there is increased pressure on authorities to couple the delivery of social services with increasing elements of job creation. Labour-intensive - rather than mechanised - methods are positively encouraged by central government and this form of collection is rapidly becoming the norm rather than the exception, as it provides entrepreneurial opportunities and job creation in an activity where there are no serious technical or financial barriers to entry. The government’s privatisation policy further encourages this pattern, but the demand for higher wages and career opportunities must mean that “old technology” must incorporate modern methods of cost control, efficiency and planning in order to provide a cost-effective service.

**Waste management in townships**

Some of today’s waste management problems in townships can be traced back to the initial construction of townships. In some cases, the technologies used were inadequate, and have subsequently collapsed. A broader problem, however, has been the neglect of necessary maintenance and repairs to public infrastructure which resulted in township infrastructure being old, decaying and unable to accommodate growing populations.

Most South African towns and cities have at least one township associated with them. Some old townships have seen rapid development since 1994 with, for instance, wealthy and middle-income areas sprouting in parts of Soweto and Chatsworth. The townships associated with Johannesburg include: Orange Farm, Alexandra, Soweto, Ivory Park and Diepsloot. Township communities are faced with several social problems. Most often, the residents of townships do not own the land on which their houses are built. In effect, these houses are built illegally. Construction is informal and unregulated by the government. This results in a lack of access to basic services such as sewage, electricity, roads and clean water, which adversely affects residents’ quality of life.

Waste management remains a challenge for most municipalities in the country especially in township areas. The problem is aggravated by the lack of strategies, financial resources, materials and equipment, and skills required for waste management. Local communities are therefore in a dilemma in keeping their surroundings clean. Communities and their municipalities find it difficult to address this problem without support from other stakeholders.

**Waste management in Johannesburg**

In Johannesburg the challenges of overcoming service and infrastructure backlogs, meeting developmental goals and encouraging economic growth mean that new and creative mechanisms are urgently required. As seen over the years, the city has experienced a rapid growth in population from around 3 million in 2001 to an estimated 4.6 million in 2016. High levels of inequality are still a concern. This together with the high poverty rate (currently 24.7%) needs to be tackled urgently. Unemployment is still a huge problem and very high at 25%. Of particular concern is youth unemployment which is estimated at 32%.

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

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4 JOZI: A City @ Work 2012/16 Integrated Development Plan 2014/15 Review
urbanization in South Africa have resulted in increased waste generation which requires establishing and implementing effective waste management policies and programmes. A number of issues continue to be challenges for effective waste management. These include ineffective data collection systems and lack of compliance and enforcement capacity, lack of education and awareness amongst stakeholders within the waste sector, operational costs for management of waste, support for waste reduction at local government level, availability of suitable land for waste disposal, lack of structured incentives for reduction, and recycling and/or reuse of waste.

2.2 Definition of Waste

Waste by definition can be described as any matter - whether gaseous, liquid or solid - originating from any residential, commercial or industrial area, which is superfluous to requirements and has no further intrinsic or commercial value.

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

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

Different types of waste may be generated from a variety of sources such as: residential, industrial, commercial, institutional, construction and demolition, municipal services, process (manufacturing, etc.) and agricultural activities. As defined in the National Environmental Management: Waste Amendment Act (26 of 2014), waste is divided into two classes based on the risk it poses - general waste and hazardous waste.

**General waste** is waste that does not pose an immediate hazard or threat to health or to the environment, and includes:

- domestic waste;
- building and demolition waste;
- business waste;
- inert waste; or
- any waste classified as non-hazardous waste in terms of the regulations made under section 69, and includes non-hazardous substances, materials or objects within the business, domestic, inert or building and demolition wastes

**Hazardous waste** is any waste that contains organic or inorganic elements or compounds that may have a detrimental impact on human health and the environment.

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5 SAWIC: http://sawic.environment.gov.za/?menu=60
3. The South African Waste Industry

3.1. Overview

The waste management landscape in South Africa is changing as a result of policy and regulatory reform, pressures on municipalities (e.g. limited landfill airspace) and, to some extent, an increase in awareness of sustainability imperatives in the industry. The government, through various green economy policies and strategies, is also looking to the waste industry as a job creator.6

The waste industry in South Africa currently consists mainly of collection and landfilling, with a limited amount of recycling. A report by the Department of Environmental Affairs states that in 2011 South Africans generated more than 108 million tonnes of waste per year - that’s 5kg of waste per person per day - and only 10% of this gets recycled. According to the National Waste Information Baseline Report, of the total 108 million tonnes, 90% goes to landfills.7

Fifty percent of the recycled waste is classified as general waste (domestic, building and demolition waste, business waste), 44% is unclassified waste (electronic waste, sewerage sludge, brine, bottom ash, dust) and 0.93% is hazardous (batteries, toxic chemical waste).8

Household waste is managed by municipalities (and/or their service providers) and commercial and industrial waste is typically managed by the private sector (in larger municipalities), although some waste may still be disposed of at municipal landfills.

There is potential to increase the amount of recycling and to create opportunities for the development and sale of alternative waste treatment technologies. Recycling would likely be further driven by the call for the development of sector-specific industry waste management plans (IndWMPs) — such as the draft call for packaging, lighting and e-waste. These IndWMPs would potentially build on the initiatives already established in the industry.

Alternative waste treatment may be driven by restrictions that will come into force soon on materials going to landfill and, in the case of municipalities, due to pressures on landfill airspace, among other factors.

There are opportunities for an expanded waste management sector (collection, sorting, processing, treatment, etc.) — provided there is access to waste and, where applicable, a market for recovered materials (i.e. a secondary materials economy in South Africa or overseas).

It must also be financially viable to recover materials to access these markets and/or to treat waste using alternative technologies.

6 Department of Environmental Affairs: https://www.environment.gov.za/
7 eNCA. (2014): SA drowning in dirt
3.2 Industry Structure

The South African waste sector is complex and not easy to outline due to the extent to which the formal and informal sectors are intermingled. This is further complicated by organisations that have waste management as core and secondary activities. The South African waste sector is also not recognised as a distinct economic sector. Unlike other countries which have specific economic categories assigned to the various waste management activities, South Africa does not have recognised Standard Industrial Classification (SIC) codes for the waste sector. This makes the collection of formal economic data for the local waste sector very difficult to collate and report on. The South African waste sector includes both formal and informal sectors, each of which play an important role in the management of waste in the country.9

The formal waste sector includes:

- waste handlers (private and municipal)
  - included city cleansing
  - waste collection and transport
  - storage and transfer
  - sorting and separation of recyclables
  - reprocessing or recovery of recyclables
  - treatment
  - disposal (landfilling)
- waste equipment providers
- waste consulting/engineering companies
- waste research and development organisations
- waste and resources sector associations

The informal waste sector includes:

- informal waste pickers
  - waste collection and selling

According to the South African Constitution (Act No. 108 of 1996), local municipalities are mandated to collect domestic waste. Municipalities can either provide the collection services directly or appoint private contractors. The commercial and industrial sectors are responsible for the safe disposal of their own waste, which includes both general and hazardous waste fractions, and generally appoint waste service providers to manage their wastes.

Given the responsibility assigned through the Constitution and elaborated on in the Municipal Systems Act (No. 32 of 2000) (MSA), municipalities must ensure that adequate waste collection and disposal facilities are available to meet the need within their boundaries10.

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10 DEA: National Waste Management Strategy (2011)
Furthermore, the National Environmental Management: Waste Act (No. 59 of 2008) (NEM:WA) and the National Waste Management Strategy (NWMS) (2011) mandate municipalities to implement alternative waste management to divert waste from landfill and minimise environmental degradation. Based on current waste management costs and limited capacity the implementation of alternative waste management practices, such as recycling, is perceived as more costly, relative to landfill. This perception has been partially responsible for the slow uptake of alternative waste management measures, despite national laws and mandates.

The demand for basic services, coupled with the demand for alternative waste treatment, which is usually accompanied with the need for new infrastructure, cannot be met using current (allocated) government finances. As a result, municipalities need to look into innovative and alternative ways of funding these support functions. This includes partnerships with the private sector, and provincial and national government playing a role in the implementation of extended producer responsibility (EPR), allowing for the levies charged to offset some of the infrastructural and operational demands. The White Paper on Local Government recommends that municipalities look for innovative ways of providing and accelerating the delivery of municipal services (South African Local Government Association (SALGA) 1998)\(^{11}\).

The majority of municipalities and cities in South Africa face serious economic, social and environmental challenges related to solid waste management. The current waste disposal methods, such as landfills, are not environmentally sustainable, and municipalities have difficulty complying with regulations and other environmental laws. The problem is further compounded by the depletion of available landfill space, particularly in the large cities and metros. Most small towns and rural areas struggle to find funds for developing and rehabilitating waste management infrastructure. Municipalities can no longer afford the ‘collect and dump’ approach to solid waste management because of soaring collection and transportation costs. New and innovative mechanisms for financing solid waste management are needed to address these challenges.

Municipalities, however face many challenges with respect to basic city cleansing, waste collection and disposal. Recent initiatives aimed at identifying the challenges experienced by municipalities, identified four broad themes of obstacles to effective waste management, namely\(^{12}\)

- financial management
- equipment management
- labour (staff) management, and
- institutional behaviour (management and planning)

In spite of the constraints municipalities face, South Africa realised an estimated 52.6% recycling rate for paper and packaging waste in 2014. This is mainly due to a large, and active, informal sector, with an estimated 80-90% (by weight) of packaging waste recovered by the informal sector (Packaging SA, 2015). South Africa has yet to implement a national separation at source programme, and so informal pickers are forced to recover valuable recyclables from landfill, or by

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\(^{11}\) SALGA (1998): White paper on local government

picking through municipal bins and bags at kerbside. While no official data exists, an estimated 60,000 – 90,000 pickers earn a livelihood from the recovery of recyclables from municipal waste in South Africa (DST, 2013).\(^3\)

4. Policy and regulation

The National Environmental Management Waste Act (NEM:WA), which came into effect on 1 July 2009 (Act No.59 of 2008) and was amended in 2014, requires that waste minimisation be considered by municipalities in addition to the traditional municipal waste management services such as cleaning, collection and disposal to landfill. The Draft Waste Classification and Management Regulations (Department of Environmental Affairs 2010) and the National Domestic Collection Standards (October 2010) set out the regulatory requirements and standards necessary for the implementation of the provisions of the Act (NEM:WA). The National Domestic Collection Standards clearly states that separation at source must be encouraged and supported in line with the relevant industry waste management plans, and in addition:

- All domestic waste must be sorted at source (i.e. households) in all metropolitan and secondary cities
- The service provider/municipality must provide clear guidelines to households regarding types of waste the sorting of waste, appropriate containers and removal schedules for each type of waste
- Community involvement in recycling must be encouraged.

In South Africa waste management is governed by the:

- National Environmental Management: Waste Act 2008 (Act 59 of 2008) as amended by the
- National Environmental Management: Waste Amendment Act (26 of 2014) and the
- National Environmental Management Laws Amendment Act (25 of 2014)

The Waste Act promotes integrated waste management based on the waste management hierarchy as a means to reduce the amount of waste going to landfill, through waste avoidance, reduction, re-use, recycling, recovery, treatment, and safe disposal as a last resort.

In order to reduce the impact on human health and the environment, the Act also includes minimum requirements and licensing for activities involving the storage, transportation, re-use, recycling, treatment and disposal of waste.

Following the enactment of the Waste Act, the Minister of Environmental Affairs established the National Waste Management Strategy (NWMS) in terms of Section 6 (1) for achieving the objects of the Act. The NWMS was approved for implementation by the Cabinet in November 201114.

Apart from specific waste legislation, the waste management sector is regulated by the following legislation15:

- Hazardous Substances Act (Act 5 of 1973)
- Health Act (Act 63 of 1977)
- Environment Conservation Act (Act 73 of 1989)

15 SAWIC: http://sawic.environment.gov.za/?menu=60
The National Waste Management Strategy (NWMS) is to achieve the objectives of the National Environmental Management: Waste Act 2008 (Act 59 of 2008) and provide a plan to address challenges associated with waste management in South Africa. The NWMS has identified eight priority goals, accompanying objectives to achieve these goals and indicators to measure the achievements against targets, which are to be met within a five-year timeframe.

Goal 1: Promote waste minimisation, re-use, recycling and recovery of waste
Goal 2: Ensure the effective and efficient delivery of waste services
Goal 3: Grow the contribution of the waste sector to the green economy
Goal 4: Ensure that people are aware of the impact of waste on health, well-being and environment
Goal 5: Achieve integrated waste management planning
Goal 6: Ensure sound budgeting and financial management for waste services
Goal 7: Provide measures to remediate contaminated land
Goal 8: Establish effective compliance with and enforcement of the Waste Act

To achieve these eight goals, the Waste Act provides a toolbox of waste management measures:

**Waste Classification and Management System** – methodology for the classification of waste and provides standards for the assessment and disposal of waste for landfill disposal.

- **Norms and standards** - baseline regulatory standards for managing waste at each stage of the waste management hierarchy.
- **Licensing** – activities that require licenses (with conditions) and those that do not, if undertaken according to conditions or guidelines.
- **Industry waste management plans** – enables collective planning by industry to manage products once they become waste and to collectively set targets for waste reduction, recycling and re-use.
- **Extended Producer Responsibility (EPR)** – regulates that industry is responsible beyond point of sale for particular products that have toxic constituents or pose waste management challenges, particularly where voluntary waste measures have failed.

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16 DEA: National Waste Management Strategy (2011)
- **Priority wastes** – categories of waste that, due to their risks to human health and the environment, require special waste management measures, particularly where a solution requires the involvement of multiple role-players.

- **Economic instruments** - encourages or discourages particular behaviour and augments other regulatory instruments.

The Waste Act supports the waste management hierarchy in its approach to waste management, by promoting cleaner production, waste minimisation, re-use, recycling and waste treatment with disposal seen as a last resort in the management of waste.

### 4.2 Waste Management Hierarchy

The Waste Act promotes the internationally recognised waste management hierarchy, which states waste should first be avoided; where it cannot be avoided it should be reduced, re-used, recycled or recovered and only disposed of if there is nothing else that could be done with it.

The objectives of the Waste Act are structured around the steps in the waste management hierarchy, which is the overall approach that informs waste management in South Africa. Therefore, the NWMS follows the waste management hierarchy approach

#### Table 1: Steps involved in the waste hierarchy

<table>
<thead>
<tr>
<th>Hierarchy step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoid and Reduce</td>
<td>Design principles that incorporate the re-use of goods or their dismantling into components for re-use. Reduction of quantity and toxicity of waste generated during the production process</td>
</tr>
<tr>
<td>Re-Use</td>
<td>Diversion from the waste stream for use in a similar or different purpose without changing its form or properties</td>
</tr>
<tr>
<td>Recycle</td>
<td>Separation of items in the waste stream and processing them as products or raw materials</td>
</tr>
<tr>
<td>Recover</td>
<td>Reclaiming of particular components or materials, or using the waste as a fuel</td>
</tr>
<tr>
<td>Treat</td>
<td>Treatment in preparation for disposal</td>
</tr>
<tr>
<td>Dispose</td>
<td>Final disposal in the safest manner possible</td>
</tr>
</tbody>
</table>

*Source: National Waste Management Strategy (2011)*

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17 DEA: National Waste Management Strategy (2011)
The waste hierarchy places waste avoidance and reduction, and recycling at the top of the pyramid. The foundation of the NEM:WA and the new National Waste Management Strategy (NMWS) is based on the waste hierarchy. All integrated waste management plans are required to encompass the whole concept of the waste hierarchy. Central to this theme is recycling, which is seen by many as a platform for the creation of jobs in waste management.

4.3 South Africa’s Waste Management Strategy

The purpose of the NWMS is to achieve the objectives of the National Waste Act. The reality, however is that South Africa has embraced the principles of the waste hierarchy in legislation, but it has been slow to transition up the waste hierarchy. South Africa stills landfills ~ 90% of all waste generated (2011)\(^8\).

Landfilling stills remains the most common and currently most financially affordable solution to growing waste issues. In order to alter this situation, research has an important role to play in informing regulatory and business approaches and in contributing to the introduction of alternative technical solutions and higher financial viability. In terms of capacity building, training is needed in both the public and private waste sector to enhance knowledge on the selection and implementation of appropriate, alternative technology solutions as well as the design and application of financing schemes, such as public-private partnerships and full-cost accounting. The promotion of a comprehensive approach to waste management is considered as crucial and can be achieved, among others, through the adoption and implementation of municipal integrated waste management plans (IWMPs) and industry waste management plans (IndWMP). Even though South Africa has a comprehensive legislative framework, compliance and enforcement remains relatively weak in a range of areas. It is also emphasized that all efforts that are undertaken at the policy, technical and

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\(^8\) DST (2014): *A waste research, development and innovation roadmap for South Africa (2015-2025)*
research, and financial levels have to be complemented by measures of raising awareness at the household and consumer levels and that they must be adapted to local social and infrastructural conditions.

4.4 Waste Research, Development and Innovation (RDI) Roadmap

The Department of Science & Technology (DST) initiated a project in 2012 to develop a Waste RDI Roadmap for South Africa. The DST’s mission is to develop, coordinate and manage a National System of Innovation (NSI) that will bring about maximum human capital, sustainable economic growth and improved quality of life for all. To this effect, the DST is engaged in fostering innovation, job creation and enterprise development within the South African waste sector, through the implementation of a 10-year national Waste Research, Development and Innovation (RDI) Roadmap.

The Waste RDI Roadmap emanates in response to the Global Change Grand Challenge (GCGC) initiative, which recognises the economic opportunity for South Africa in mitigating climate change, under the so called “Green Economy”. The Roadmap supports the goals of the National Waste Management Strategy (NWMS), National Development Plan (NDP), Industrial Policy Action Plan (IPAP), and Green Economy Accord, by providing the necessary scientific knowledge and technology to help improve the manner in which waste is managed in the country.

The vision of the Roadmap is to stimulate waste innovation (technological and non-technological), R&D, and human capital development (HCD), through the investment in science and technology and in so doing, maximise the diversion of waste from landfill towards value-adding opportunities, including prevention of waste and the optimised extraction of value from reuse, recycling and recovery, in order to create significant economic, social and environmental benefit.

Research by the DST showed that

- South Africa generated at least R25.2b worth of resources as waste (in 2012)
- But R17.0b worth of resources were lost to the economy in 2012 through disposal as waste to landfill
- This evidence provides an opportunity to inform the move up the waste hierarchy –
  - Appropriate technology solutions – material recovery (recycling) of plastic waste provides a ten-fold greater economic benefit to the country than energy recovery
  - Policy responses – How do we unlock economic opportunities, where the unit value (R/t) is greater than the cost of landfilling but recycling remains low

The waste sector provides opportunities to create –

- Large numbers of low-skill jobs for the currently unemployed
- New economic activities in the secondary resources economy (recycling/manufacturing) thereby creating new job opportunities

4.5 Waste streams

The Department of Science and Technology gave an overview on the various waste streams in South Africa based on collective experience in the sector and on work undertaken in the development of a Waste R&D and Innovation Roadmap for South Africa.\(^1\)

Municipal solid waste (MSW)

In recent years, South Africa has developed an extensive waste policy and regulatory framework that supports sound municipal waste management practices. While the establishment of further policies and regulations are therefore considered of lower priority, there now remains considerable scope for implementing and enforcing existing policies and regulations more effectively. Enhancing compliance with the existing legislation will require the development of capacities and operational adjustments at all levels. In particular, technical capacities that ensure the successful operation of sanitary engineered landfill sites (and associated equipment) as well as capacities in auditing and monitoring are required to support legislative measures. In South Africa, the majority of municipal solid waste is still landfilled. To change this, it is necessary to develop capacities to effectively select and implement appropriate, alternative technological solutions (e.g. energy recovery, thermal treatment, beneficiation, recycling). Building up these capacities, especially at the municipal level, will contribute to a more comprehensive approach to the management of municipal solid waste. To effectively design and operate such facilities, the process will have to be supported financially. A major obstacle in this

\(^1\) DST (2014): *A waste research, development and innovation roadmap for South Africa (2015-2025)*
regard remains the relatively low cost of landfilling in South Africa, rendering alternative technologies and practices financially unsustainable (e.g. recycling). In this regard, capacity building in full-cost accounting of waste management, particularly within municipalities, is required. A toolkit enabling capacity building in budgeting and full-cost accounting is being developed by the Department of Environmental Affairs (DEA), but has yet to be implemented. The efforts at the regulatory and technical level will have to be accompanied by increased post-consumer recycling in South Africa. Here, capacity building and awareness programmes at the household level are needed to ensure at-source separation and collection of recyclable materials.

**Waste plastics**
With a policy framework and appropriate institutions in place to support the recovery, recycling, and manufacturing from packaging waste, South Africa has the potential to sustain a recycling sector. However, to secure financial viability of the recycling sector it is necessary to implement appropriate financial mechanisms. For instance, putting in place full-cost accounting schemes for municipal waste will help correct price distortions in the sector. It is emphasized that advancements in the technological field are needed to ensure that processing and manufacturing of packaging waste can be undertaken locally and can thereby be a factor in spurring local economic development. Raising awareness at the household level is important to support the source separation and recovery of different types of post-consumer recyclables. Moreover, it is considered critical for a well-functioning recycling system for packaging waste to build capacities in the informal waste sector, e.g. waste pickers, who play an invaluable role in the local waste value chain. In the absence of a formal collection and sorting system for recyclables, waste pickers have provided a valuable, and low cost, solution for moving resources from the service chain to the value chain.

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22 DST (2014): A waste research, development and innovation roadmap for South Africa (2015-2025)
5. Opportunities for alternative waste management technologies

South Africa is still largely at the periphery of this global transition towards a circular economy. The promulgation of the NEM:WA (No. 59 of 2008) (RSA, 2009), underpinned by the principle of the waste hierarchy, is prompting change within the South African waste sector. In terms of the waste management hierarchy, South Africa is predominantly focusing on recycling, recovery (energy), and treatment and disposal. In this regard, there is potential to increase the amount of recycling and to create opportunities for the development and sale of alternative waste treatment technologies. Among other elements, recycling may be driven by the call for the development of sector-specific IndWMPs (such as packaging, lighting and e-waste), and potentially building on the initiatives already established by the industry\(^2^3\).

However, as at 2011, an estimated 90% of all general and hazardous waste generated in the country was still disposed of to landfill. In the case of municipal waste, often to uncontrolled open dumpsites. Only 9.8% of generated waste was recycled and 0.1% treated (DEA, 2012). The current portfolio of waste technology solutions for South Africa is therefore still heavily reliant on landfilling\(^2^4\). The national Waste Sector Survey for 2012 (DST, 2013), also highlighted the heavy reliance on landfilling as a technology option in both the South African private and public waste sectors. The study showed that while the private sector is introducing (to some degree) alternative technology solutions, municipalities still rely very heavily on landfilling as the primary solution for the management of waste.

As with most developing countries, where recycling is occurring in South Africa, it is largely driven by the informal waste sector, currently estimated to provide a living for some 60 000 – 90 000 people (World Bank, 2012; DST, 2013). The informal sector in South Africa is thought to collect 80% of glass, 90% of PET plastic and the majority of the recovered paper into the recycling economy (BMI, 2013). This has resulted in fairly good (by international standards) recycling rates for packaging materials including glass, metal, paper and plastic (BMI, 2013)\(^2^5\).

Alternative waste treatment may be driven by restrictions that will come into force soon on materials going to landfill and, in the case of municipalities, due to pressures on landfill airspace, among other things.

5.1 Recyclables

The economics of recycling are simple: if the cost of collecting and processing something is cheaper than the resulting end-product, or if there is a large enough subsidy available, then it is generally recycled. This holds true for commodities such as paper, metal and certain types plastics typically used in packaging.

For everything else, including the vast majority of packaging types (from a blister pack to a flexible food package) and almost all objects (pens, toothbrushes, etc.), it is understood to cost more to collect and process than it is to landfill. Thus,


these materials are considered as waste, which means they will either be landfilled or could potentially be used for Waste to Energy. However, recycling is still ranked higher in the waste management hierarchy than (energy) recovery and treatment and disposal, which is an attempt to have ‘rules of thumb’ for more sustainable approaches to managing waste.

Although recycling is legislated within South Africa, the actual recycling activities are largely driven by industry through the establishment of industry bodies or PROs (Producer responsibility organisation). A PRO is generally a non-profit organisation funded by industry to promote the recovery and recycling of recyclable materials in South Africa.\footnote{GreenCape (2016): Waste Economy: Market Intelligence Report 2016}

All mainstream recyclables (paper, glass, plastics and metal), tyres and electronic waste (e-waste) have respective PROs responsible for the diversion of the waste from going to landfill. The following table shows a list active PROs and the tonnages generated and diverted for South Africa. Currently, in most cases, membership of and financial contribution to PROs is voluntary. However, for the management of waste tyres, it is legislated that all tyre producers/importers must be a member of REDISA (the tyre management PRO) and pay a levy on all tyres sold in South Africa. Thus, to access waste tyres, it is needed to consult REDISA. However, although it would be beneficial to engage with other PROs when dealing with the respective wastes (plastics, paper, etc.), it is not mandatory.

**Table 2: PROs and recyclables managed**

<table>
<thead>
<tr>
<th>Name of PRO</th>
<th>Material</th>
<th>Generated (tonnes)</th>
<th>Diverted from landfill (tonnes)</th>
<th>Still available for recycling (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper Recycling Association of South Africa (PRASA)</td>
<td>Paper</td>
<td>2 200 000</td>
<td>1 100 000</td>
<td>1 100 000</td>
</tr>
<tr>
<td>Plastics SA</td>
<td></td>
<td>Umbrella organisation for plastics</td>
<td>1 400 000</td>
<td>315 000</td>
</tr>
<tr>
<td>• PETCO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Polyolefin Recycling Company (POLYCO)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Southern African Vinyl’s Association (SAVA)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Polystyrene Packaging Council (PSPC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Glass Recycling Company (TGRC)</td>
<td>Glass</td>
<td>845 663</td>
<td>338 265</td>
<td>507 398</td>
</tr>
<tr>
<td>e-Waste Association of South Africa (eWASA)</td>
<td>e-Waste</td>
<td>322 000</td>
<td>45 000</td>
<td>277 000</td>
</tr>
<tr>
<td>South African e-Waste Alliance (SAEWA)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metal Recyclers’ Association of South Africa</td>
<td>Scrap metal</td>
<td>3 121 000</td>
<td>2 497 000</td>
<td>624 000</td>
</tr>
<tr>
<td>REDISA</td>
<td>Tyres</td>
<td>270 000</td>
<td>109 906</td>
<td>160 094</td>
</tr>
</tbody>
</table>

Source: Waste Economy: Market Intelligence Report 2016 (GreenCape)
5.2 Recycling of Plastics

This paper will deal solely with the recycling of the plastics waste stream, since this will also be the main focus point of the workshop.

Plastics SA, the umbrella organisation representing the local plastics industry has been measuring the recycling rate of plastics in South Africa. Annual updates are done to track the trends in recycling, with the results of the last comprehensive and complete survey for the year ending December 2015.

**Figure 3: Overview of South African Plastics Recycling Industry**

![Overview of South African Plastics Recycling Industry]

Source: Courtesy Plastics SA: Plastics recycling in South Africa

Key findings for the 2015 plastics recycling figures are\(^\text{27}\):

- South Africa mechanically recycled 292,917 tons of plastics in 2015 – an increase of 3% year on year from 2014.
- Over the last 5 years the compounded growth in plastics recycling was 5.5% per annum.

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\(^{27}\) Plastics SA (2016): Plastics recycling in South Africa
Domestic production of virgin polymers totalled 1 490 000 tons in 2015, growing 6.4 % from 2014. This growth would essentially be as a result of the weakening exchange rate against international currencies that lead to local procurement of plastics products rather than imports.

A total of 310 641 tons of plastics were diverted from landfill in 2015. This is 1.6 % less than in 2014 and is due to the significant reduction in the export of recyclable waste.

The overall diversion from landfill rate was 20.8 % - decreasing from 22.5 % in 2014.

Strong growth was seen in the recycling of PET, PE-LD/LLD and PS due to new capacities that came on line in 2015.

Recycling rates of PE-HD, PP and PVC declined as some of the products traditionally made from recyclate of these materials are directly linked to consumer spending and mining activities.

Formal employment in the recycling sector increased with 3.3 % to 6234 permanent jobs.

Informal employment has grown with 3 % to an estimated 48 820 collectors.

The recycling industry invested 48 % more in capital equipment per ton of material processed in 2015 to deal with increasing demands and improved quality requirements.

Processing costs increased 15.4 % year on year with the biggest contributors to cost being water, electricity and transport.

Figure 4: Tonnages Recycled


Diverting plastic waste from landfill

According to Plastics SA (2016), the plastics fraternity adopted the aspirational vision of sending Zero Plastics to Landfill by 2030 early in 2014. For the past two years, industry associations, polymer groups and recyclers have been encouraged to unite their efforts in order to achieve this objective. Despite their conscious efforts to increase the recycling rate and
develop new end-markets for recycled material, just over 20% of all the plastics that were manufactured were successfully diverted from landfill during 2015.

**Lack of quality materials**
According to the latest Plastics SA figures, the lack of a consistent incoming stream of recyclables was the single biggest challenge plastics recyclers had to face during 2015. A large quantity of the materials that were made available for recycling, was recovered by waste pickers off landfill sites, where they were contaminated and therefore of very poor quality. In the Northern Province, where the demand for recyclable materials exceeds supply, up to 40% of materials had to be scrapped or rejected due to impurities. This according to Plastics SA clearly highlights the need for an effective separation-at-source infrastructure to be implemented throughout the country.

**Generating energy from plastic waste**
Plastics SA further mentions that incineration, or energy recovery, is popular for large volumes of mixed waste in developed countries. Solid municipal waste can be used, no sorting and very little handling in general is required. Pyrolysis is slowly developing in South Africa to access the fuel value of the discarded products. Trial plants are using tyres as well as plastics to generate crude oil, diesel, gas and carbon black.

**Supporting a growing recycling industry**
Recycling is a very important industry that sustained close to 55 000 jobs in 2015 (Plastics SA, 2016). However, the industry faces several challenges. Recycling is a manufacturing process that needs to make money to be sustainable and economically viable. However, recyclers have to operate in an increasingly difficult business environment, where they have to face high operating costs, tight margins and day to day challenges such as load shedding, escalating electricity costs, water shortages, and a general downturn in the economy.

Like all manufacturing processes, challenges in the recycling industry have to be understood and managed, and opportunities need to be identified and utilised. According to the Plastics SA report, the following elements are needed to grow South African recycling figures over the next few years to come:

- **Political will**: Decision makers and legislators are not always aware of the achievements and challenges at ground level. To address this, the plastics industry will continue to invite decision makers and legislators to recycling plants to inform them about the intricacies of plastics recycling in South Africa.
- **Stakeholder commitment**: Plastics converters have committed themselves to voluntary levies to encourage recycling and create awareness through the various Extended Producer Responsibility organisations. More products need to be designed with their recyclability in mind.
- **Quality of Recyclables**: Waste pickers, collectors and recyclers need to be educated on the various materials and basic chemical principles that will impact on recyclate quality. Sorting processes need to be managed better. Recyclers should communicate their requirements to their suppliers all down the value chain to waste picker level.
- **Energy efficiency**: Electricity usage is three to four times more for recyclers than converters for the same tonnages. Energy management must receive priority to minimise and optimise energy usage – for water and
Recyclers will have to do long-term planning for increased costs of energy and may even have to consider self-generation of energy.

- **Public awareness and education**: The public needs to be educated about separating-at-source and to insist on recyclable packaging. Consumers need to be educated with regards the removal of shrink-labels, separation of various components and cleaning out of residual contents, etc.

- **Alternate technologies**: Mechanical recycling has a ceiling, and not all materials can be recycled economically. The plastics industry should find some technology partners to tailor-make alternative recycling methods to deal with plastics waste that cannot be mechanically recycled.

### 5.3 Waste technologies in South Africa

Waste patents registered in South Africa provide an indication of new waste technology trends which may emerge in the future, as companies begin to protect their intellectual property. In Figure 5 a review of registered patents (over the period 2007-2012) shows a strong leaning towards high- and low-temperature Waste to Energy technologies (‘fuel’, ‘incineration’, ‘combustion’, ‘anaerobic digestion’ and ‘pyrolysis’) and recycling (DST, 2012), which mirrors international trends towards recycling and recovery. However, according to DST (2012), the majority of these patents (86%) are non-South African owned. This would suggest that international companies see South Africa as an attractive market for the introduction of waste technologies. This could offer opportunities for German companies to introduce their waste technologies to the South African market.

**Figure 5: Percentages of Waste Patents per field**

![Percentage of Waste Patents](Image)

*Source: DST (2014) A waste research, development and innovation roadmap for South Africa (2015-2025)*

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6. Challenges

Waste management in South Africa faces numerous challenges. Ever increasing population totals, increased demands on existing resources, and the pressure to provide basic needs has placed significant pressure on South Africa in terms of waste management. Coupled with this, the rejection of common waste management practices by environmental lobbyists has made the disposal of various waste streams a lot more difficult. The impact of waste on the environment and on people’s health is also a critical point of concern.

Although South Africa’s waste legislation is in line with global trends, enforcement and monitoring have proven difficult due to both a lack of suitable waste expertise and practices. The South African Government has, however, mandated waste management as one of the critical areas it needs to address in terms of service delivery and sustainability.

The Department of Environmental Affairs identified a few challenges and hopes to address them through the NWMS. The main challenges are29:

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

Apart from the challenges identified by the Department of Environmental Affairs and addressed in the NWMS, Godfrey, L., et al. (2014) from the CSIR also identified a number of issues which continue to be challenges for the establishment of effective waste management. These include e.g.:

- ineffective data collection systems and lack of compliance and enforcement capacity;
- lack of education and awareness amongst stakeholders within the waste sector;
- operational costs for management of waste;
- political instability and support to waste reduction at local government level;
- availability of suitable land for waste disposal, and
- lack of structured incentives for reduction, recycling and/or re-use of waste.

The main problems in South Africa in connection with recycling are:

- No incentive for the separation of recyclable material.
- So far, there were no guidelines on recycling and the introduction of these into the existing system could be problematic.
- Separation at source is a relatively new concept in South Africa and hence not practiced in many municipalities. The bulk of the re-usable and recyclable waste is thus disposed to landfill and largely lost to the recycling industry. In addition, this contributes to the diminishing capacity of available landfill airspace
- Potential users of waste material and potential suppliers are not aware of each other
- Recovering electronic waste is a relatively new stream in the South African recycling industry. The hazardous components in electronic waste complicate the dismantling, recycling and disposal process.
- Municipalities may not have the required resources to establish the necessary facilities to support recycling, especially separation at source.

Another huge challenge which South Africa struggles with is unemployment.

The waste sector has been identified by the Department of Environmental Affairs as one of the critical sectors with the potential to contribute substantially to the generation of jobs within the green economy.

In 2014 the CSIR conducted a study on job opportunities in recycling: Are there jobs in recycling? The Formal and Informal Sector – Status Quo and Opportunities. Their findings were that there are opportunities for jobs across the value chain.

Opportunities for immediate job creation in the waste sector have been identified in:

- Open-spaces cleaning (e.g. clearing of illegal dumping sites, street cleaning and sweeping, litter picking)
- Waste collection

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- Sorting of recyclables
- Labour intensive activities that require low skills

While 29.8% of South African’s of employable age are unemployed (Census, 2011) approximately 60% of the unemployed have less than a high school (Grade 12) qualification (StatsSA, 2012) which means South Africa sits with high numbers of uneducated, unskilled, unemployed citizens31.

South Africa’s employment challenge is therefore two-fold. It needs to:

1. Create large numbers of low-skill jobs for the currently unemployed
   Simultaneously grow waste skills in sector to –
2. Stimulate medium- to high-skill job creation
   Support growth in downstream recycling and manufacturing activities

The majority of people employed in the formal SA recycling sector can be considered “unskilled” (70.9%). Only 10.8% can be considered technically “skilled” (for the recycling sector). The South African formal waste sector is estimated to employ 29,833 persons (as at 2012) of which the informal sector is estimated to provide an income for 2-3 times this. The DEA estimated the total waste sector (formal and informal to be 113,505 people (as at 2009) of which 74% of these are likely informal in recycling (CSIR, 2014).

The CSIR reached the conclusion that there is opportunity to create jobs in recycling. These may be formal jobs and informal income-earning opportunities. There are opportunities for job creation all along the value chain. According to the CSIR the following questions need to be raised when thinking of job creation within the waste sector:

- How do we integrate the informal sector into the recycling economy to achieve growth in income earning opportunities?
- How do we up-skill to create not only early-stage jobs (collection, separation) but also down-stream jobs (dismantling, reprocessing, manufacturing)?
- How can manual labour and technology co-exist in this industry?
- Where will labour-intensive approaches provide the maximum value recovery from waste?

Godfrey, L.; et al stressed in their Briefing Note: “Integrating the Informal Sector into the South African Waste and Recycling Economy in the Context of Extended Producer Responsibility (2016)” that it is important to not forget the invaluable service the informal waste sector renders to South Africa’s waste management service chain.

The Department of Environmental Affairs made legal provision for the implementation of EPR in South Africa through the National Environmental Management: Waste Act (No. 59 of 2008). EPR is an advanced policy instrument, implemented widely in developed countries, aimed at shifting the responsibility (financial and operational) (partially or fully) for the management of certain waste streams from government, typically municipalities, to producers. Mandatory

EPR has been implemented, to date, intentionally or unintentionally, through the “Industry Waste Management Plan (IndWMP)”, for example the Integrated Industry Waste Tyre Management Plan (RSA, 2012). Voluntary EPR has been operating in South Africa for a number of years, with most of the Material Organisations for paper, plastic, glass, and cans at least 5-10 years old, but with some as old as 22 years, e.g. Collect-a-can32.

According to Godfrey, L.; et al (2016), EPR is defined by the Organisation for Economic Co-operation and Development (OECD, 2001) as “an environmental policy approach in which a producer’s responsibility for a product is extended to the post-consumer stage of a product’s life cycle.” It addresses what many regard as the “weakest link” in the product value chain – the final disposal of products after their use by consumers. This is particularly relevant for South Africa, where an estimated 90% of all general waste produced is still sent to landfill (DEA, 2012), in spite of a strong policy approach towards establishing a regional secondary resources economy centred around the recovery and reprocessing of recyclable waste. The ongoing disposal of waste to landfill is largely due to the fact that waste prevention, re-use, recycling and recovery are more expensive relative to disposal to landfill, which is constraining the growth of the recycling sector to only those waste streams which are economically viable, e.g. ferrous metals, PET, paper. While a clear message is evident in national policy, the private sector has been slow to respond to the opportunities, due to the economic viability of recycling.

A crucial aspect that government, business and academia must consider in designing and implementing these EPR schemes for South Africa is the existing informal sector, a very active, but still largely marginalised community of waste pickers.

The informal sector is active in recovering valuable post-consumer recyclables from the service chain in South Africa. An estimated 80-90% (by weight) of paper and packaging is recovered by informal waste pickers. However, the South African waste and recycling sector is on the brink of change, with planned mandatory Extended Producer Responsibility (EPR). If not appropriately designed and implemented, adopting traditional EPR models has the potential to negatively impact on the livelihoods of waste pickers by creating competition between the informal and formal sectors in the collection and sorting of recyclables. Informal pickers are estimated to have saved municipalities between R309.2 – R748.8 million in landfill airspace (in 2014), at little to no cost, by diverting recyclables away from landfill, at ± 16-24 tonnes/picker/annum (CSIR, 2016).

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Figure 6: Job opportunities across the recycling value chain


Figure 6 illustrates a simple schematic of the recycling value chain. The arrows represent exchanges of materials, each of which also entails monetary exchanges (in the opposite direction). For example, collectors purchase waste materials from individuals or waste pickers and in turn sell the collected to recyclers. In turn, the recyclers undertake processing of the waste materials and sell the recycled materials to downstream industries for further processing and ultimately for use as raw material production processes. Importantly, at each point along the value chain, value is added to the waste materials. This implies that the “value” (and the price) per tonne of the material increases along the chain.

7. Partners/Stakeholders

7.1 National Recycling Forum

Contact Person:
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Chairman
Plastics Federation of SA
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Halfway House
1685
+27 (0)11 314 4021
www.plasticsinfo.co.za
enquiries@plasfed.co.za

The National Recycling Forum (NRF) is a non-profit organisation created to promote the recovery and recycling of recyclable materials in South Africa. Members of the NRF include representatives of:

- the formal recycling industry in South Africa
- government departments
- regional recycling forums
- local government based organisations
- local government utilities
- and co-opted advisory members

7.2 Plastics SA

Contact Person
Jacques Lightfoot
Sustainability Manager
Plastics SA
18 Gazelle Ave,
Corporate Park South,
Old Pretoria Rd, Midrand

+27 (0)11 314 4021
www.plasticsinfo.co.za

34 NRF: http://www.recycling.co.za/about.html
35 Plastics SA: http://www.plasticsinfo.co.za/about-us-2/
Plastics|SA represents all sectors of the South African Plastics Industry including polymer producers and importers, converters, machine suppliers, fabricators and recyclers.

Together with their associations, they play an active role in the growth and development of the SA industry and strive to address plastics related issues, influence role-players and make plastics the material of choice.

7.3 PET Recycling Company (Pty) Ltd (PETCO)\textsuperscript{36}

Contact Person:

Belinda Booker
Collections and Training Project Manager

PET Recycling Company (Pty) Ltd trading as PETCO
unit 3, Parade on Kloof
132 The Parade
Oriel, Bedfordview

+27 (0)11 615 8875
www.petco.co.za
info@petco.co.za

PETCO was established in December 2004 as a Pty Ltd Company with the specific objective of promoting and improving the waste management and recycling of post-consumer Polyethylene Terephthalate (PET) products on behalf of all stakeholders in the PET industry in South Africa.

7.4 PackagingSA\textsuperscript{37}

Contact Person

Charles Muller
Executive Director

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Bryanston 2021

+27 (0)12 001 1914
www.packagingsa.co.za

The Packaging Council of South Africa (PACSA) was founded in 1984 and has been replaced by a new industry body called Packaging SA. Packaging SA is closely associated with The Institute of Packaging South Africa (IPSA). Packaging SA is a voluntary industry body. Its members are in two broad categories,
Converters and Associates. The Converters represent some 70% of the revenue generated by the industry. Associates are in effect the major raw material suppliers, material organizations, brand owners, retailers and other organizations and associations with interests in the packaging industry.

7.5 Polyolefin Recycling Company (POLYCO)\textsuperscript{38}

The Polyolefin Recycling Company, trading as POLYCO, is a not-for-profit industry body formed by the polyolefin converters themselves to promote the collection and recycling of post-consumer polyolefin packaging containers.

7.6 Pikitup Johannesburg (Pty) Ltd\textsuperscript{39}

Pikitup Johannesburg (SOC) Ltd is the official integrated waste management service provider to the City of Joburg. They are mandated to provide integrated waste management services to the residents of Johannesburg.

**Flagship Projects\textsuperscript{40}**

Pikitup is implementing a number of Flagship projects, which are designed to assist us, in their delivering on their strategy to reduce the amount of waste generated in the City. These projects vary in scope, and scale, and involve a range of different stakeholders.

\textsuperscript{38} POLYCO: http://www.polyco.co.za/introducing-polyco/
\textsuperscript{39} Pikitup: http://www.pikitup.co.za/about-pikitup/
\textsuperscript{40} Pikitup: http://www.pikitup.co.za/waste-minimisation-initiatives/
Separation@Source

They provide residents with recycling bags on a weekly basis. These can be collected, or dropped off at the Pikitup Garden Sites, found across the city. They work with co-operatives and small enterprises to collect, and sort the recyclable waste collected from households and businesses. These initiatives create additional jobs, businesses and income for the unemployed residents within the City.

Food for Waste

Pikitup provides 108 individuals across the City with food packages. In exchange, they are required to keep designated areas clean. Through this project, they are hoping to encouraging recycling as a viable means of income generation in poorer communities. To date, they have successfully piloted it in Orange Farm, and have successfully converted five illegal dumping sites into community food gardens. The project is run in partnership with City’s Community Development department.

Joburg Waste Summit

The people of Johannesburg produce in the region of 6000 tons of waste per day, most of which is directed to the City's four active landfill sites. The Joburg Waste Summit aims to provide an opportunity for Pikitup to share its Waste Minimisation Strategy, and gain support from communities, labour and private sector companies.

7.7 The South African Local Government Association (SALGA)\textsuperscript{41}

The South African Local Government Association (SALGA) is an autonomous association of municipalities with its mandate derived from the Constitution of the Republic of South Africa. This mandate defines SALGA as the voice and sole representative of local government. SALGA interfaces with parliament, the National Council of Provinces (NCOP), cabinet as well as provincial legislatures.

The association is a unitary body with a membership of 278 municipalities, with its national office based in Pretoria and offices in all nine provinces. The strength at SALGA lies in the intellectual capital they have

\textsuperscript{41} SALGA: http://www.salga.org.za/About%20Us%20W.html
acquired through their people over the years and our values to be Responsive, Innovative, Dynamic and Excellent underpin all that they do. Their mission to be consultative, informed, mandated, credible and accountable ensures that they remain relevant to their members and provide value as they continuously strive to be an association that is at the cutting edge of quality and sustainable services.

7.8 The Department of Environmental Affairs (DEA)

The Department of Environmental Affairs (DEA) is one of the departments of the South African government. It is responsible for protecting, conserving and improving the South African environment and natural resources.

The branches of the Department of Environmental Affairs are:

- Air Quality and Climate Change
- Biodiversity & Conservation
- Chemicals and Waste Management
- Environmental Advisory Services
- Environmental Programmes
- Legal Authorisations and Compliance Inspectorate
- Oceans and Coasts
- Office of the Chief Operating Officer

Projects and Programmes

Working on Waste

Working on Waste is one of the initiatives by the Department of Environmental Affairs implemented under the auspices of the Expanded Public Works Programme (EPWP). The initiative is a proactive preventative measure that recognises that inadequate waste services may lead to litter which is not only visual pollution but may lead to health hazards and environmental degradation.

42 DEA: https://www.environment.gov.za/
43 DEA: https://www.environment.gov.za/projectsprogrammes/workingonwaste
Youth Jobs in Waste (YJW) Programme

The Youth Jobs in Waste Programme is expected to create 330 job opportunities in waste in the Free State and 326 in the North West provinces. The project is intended to provide 3,577 young people with job opportunities in waste management and related entrepreneurship.

7.9 The Department of Science and Technology (DST) 44

Contact Details
Dr Henry Roman
Director: Environmental Services and Technologies
Department of Science and Technology
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CSIR (Scientia Campus)
Meiring Naudé Road
Brummeria
0001
+27 (0)12 843 6333
www.dst.gov.za

The Department of Science and Technology (DST) is the South African government department responsible for scientific research, including space programmes. The current Minister is Naledi Pandor previously held the post from 2009-2012.

Much of the Department’s work is ultimately carried out through various quasi-independent agencies (although still usually government bodies) including:

- the National Research Foundation of South Africa, which receives a substantial proportion of the DST budget to carry out various research support tasks, including supporting key national research infrastructure (“National Research Facilities”), scientific research grant administration and a student grant scheme;
- the Council for Scientific and Industrial Research, which acts as a quasi-privatised research and development agency with a specific focus on research of application to industry;
- the Technology Innovation Agency, which serves to provide funding to turn innovative research into commercial products;
- the South African National Space Agency, which covers space-related research;
- the Human Sciences Research Council (South Africa), which focuses its research on human health and disease.

44 DST: http://www.dst.gov.za/
The Council for Scientific and Industrial Research (CSIR) is South Africa’s central and premier scientific research and development organisation. It was established by an act of parliament in 1945 and is situated on its own campus in the city of Pretoria. It is the largest research and development (R&D) organisation in Africa and accounts for about 10% of the entire African R&D budget. It has a staff of approximately 3,000 technical and scientific researchers, often working in multi-disciplinary teams.

The CSIR contract R&D portfolio aims to enable clear understanding of national imperatives and the needs of industry to optimise the impact of the CSIR’s R&D outputs. It leverages public, private and international partnerships in support of cutting-edge science, engineering and technology. The organisation has clients in both the private sector (micro, small, medium and large enterprises; formal and informal), as well as in the public sector (national, provincial and local government). The organisation also deals with public enterprises and institutions, national safety and security establishments, and development structures. Regionally and abroad, the CSIR fosters partnerships and a network of clients and partner organisations as part of a global sphere of influence on matters of technology. The CSIR liaises closely with tertiary education institutions. With a strong emphasis on relevant and developmental work, it also has strong roots in various communities, and collaborates with a wide range of donors and funding agencies. The CSIR aims to contribute to the national programme of development, perform relevant knowledge generating research and transferring technology and skilled human capital, and strengthen the science and technology base.

Contact Person
Prof Linda Godfrey
Principal Scientist Waste for Development
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Meiring Naude Road
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+27 (0)12 841 4801
www.csir.co.za

45 CSIR: http://www.csir.co.za/
7.11 Industrial Development Corporation (IDC)\(^{46}\)

**Contact Details**

IDC  
19 Fredman Drive, Sandown  
PO Box 784055  
Sandton, 2146  

\(+27 \text{ (0)11 269 3000}\)  
www.idc.co.za

The IDC is a national development finance institution set up to promote economic growth and industrial development. The institution is owned by the South African government under the supervision of the Economic Development Department.

The IDC provides finance for industrial development projects, play a catalytic role in promoting partnerships across industries within and outside our borders, and promote regional economic growth.

7.12 KfW Development Bank\(^{47}\)

**Contact Details**

KfW Office Pretoria  
Hatfield Gardens  
333 Grosvenor St / Cnr Arcadia & Hilda St  
Hatfield 0028 Pretoria  

\(+27 \text{ (0)12 42 36 357}\)  
www.kfw.de

KfW Entwicklungsbank (KfW Development Bank) provides financing to governments, public enterprises and commercial banks engaged in microfinance and SME promotion in developing countries. It does so through loans close to market terms using its own resources ("promotional loans"), soft loans that blend KfW resources with support from the federal government's aid budget ("development loans"), as well as highly subsidized loans and grants, the latter two coming entirely from the federal aid budget. Different country groups are offered different financing conditions depending mainly on their per capita income. All these financing instruments are part of what is officially called development cooperation and is more commonly called "development aid".

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\(^{46}\) IDC: [http://www.idc.co.za/about-the-idc.html](http://www.idc.co.za/about-the-idc.html)  
\(^{47}\) KfW: [https://www.kfw-entwicklungsbank.de/International-financing/KfW-Entwicklungsbank/](https://www.kfw-entwicklungsbank.de/International-financing/KfW-Entwicklungsbank/)
8. Conclusion

Despite the extensive legislative framework in place in South Africa, the implementation of said legislation is not being realised fast enough. While the Waste Act and National Waste Management Strategy place a great deal of emphasis on waste minimisation, re-use, recycling and recovery of waste, up to 90% of waste still ends up in local landfills since it is presented as the more expedient option at this stage.

It is evident that the waste sector in South Africa faces several challenges, but at the same time it also offers many opportunities.

Municipalities

Challenges on municipal level include:
- Skills development
- Lack of resources (capacity, funding, exposure to alternative technologies
- Inadequate integrated waste management planning
- Access to reliable waste data
- Better infrastructure and greater technological development

Awareness

Awareness of the benefits of recycling should be stressed among the general public, consumers and business owners.

Job creation

There are opportunities to create jobs in recycling in both the formal and informal sector all along the value chain. Two questions arise though:
- How do we integrate the informal sector into the recycling economy to achieve growth in income earning opportunities?
- How do we up-skill to create not only early stage jobs (collection, separation) but also down-stream jobs (dismantling, reprocessing, manufacturing)?

Questions and objectives that could be addressed in the workshop:
- How can we best educate or train our municipalities and raise awareness among the general population? How can German experts assist in this?
- How can we integrate German technology into the South African waste sector without risking a loss of jobs?
- How can we integrate the informal sector into the formal sector (preserving current jobs, while increasing efficiency)?
- How can we support local entrepreneurs who are already involved in this industry?
- Raising awareness to the South African government by presenting modern technologies and their use to create jobs
- Creating environmental awareness through intensive media support
- Training of people in the field of recycling
- Creation of jobs
9. Programme: Workshops

9.1 Background

The aim of the workshops is twofold. On the one hand it is to address the issues raised in the paper with the help of local stakeholders as well as German experts; and on the other hand it is to discuss the possibilities of implementing a pilot project in one of Johannesburg’s townships.

In order for the German experts to get an overview of how the South African waste management system operates, the first day’s programme will include site visits to various waste management operations. The German experts together with local stakeholders will visit a waste management operator, a plastic recycling plant and a buy back centre in a township.

The workshop on the second day will address the following:

1. Issues raised in the paper with the help of German experts. This will include workshop discussions on:
   - How to include German technology in the South African waste management sector, not only in the formal sector, but especially in the informal sector.
   - How to raise awareness among the municipalities and the general public on the benefits of recycling.
   - Advice on skills development, training, capacity building. How could it be approached and implemented?

2. Implementing a pilot project in a township:
   - What will be needed to launch/implement a pilot project in a township and who could contribute to it and how?

The National Recycling Forum (NRF) and Plastics SA recently hosted a panel discussion at the 3rd Annual National Green Youth Indaba 2016, which took place at the Innovation Hub in Tshwane, Gauteng at the end of June 2016. The emphasis of the panel discussion was on the role that the youth play in the environment. During the panel discussion the heard first-hand about some of the exciting initiatives that South Africa’s youth is involved in, especially in the area of recovery and recycling of recyclable materials in South Africa. During this event, Plastics SA identified two young black engineers who started a recycling business from the house of one of the two young men, whom they would like to support. They also raised the interest of Petco and Pikitup who would also like to get involved with their project.

The two entrepreneurs would need help in the following:

- Infrastructure
- Machinery, technology, transport
- Land
- Skills and knowledge on how to create a business plan and implement it
- Financing
The following stakeholders could play a role in implementing the pilot project and contribute to the discussion:

- The National Recycling Forum with all its members:
  - Plastics SA: could assist with training
  - Petco: could assist with technology, machinery and training
  - Polyco
- Pikitup
- City of Joburg: needs to help with land
- IDC or KfW: could inform about financing and specific programmes for waste management

The pilot project should be launched in one of the townships in Johannesburg. It could be discussed during the workshop which township is in most need of a buy back centre. The focus would mainly be on the recycling of plastics for this pilot project. The reason why plastics were chosen is because it is relatively easy for the waste pickers to gather, collect and resell to a buy back centre. The various plastic PROs also have programmes in place to assist the young entrepreneurs in implementing the project.

The programme for the workshops will run over two days.

**Day 1: Monday, 10 October 2016 - Site visits**

On the first day of the programme we will visit different waste management and recycling plants in order for the German experts to get an overview of waste management in South Africa. We will visit:

**WastePlan**
WastePlan is a national on-site waste management company specialising in recycling and reducing waste to landfill. It is the second largest company of its kind in South Africa with a footprint in KZN, Gauteng, the Eastern and Western Cape and the Free State, servicing over 200 clients nationally.

**Mpact**
Mpact Limited, formerly Mondi Packaging South Africa, is one of the largest paper and plastic packaging businesses in southern Africa, with 33 operating sites, 24 of which are manufacturing operations, based in South Africa, Namibia, Mozambique and Zimbabwe. Mpact employs 4,467 people.

**K1 Recycling**
K1 Recycling, a plastic collection (buy back centre) company based in Katlehong, a township east of Johannesburg. Petco contributed hugely in the success of this company by donating a baling machine.

**Day 2: Tuesday, 11 October 2016 - Presentations and workshops**

**Venue:** Country Club Johannesburg
The following points could be discussed during the workshops:

<table>
<thead>
<tr>
<th>Item</th>
<th>Aim</th>
<th>Participants</th>
<th>Discussion</th>
<th>Format</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening and welcome</td>
<td>Introduction and welcome</td>
<td>Maximilian Butek – Deputy CEO (SAGGC)</td>
<td>Introduction to programme, purpose of programme and introduction to speakers</td>
<td>Welcoming address</td>
<td>10 minutes</td>
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<tr>
<td>Overview of waste situation in South Africa</td>
<td>Information transfer of current waste situation.</td>
<td>Moderator: Prof Linda Godfrey (CSIR)</td>
<td>Introduction of current situation, challenges, etc.</td>
<td>Presentation</td>
<td>20 minutes</td>
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<tr>
<td>Interview with a municipal waste collector</td>
<td>Explanation of problems, challenges. Sketching of current situation Where is action required?</td>
<td>Moderator Representative of Pikitup</td>
<td>Which challenges are there? What is needed to change or improve the problems?</td>
<td>Interview Open discussion Questions from audience</td>
<td>30 minutes</td>
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<td>How can we integrate the informal sector into the formal sector (preserving current jobs, while increasing efficiency)?</td>
<td>Role of informal sector?</td>
<td>Moderator Representative of DEA Representative of SAWPA Representative of SALGA</td>
<td>What does the sector contribute? How can work conditions be improved? How can the sector be integrated?</td>
<td>Open discussion Questions from audience</td>
<td>30 minutes</td>
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<tr>
<td>Best Practice Example: K1 Recycling – Township project</td>
<td>Present success story to audience</td>
<td>Moderator Representative of K1 Recycling Representative of PETCO</td>
<td>How did they do it? What challenges did they have? Advice?</td>
<td>Presentation Open discussion Questions from audience</td>
<td>30 minutes</td>
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<tr>
<td>Presentation: German expert</td>
<td>Introduction of German technology</td>
<td>Moderator German expert</td>
<td>What kind of technology would suit the South African</td>
<td>Presentation Open discussion</td>
<td>30 minutes</td>
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<tr>
<td>How can we integrate German technology into the South African waste sector without risking a loss of jobs?</td>
<td>Introduction of proposed pilot project – 2 black entrepreneurs recycling from their grandparents house</td>
<td>Moderator</td>
<td>Introduction of project Where and how they could be assisted by industry and PROs</td>
<td>Questions from audience</td>
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<tr>
<td>How can we support local entrepreneurs who are already involved in this industry?</td>
<td>Introduction of proposed pilot project – 2 black entrepreneurs recycling from their grandparents house</td>
<td>Moderator Representative of NRF Representative of Pikitup Representative of Plastics SA</td>
<td>Introduction of project Where and how they could be assisted by industry and PROs</td>
<td>Open discussion, Questions from audience</td>
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<td>30 minutes</td>
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<td>German Expert: German recycling concept – how to involve all citizens?</td>
<td>Introduce concept from Germany to raise awareness</td>
<td>Moderator German Expert</td>
<td>Examples of how it was implemented and done in Germany</td>
<td>Presentation Open discussion, Questions from audience</td>
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<td>30 minutes</td>
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<tr>
<td>Education and training: how to raise awareness of recycling?</td>
<td>Creating awareness of recycling Awareness of the benefits of recycling</td>
<td>Moderator German Expert Representative of Pikitup Representative of Plastics SA Representative of PETCO Representative of DEA</td>
<td>How can awareness be raised? What existing programmes do we have? How successful are they?</td>
<td>Open discussion, Questions from audience</td>
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<td>30 minutes</td>
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<td>Presentation: Challenges Municipalities face regarding waste</td>
<td>Overview of problems municipalities face</td>
<td>Moderator Representative of City of Joburg</td>
<td>Where are the challenges? How could they be addressed?</td>
<td>Presentation Open discussion, Questions from audience</td>
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<td>30 minutes</td>
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<tr>
<td>How can we best educate or train our municipalities? How can German experts assist in this?</td>
<td>German waste management models?</td>
<td>Moderator German Expert</td>
<td>How can the people be actively involved? Are there existing structures in the informal sector?</td>
<td>Open discussion, Questions from audience</td>
<td>30 minutes</td>
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</tbody>
</table>

The proposed programme could look as follows:
## Programme

The Country Club Johannesburg  
1 Napier Road, Auckland Park  
11 October 2016

**Moderator:** Mr Maximilian Butek, Deputy CEO, Southern African-German Chamber of Commerce and Industry NPC

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>08:30</td>
<td>Registration</td>
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</tbody>
</table>
| 09:00 | Opening and Welcome  
Mr Maximilian Butek, Deputy CEO, Southern African-German Chamber of Commerce and Industry NPC |
| 09:10 | Introduction of the Current Waste Situation in South Africa  
Prof Linda Godfrey, CSIR |
| 09:30 | Interview with a municipal waste collector  
Moderator, Pikitup |
| 10:00 | How can we integrate the informal sector into the formal sector (preserving current jobs, while increasing efficiency)?  
Moderator, DEA, SALGA, SAWPA |
| 10:30 | Coffee Break                                                            |
| 11:00 | Overview of Recycling of Plastics in South Africa  
Plastics SA, Packaging SA, PETCO |
| 11:30 | Best Practice Example: K1 Recycling – Township project  
Moderator, K1 Recycling, PETCO |
| 12:00 | Presentation: German Expert: How can we integrate German technology into the South African waste sector without risking a loss of jobs?  
Moderator, German Expert |
| 12:30 | Lunch                                                                   |
| 13:30 | How can we support local entrepreneurs who are already involved in this industry?  
Moderator, Representative of NRF, Representative of Pikitup, Representative of Plastics SA |
| 14:00 | German Expert: German recycling concept – how to involve all citizens?  
Moderator, German Expert |
| 14:30 | Education and training: How to raise awareness for recycling  
Moderator, German Expert, Representative of Pikitup, Representative of Plastics SA, Representative of PETCO  
Representative of DEA |
| 15:00 | Coffee Break                                                            |
| 15:30 | Presentation: Challenges Municipalities face regarding waste management  
Representative: City of Joburg |
| 16:00 | How can we best educate or train our municipalities? How can German experts assist in this?  
Moderator, German Expert |
| 16:30 | Summary and conclusions  
Mr Maximilian Butek, Deputy CEO, Southern African-German Chamber of Commerce and Industry NPC |
10. References


Godfrey, L., Muswema, A., Strydom, W., Mamafa, T. and Mapako, M. 2015. Evaluation of co-operatives as a developmental vehicle to support job creation and SME development in the waste sector. CSIR


JOZI: A City @ Work 2012/16 Integrated Development Plan 2014/15 Review. City of Johannesburg Metropolitan Municipality


