Trends in the application of environmental technologies in (Gauteng) South Africa

- Potential, needs and barriers
- Policies and technologies for waste treatment & recycling

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OUTLINE OF PRESENTATION

- Focus on waste technologies
- Status quo of waste management in South Africa
- Potentials, needs and barriers
- Policies for waste treatment and recycling
- Technologies for waste treatment and recycling
An estimated 90% of the waste we generate is disposed of to landfills (DEA, 2012) – often to very poorly designed and operated dumpsites.
An estimated 60,000 – 90,000 informal waste pickers in South Africa earn a livelihood through collection of recyclables either from landfills or at kerbside.
According to Packaging SA (2016), 46% of packaging waste is still disposed of to landfill.
An estimated 65% of organic waste and 100% of industrial biomass is disposed of to landfill (DEA, 2012)
An estimated 30% of the food we produce (local agricultural production) goes to waste (CSIR, 2013)
About 85% of builders’ rubble (mineral component) is disposed of to landfill (GreenCape, 2016)
An estimated 60-70% of South Africa’s general waste could be diverted away from landfill into recycling/recovery.
CONTRAINTS TO THE WASTE SECTOR

• So, why are we sending the bulk of the waste we generate in South Africa to landfill (last official statistics 90%)?
• An estimated R17b worth of viable resources lost to landfill\(^{(1)}\)
• And, on top of that, to typically poorly designed and operated landfills (open dumpsites)
• The following insights come from the past 4 years of work done in support of the development and implementation of South Africa’s 10-year Waste Research, Development and Innovation (RDI Roadmap)

\(^{(1)}\) Value of resources lost to the South African economy as waste disposal to landfill in 2014
• **Current and required institutional mechanisms to support waste innovation** (DST, 2012)
  – Main **constraints** to waste innovation include –
    • Legislative; economic/financial; institutional; behaviour & perceptions; infrastructural; information; skills
  – Opportunities to address these constraints include –
    • Including the private sector meaningfully in the innovation system
    • Identifying sectoral priorities for innovation, with directed investment and support
    • Strengthening human capital in the waste innovation sector through formal HCD programmes

• **Skills for an Innovative Waste Sector** (DST, 2012)
  – Post-graduate specialisation to produce work-ready graduates
  – Up-skilling of existing waste management practitioners to keep them at the cutting edge of their fields
  – Training of trainers to produce waste educators at all levels
The 10-year Waste RDI Roadmap

• **Waste Research, Development and Innovation (RDI) Capabilities at SA Universities and Science Councils** (DST, 2014)
  - Waste RDI Community is considered “emerging”
  - Evidence of both specialisation and diversity in waste RDI
  - Funding for waste RDI remains small, with limited investment in waste RDI infrastructure (often self-funded)
  - Low numbers of post-graduates are entering the waste sector

• **The economic benefits of moving up the waste management hierarchy in South Africa** (DST, 2014)
  - Considerable value (resource value and broader economic value) is locked-up in waste and is lost to the economy through landfilling
  - Waste disposal costs (tipping fees) are particularly low, however, the value of recyclables alone should drive a more aggressive recovery of these resources than what we currently see
  - The annual resource value of waste (>R25.2b) represents ±0.86% of South Africa’s GDP
The 10-year Waste RDI Roadmap

  - Waste sector (public & private) employed ± 29,833 people
  - Minimum financial value of the formal waste sector (public and private) was R15.3 billion or 0.51% of GDP
  - Minimum spend on waste RDI was R50.2m (0.33% the value of the sector)
  - Positive transformation of sector with average BBEEE level 4

  - Economic opportunities in waste exist (opportunity waste streams & opportunity regions)
  - Globalization of waste (increasing flows between countries)
  - Increasing partnership between public and private sectors, globally, to achieve waste diversion targets
  - Improved feedstock management (quality and quantity)
  - Different paths to achieving IWM (technology portfolios)
A WASTE RESEARCH, DEVELOPMENT AND INNOVATION ROADMAP FOR SOUTH AFRICA (2015-2025)
Towards a secondary resources economy
The 10-year Waste RDI Roadmap

**Problem Statement:**
- 90% of South Africa’s waste goes to landfill
- Resulting in loss of resources to the economy
- Resulting in social (human health) and environmental impacts
- Municipalities face challenges in delivering services and diverting waste from landfill
- Alternative waste treatment typically more expensive than landfilling

**Human Capital Development (HCD)**
(Skills)

**Strategic Planning**
Strengthen skills and generate evidence to inform decision-making, planning and policy development by government and industry

**Modelling and Analytics**
Strengthen skills in methods, tools, models and techniques and apply these to generate evidence to inform the management of waste

**Research and Development (R&D)**
(Evidence)

**Technology Solutions**
Develop, evaluate, demonstrate, localise and deploy technologies to support municipalities and industry in diverting waste away from landfill towards value-add

**Innovation (technological and non-technological)**
(Technology)

**Waste Logistics Performance**
Strengthen skills and generate evidence to optimise decision-making around the movement of waste across the country (logistics, assets, resources)

**Waste and Environment**
Strengthen skills, generate evidence, deploy technologies to reduce the impacts of waste on receiving environments

**Waste and Society**
Deepen understanding of the socio-economic opportunities provided by waste, but also the threats that waste poses to human health

**Opportunities:**
- Preventing waste creates opportunities for industry to increase value-addition and competitiveness
- Diverting waste from landfill creates opportunities for new direct and indirect jobs and enterprises
- Improved management of waste reduces risks to human health and environment
• What are the barriers or constraints to waste innovation in South Africa, specifically technological innovation?
Constraints to Innovation

• Brief introduction to South Africa’s waste policies
• The *Waste Hierarchy* and the diversion of waste away from landfill towards prevention, reuse, recycling and recovery is embedded in South Africa’s policy and legislation
## WASTE MANAGEMENT POLICIES

**Drafting, promulgation and amendment of waste legislation**

- **ECA** – Environmental Conservation Act
- **EIs** – Economic Instruments
- **IP&WWM** – Integrated Pollution and Waste Management
- **NEMA** – National Environmental Management Act
- **NEM&WWA** – National Environmental Management Waste Act
- **NWMS** – National Waste Management Strategy
- **NWMSI** – National Waste Management Strategy Implementation
- **MAA** – Memorandum of Agreement
- **N&S** – Norms and Standards

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**Introduction of alternative policy instruments (EIIs, information)**

- Municipal Solid Waste Tariff Strategy
- REDISA Typ IndWWM
- Waste Information Regulations
- N&S: Extraction and flaring of landfill gas
- N&S: Scraping of motor vehicles
- N&S: Storage of waste
- N&S: Remediation of contaminated land
- Waste Classification and Management Regulations
- N&S: Disposal of waste to landfill
- Amendment to Plastic Bag Levy
- Municipal Waste Sector Plan
- Amendment to Plastic Bag Levy
- Model Waste Policy
- N&S: Refuse removal services, Indigent householders
- Domestic Waste Collection Standards
- Policy EIs

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In addition, the following national policies are currently in **DRAFT**

1. Draft guide for IndWWMs (2010)
2. Draft dust control regulations (2011)
5. Draft regulations for site assessments and reports (2012)

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First EIA regulations in 1997 and amended since (2006)


List of Waste Management Activities published in 2009 and updated (2013)
WASTE MANAGEMENT POLICIES


http://sawic.environment.gov.za/?menu=13
• Brief introduction to South Africa’s waste policies in support of economic instruments, to support the diversion of waste away from landfill
ECONOMIC INSTRUMENTS

• **Aim:**
  - Provide the basis and guiding methodology for *setting waste management charges* in South Africa

• **Objectives:**
  - Mainstream the Polluter Pays Principle
  - Reduce the generation of waste
  - Increase the diversion of waste away from landfill towards avoidance, minimisation, reuse, recycling and recovery
  - Support the growth of a southern African (regional) secondary resources *economy* from waste
  - Reduce the environmental impact of waste
ECONOMIC INSTRUMENTS

From: Godfrey & Nahman (2014)
## Action 1: Under-pricing of waste services is corrected (Full cost accounting and pricing of solid waste service)

### Tariff setting

- **Municipalities** to be supported in implementing **correct tariff setting and pricing** for waste management services which takes into account the full costs of waste management. This must go beyond support through guidelines, to actual assistance to the municipalities.
  - **CoGTA, DEA, Municipalities**
  - **2015/17**

- All municipalities are charging for waste management services (collection and disposal) by 2017.
  - **2016/17**

- All municipal charges for waste management services (collection, transportation, recycling/recovery, disposal) are based on full-cost accounting by 2018.
  - **2017/18**

### Financial systems set-up

- All municipalities to reach a stage where they have financial and administrative systems in place successfully recovering the costs for waste management services (collection and disposal).
  - **CoGTA, DEA, WB, Municipalities, National Treasury**
  - **2015/16**
## Action 3: Implementation of EPR schemes

<table>
<thead>
<tr>
<th>Action 3.1</th>
<th>Prioritisation of the waste streams from the list of waste streams and EPR schemes (without any order of preference)</th>
<th>DEA, WB</th>
<th>On annual basis</th>
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<tbody>
<tr>
<td>3.2</td>
<td><strong>Identification</strong> of products, product groups or waste streams for the implementation of EPR schemes</td>
<td>DEA, the dti, National Treasury</td>
<td>Ongoing</td>
</tr>
<tr>
<td>3.3</td>
<td>Development of system for <strong>transfer of funds</strong> from SARS to National Treasury</td>
<td>DEA, National Treasury</td>
<td>2016/17</td>
</tr>
<tr>
<td>3.4</td>
<td>Develop Product Plans/Programmes for identified products, product groups or waste stream(s), which should be informed by an analysis of the full social, environmental and economic costs and benefits of implementing</td>
<td>DEA, WB and Industry</td>
<td>Ongoing</td>
</tr>
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<td>3.5</td>
<td>Develop <strong>Industry Waste Management Plan(s)</strong> in response to Minister’s call for the IndWMP</td>
<td>Industry, PRO</td>
<td>Ongoing</td>
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<td>3.6</td>
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<td>3.7</td>
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The Minister of Environmental Affairs, “hereby gives notice of my intention to publish the Notice to the **Paper and Packaging** Industry, **Electrical and Electronic** Industry and **Lighting** Industry to prepare and submit to the Minister industry waste management plans for approval, in terms of section 28(1) read with section 28(5) of the National Environmental Management Waste Act, 2008 (Act No. 59 of 2008) as set out in the Schedule hereto.”

- South Africa already has EPR in place for waste tyres (REDISA)
- And **voluntary EPR** in place for many other products (number of Material Organisations)
The state of technology uptake in the South Africa waste sector
With 90% of the waste going to landfill, landfilling remains the predominant technology solution.

Paper and packaging
- Various technology solutions in place for recycling
- Recycling rates comparable with many developed countries

WEEE
- Recycling is limited to dismantling and some pre-processing through simple, labour intensive approaches (some unique issues to SA)
- Recovered fractions exported for processing
- Some concern by Provincial Government that Gauteng is becoming a dumping ground for hazardous waste (including fractions from WEEE due to cherry-picking)
• Municipal solid waste
  - No **WtE technology** in place for municipal solid waste (yet)
  - Difficult to compete with very low cost of landfilling (order of magnitude cheaper than EU) and low cost of electricity (cheap coal)

• Organic waste and industrial/agricultural biomass
  - Some basic recycling through e.g. composting, but again, difficult to compete with the low cost of landfilling, and often seasonal markets
  - **Limited** (and **under-utilised**) anaerobic digestion and biogas recovery
  - Remains a significant opportunity, especially given that biomass is the single largest general waste stream produced in South Africa – but dispersed waste stream across South Africa
  - Raises questions of **appropriateness** – single, large, centralised technologies, or small-scale, modular, mobile technologies
- National Norms and Standards for the disposal of waste to landfill (2013), sets out **waste disposal restrictions** on certain waste streams, but e.g. no ban on organic waste to landfill –

<table>
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<tr>
<th>(m) Hazardous Waste Electric and Electronic Equipment (WEEE) – Lamps.</th>
<th>Three (3) years</th>
</tr>
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<tbody>
<tr>
<td>(n) Hazardous Waste Electric and Electronic Equipment (WEEE) – Other.</td>
<td>Eight (8) years</td>
</tr>
<tr>
<td>(o) Waste tyres: Whole.</td>
<td>Immediate</td>
</tr>
<tr>
<td>(p) Waste tyres: Quartered.</td>
<td>Five (5) years</td>
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<tr>
<td>(t) Disposal of garden waste:</td>
<td></td>
</tr>
<tr>
<td>(i) 25% diversion from the baseline at a particular landfill of separated garden waste.</td>
<td>Five (5) years</td>
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<tr>
<td>(ii) 50% diversion from the baseline at a particular landfill of separated garden waste.</td>
<td>Ten (10) years</td>
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<tr>
<td>(u) Infectious animal carcasses and animal waste.</td>
<td>Immediate</td>
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Response to constraints

• Some of the responses (activities) being driven by the Department of Science and Technology, and its entities in support of the diversion of waste away from landfill towards maximum value recovery
Waste Management Technologies

- The Department of Science and Technology (DST) is investing in **biomass and organic waste valorisation** R&D and innovation
- Through the national Bioeconomy Strategy and the Waste RDI Roadmap, e.g.
  - Biorefinery
  - Biomaterials and biocomposites
  - Biopolymers and bioplastics
- e.g. CSIR's biorefinery centre – based in Durban

Visit the South African Biorefinery Research Platform for a list of R&D projects and different waste streams
[http://www.wasteroadmap.co.za/biorefinery/](http://www.wasteroadmap.co.za/biorefinery/)
The Waste RDI Roadmap is driving a number of initiatives to support the increased diversion of waste away from landfill through RDI (dependant upon the availability of funding)

- Funding post-graduate scholarships and non-recoverable RDI Grants
- Targeted research project on “Mapping South Africa’s Waste Electrical and Electronic Equipment (WEEE) dismantling, pre-processing and processing technology landscape” to inform public and private sector investment in WEEE technology in South Africa
- Establishing relevant Research Chairs (2017)
- Establishing a Waste Technology Innovation Centre, to support the uptake of alternative waste treatment technologies in South Africa (technology demonstration, adaptation, localisation) and (advisory support to e.g. local government, technology vendors)
- Discussion with TIA on the establishment of a targeted Technology Innovation Programme (TIP)
Other initiatives being driven by government supported programmes, through e.g. National Research Foundation (NRF); Technology Innovation Agency (TIA)

CSIR hosted National Cleaner Production Centre (NCPC) focussing on resource efficiency (energy, water, materials), including the National Industrial Symbiosis Programme (NISP) (industrial waste exchange)

German (GIZ) - SA Climate Flagship projects, including one on waste, working with municipalities to support increased diversion of waste from landfill
CONCLUSIONS

• There is significant **opportunity** to support the diversion of waste away from landfill towards value recovery

• Including opportunity for alternative waste treatment **technologies**

• Recognising that South Africa has a strong commitment to **labour intensive** approaches

• Leapfrog the **WtE** strategy of developed countries by driving a strong secondary resources agenda (recycling/recovery)

• Recognising that South Africa is **risk averse** when it comes to technology and innovation

• SA is still coming to terms with implementing a secondary resources economy, we may be some way off from a true circular economy dialogue
Thank you

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