

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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Circular Economy and Innovative Business Models

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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



CONSTRAINTS 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

The 10-year Waste RDI Roadmap



- **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 $\pm 0.86\%$ of South Africa's GDP



The 10-year Waste RDI Roadmap



- **South African Waste Sector Survey (2012)** (DST, 2013)
 - Waste sector (public & private) employed $\pm 29,833$ 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
- **Trends in Waste Management and Priority Waste Streams for the Waste RDI Roadmap** (DST, 2014)
 - 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)



The 10-year Waste RDI Roadmap



The 10-year Waste RDI Roadmap

Problem — Means — How — Opportunities

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)

Research and Development (R&D) (Evidence)

Innovation (technological and non-technological) (Technology)



Strategic Planning



Modelling and Analytics



Technology Solutions



Waste Logistics Performance



Waste and Environment



Waste and Society

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

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

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

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

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

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

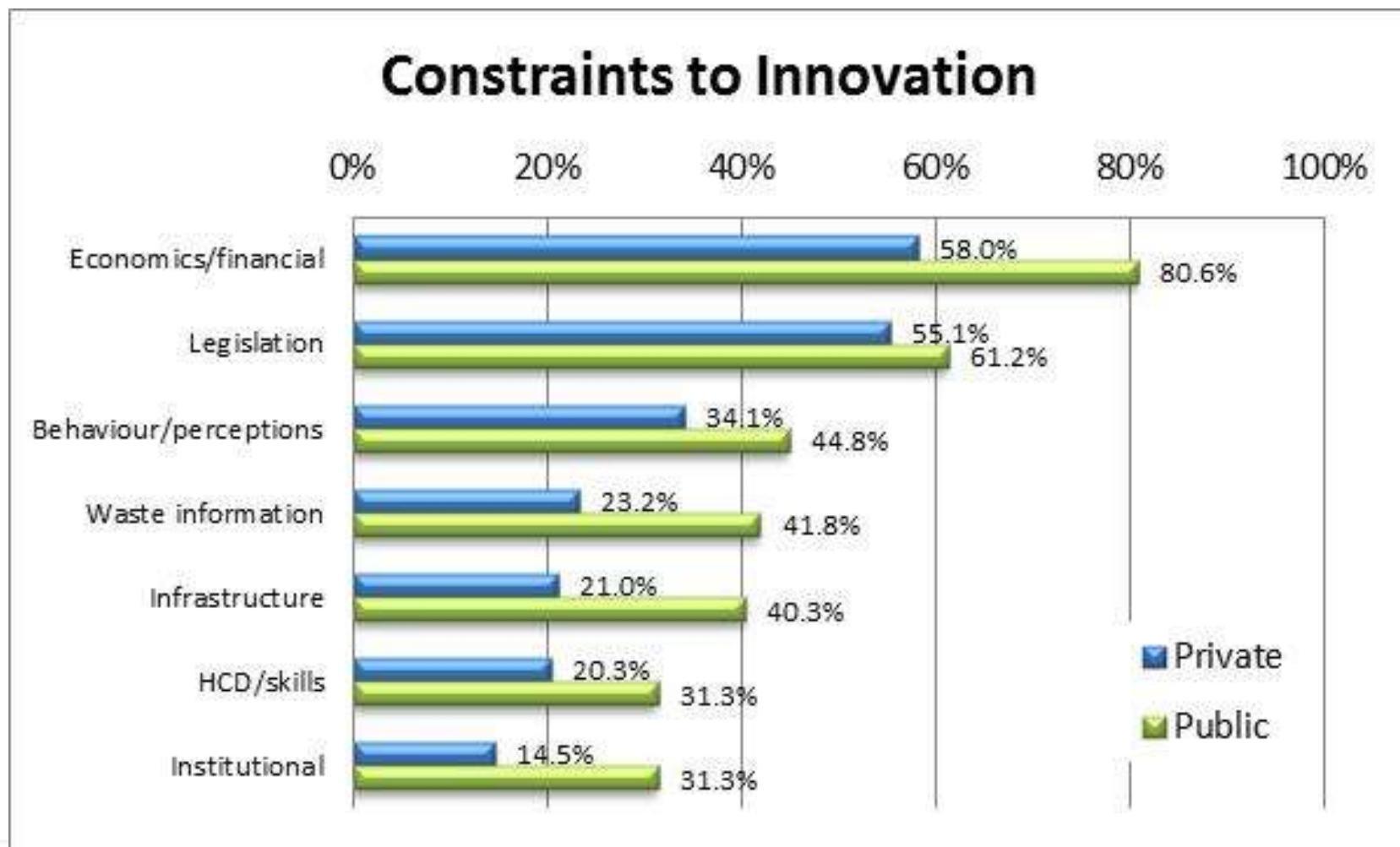




Constraints to Innovation

- What are the barriers or constraints to waste innovation in South Africa, specifically technological innovation?

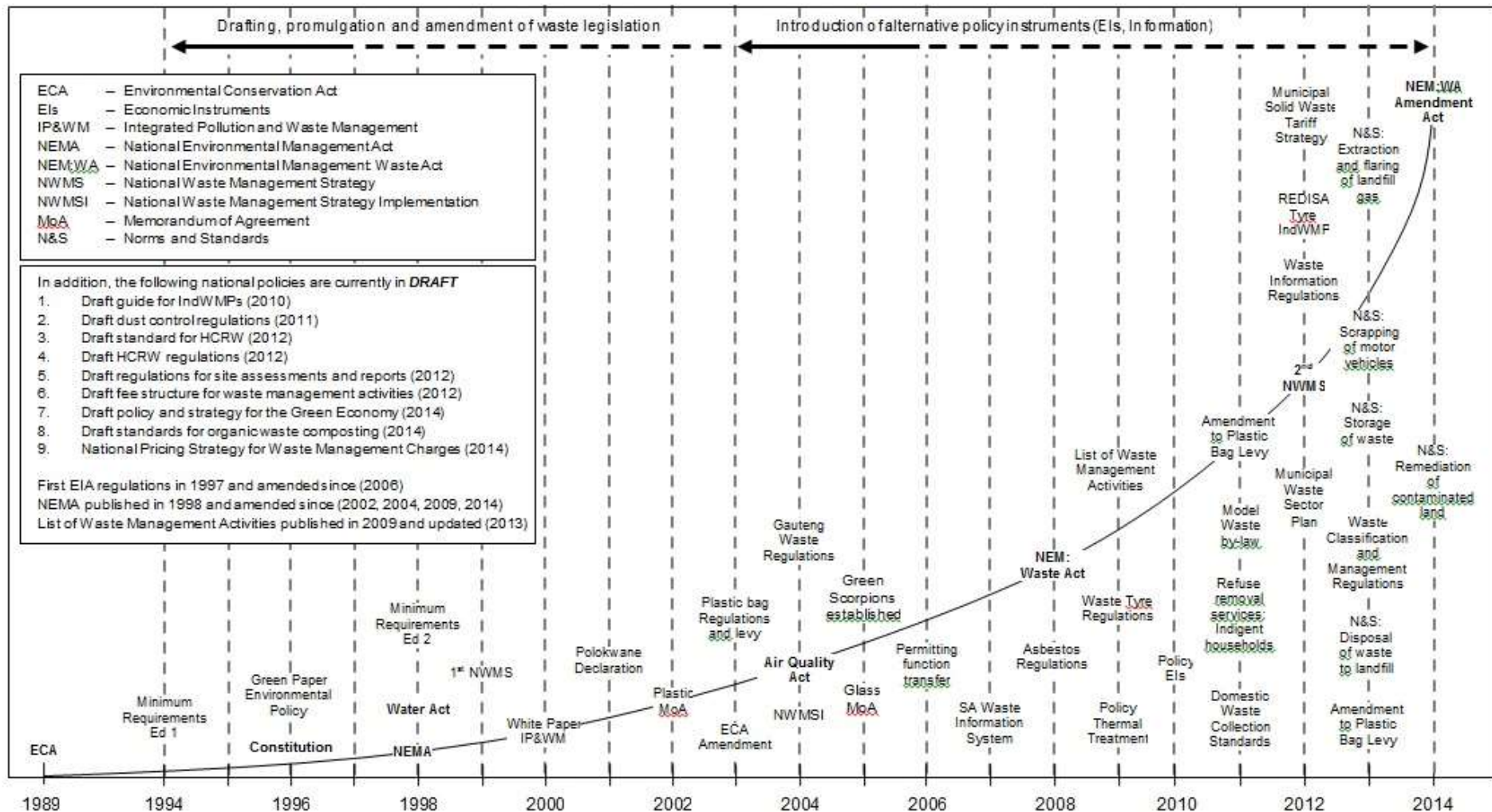
Constraints to Innovation



WASTE MANAGEMENT POLICIES

- 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



WASTE MANAGEMENT POLICIES

Act No.59 of 2008: National Environmental Management: Waste Act, 2008



DEA (2011). National Waste Management Strategy



Act No.26 of 2014: National Environmental Management: Waste Amendment Act, 2014

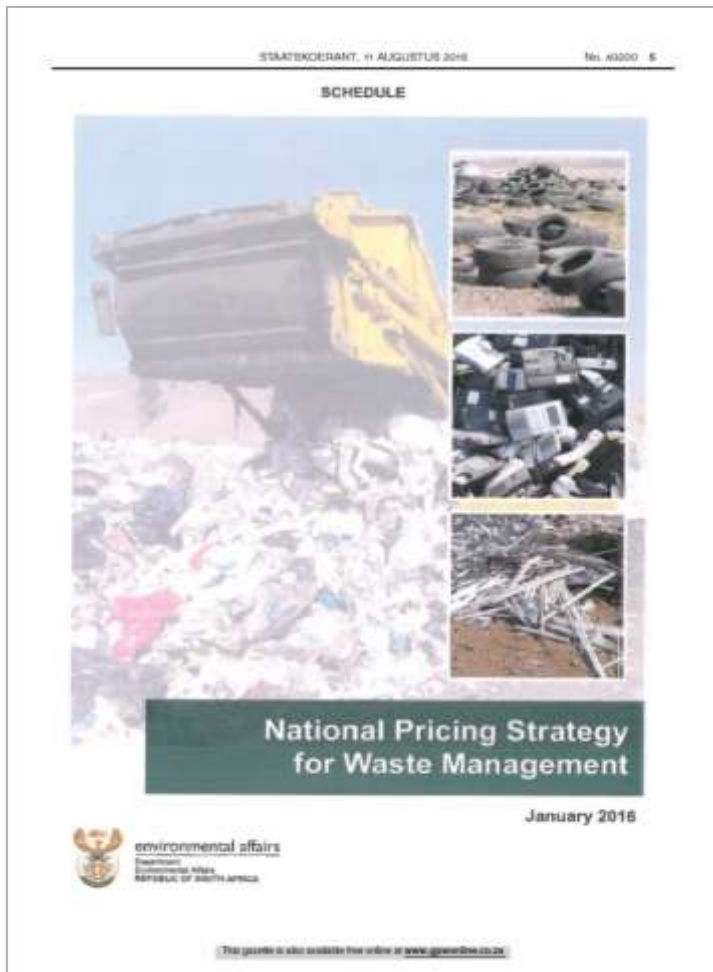


<http://sawic.environment.gov.za/?menu=13>

WASTE MANAGEMENT POLICIES

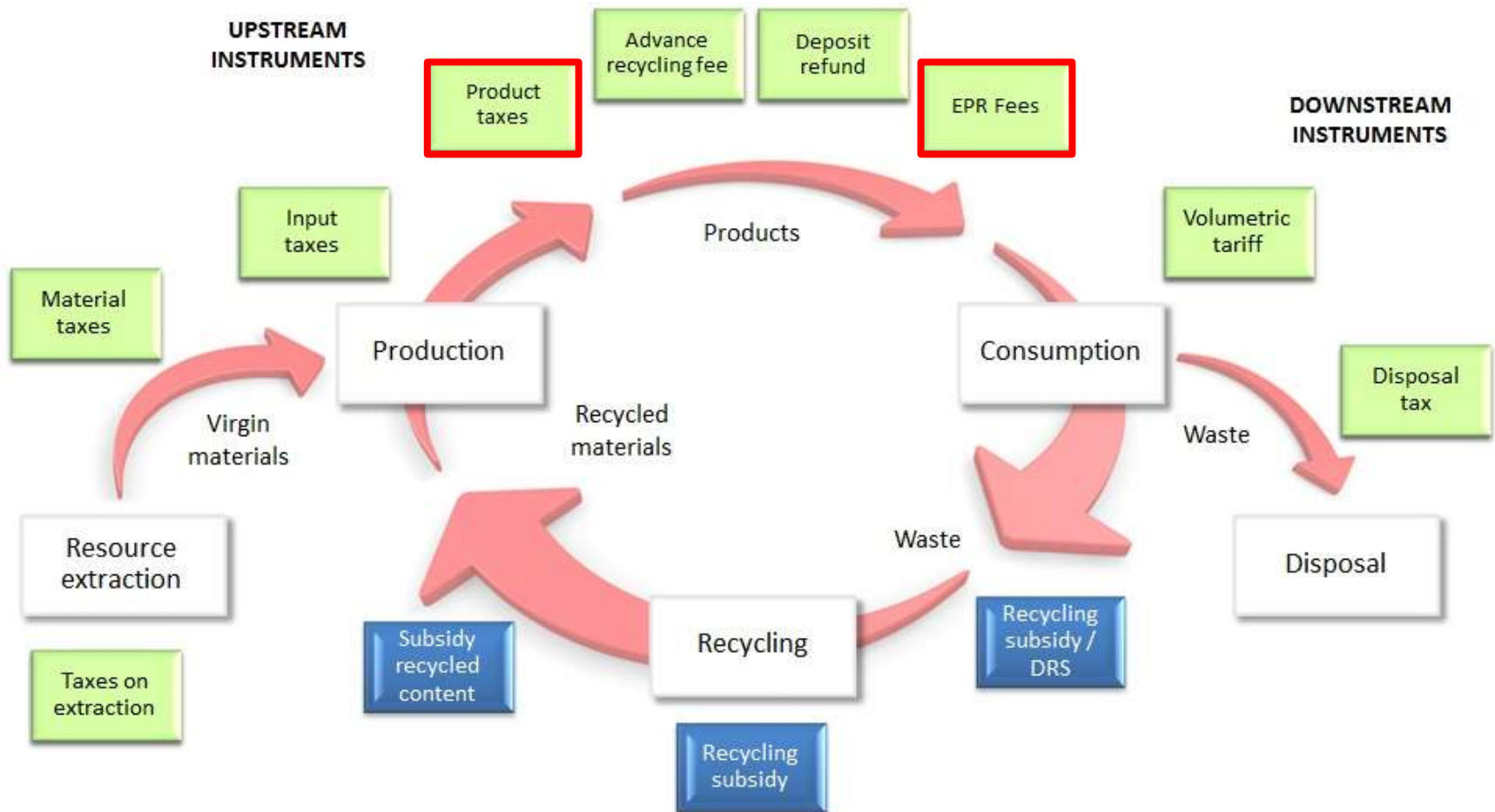
- Brief introduction to South Africa's waste policies in support of **economic instruments**, to support the diversion of waste away from landfill

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)



ECONOMIC INSTRUMENTS: ACTION PLAN

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

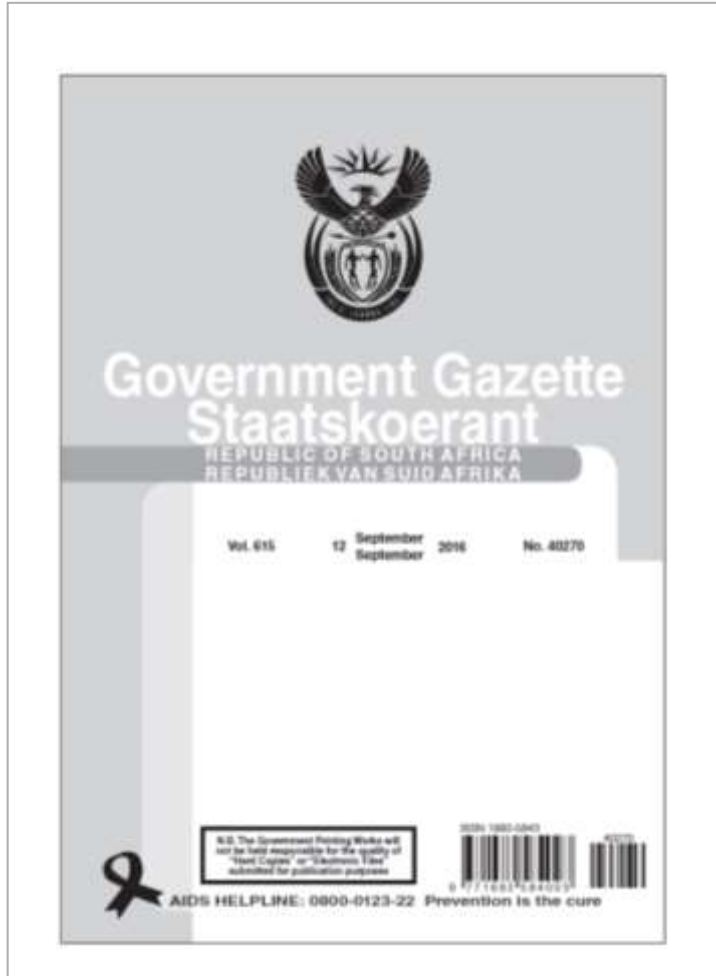
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|---|---|---------|
| ○ All municipalities to reach a stage where they have financial and administrative systems in place successfully recovering the costs for waste management services (collection and disposal) | CoGTA, DEA, WB, Municipalities, National Treasury | 2015/16 |
|---|---|---------|

ECONOMIC INSTRUMENTS: ACTION PLAN

Action 3: Implementation of EPR schemes

3.1	Prioritisation of the waste streams from the list of waste streams and EPR schemes (without any order of preference)	DEA, WB	On annual basis
3.2	Identification of products, product groups or waste streams for the implementation of EPR schemes	DEA, the dti, National Treasury	Ongoing
3.3	Development of system for transfer of funds from SARS to National Treasury	DEA, National Treasury	2016/17
3.4	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	DEA, WB and Industry	Ongoing
3.5	Develop Industry Waste Management Plan(s) in response to Minister's call for the IndWMP	Industry, PRO	Ongoing
3.6
3.7

EXTENDED PRODUCER RESPONSIBILITY



- 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)

WASTE MANAGEMENT POLICIES

- The state of technology uptake in the South Africa waste sector

WASTE MANAGEMENT TECHNOLOGIES

- 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)

WASTE MANAGEMENT TECHNOLOGIES

- 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

WASTE MANAGEMENT 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 –

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



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/>

Waste Management Technologies

- 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)



Waste Management Technologies

- 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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