SOUTH AFRICA'S 10-YEAR WASTE RDI ROADMAP

Update on the Waste Research, Development and Innovation (RDI) Roadmap

Prof Linda Godfrey

Manager: Waste RDI Roadmap IU

PETCO and Friends Seminar

30 August 2017

science & technology

Department:
Science and Technology
REPUBLIC OF SOUTH AFRICA

CSIR

our future through science

An estimated 90% of waste generated in South Africa is disposed of to landfills – Often to poorly designed and operated dumpsites (DEA, 2012)

Around 46% of packaging waste still ends up in landfills in South Africa (Packaging|SA, 2015)

Background: The Need

- The correct management of waste and the diversion of waste away from landfill
  - Create opportunities to move resources into a **local** secondary resources **economy**
  - And in so doing, create **environmental**, **social** and **economic** opportunities for South Africa
- In this lies significant **opportunity** and **need** for research, development and innovation (RDI) to –
  - Unlock **new solutions** for utilising “waste”
  - Inform **policy** development and implementation
  - Inform **technology** uptake
  - Inform decision-making through **sound evidence**

But can we unlock higher value add products through RDI?

Background: 10 Yr Waste Roadmap

- The Department of Science and Technology (DST)
  - initiated a process to develop the 10-Year Waste Research Development and Innovation (RDI) Roadmap, completed in 2014
  - aimed at providing **strategic direction**, a set of **action-plans** and an implementation framework
  - to guide South Africa's **portfolio investment**, for the next 10 years, in **six identified clusters** of waste and secondary resources research, development and innovation activity

Background: Priority Waste Streams

- **Municipal Solid Waste**

  e.g. paper and packaging, C&D waste, OFMSW, residual waste

- **Electronic Waste (WEEE)**

  e.g. all fractions, metal, plastic, glass, etc.

- **Waste Plastic**

  e.g. pre- and post-consumer plastics (all)

- **Organic Waste**

  e.g. industrial biomass, OFMSW, food waste

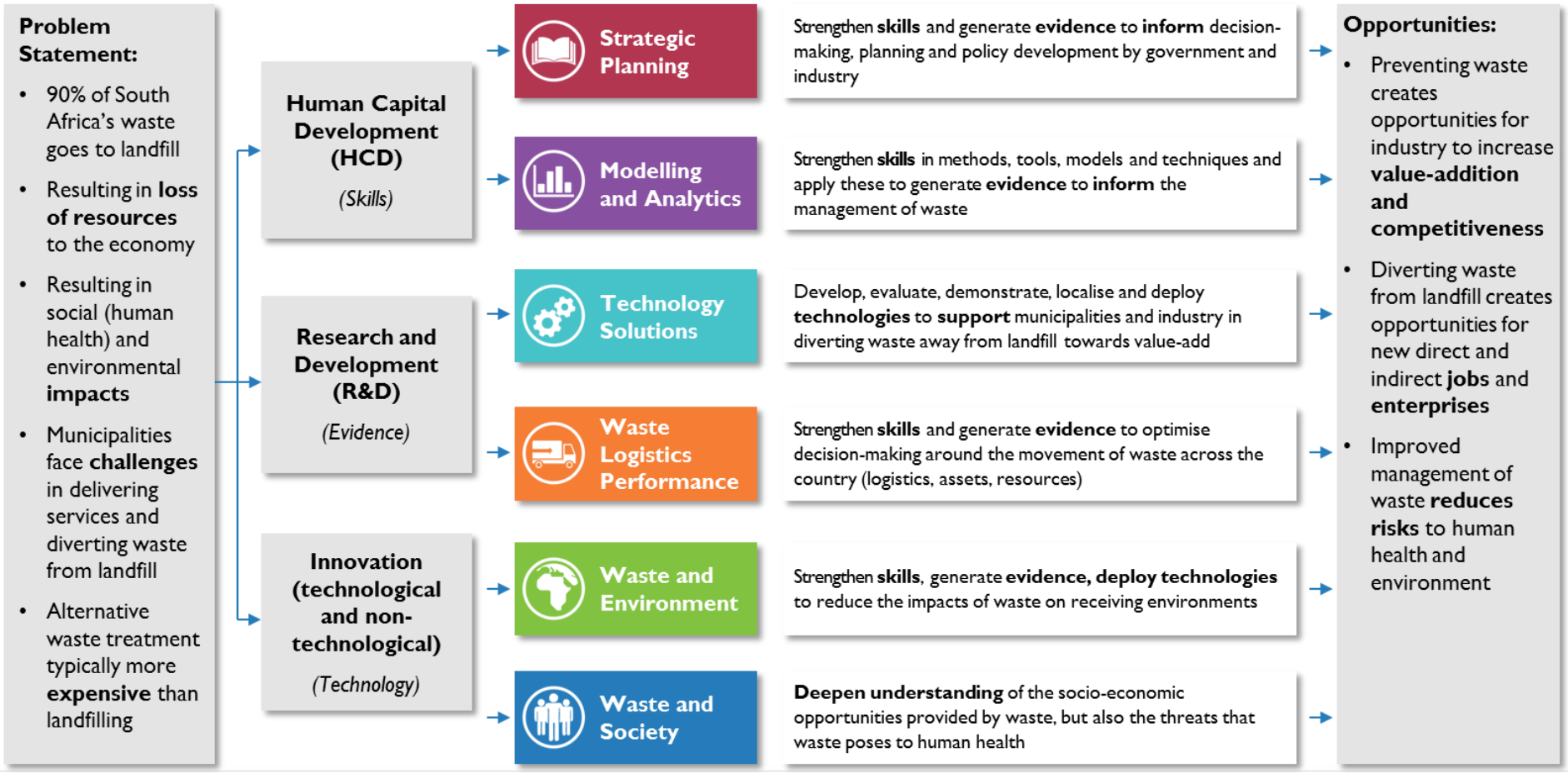
- **Waste tyres**

Maximising the diversion of waste away 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 social, economic, and environmental **benefit** for South Africa.

Background: The Roadmap pillars

- The Waste RDI Roadmap is implemented in line with the DST's mandate "*to use **science** and **technology** to improve the country's economy, create employment and improve the quality of life of all citizens*" [Minister, 2014], and
- Is underpinned by the **three pillars** aligned with the mandate

Background: 10 Yr Waste Roadmap



10-year Waste RDI Roadmap for SA

science & technology
Department:
Science and Technology
REPUBLIC OF SOUTH AFRICA

Department:
Science and Technology
REPUBLIC OF SOUTH AFRICA

www.wasteroadmap.co.za

So what have we been up to since 2014?

1. Strengthening capability

Strengthening HCD in South Africa

Human Capital Development (**HCD**)

Providing a pipeline of skilled post-graduates into the waste and secondary resources sector with the **skills to drive alternative waste treatment and to unlock opportunities**

Increasing the supervisory capacity to mentor post-graduate (Honours, Masters, Doctoral and Post-Doc students)

- Post-graduate degrees in **waste management**
  - Northwest University –
    - Offered as full-time and part-time degrees
    - 22 students currently studying towards higher degrees
    - BSc Honours (Environmental Sciences with specialisation in Waste Management)
      - First class of 10 students graduated (2015)
    - MSc (Environmental Management)
      - First intake (8 students) in 2017
  - University of KwaZulu-Natal –
    - MSc Eng (Waste Management) (new)
      - Approved by the University and SAQA and now with CHE for approval
      - Planned offering from 2018

Strengthening HCD in South Africa

Human Capital Development (**HCD**)

Providing a pipeline of skilled post-graduates into the waste and secondary resources sector with the **skills to drive alternative waste treatment and to unlock opportunities**

Increasing the supervisory capacity to mentor post-graduate (Honours, Masters, Doctoral and Post-Doc students)

- Post-graduate **scholarships** in **waste management**
  - Open and Targeted Calls for Scholarships in 2015 and 2016
  - 13 Masters/PhD scholarships funded to date
    - 7 post-graduate scholarships awarded in 2015/16
    - 6 post-graduate scholarships awarded in 2016/17
  - Strong focus of post-graduate studies on "**Technology Solutions**" (Cluster) and "**Organic waste**" (Priority waste)
  - Supporting **transformation** of the waste sector (female 46% of awarded scholarships) and (black 62% of awarded scholarships)

2. Supporting R&D and Innovation

Strengthening R&D in South Africa

Waste Research & Development (**R&D**)

Supporting the **generation of new scientific evidence**, relevant to South Africa, that will **inform policy, planning, decision-making**

Supporting the **development of new technology** and of **adapting technology** to South Africa conditions through R&D

- Issued **R&D Grant Calls** in 2015 and 2016
  - 10 Projects awarded in 2015 (starting in 2016)
    - Strong focus of planned R&D on **"Technology Solutions"** (Cluster) and **"Organic waste"** (priority waste)
  - 5 Projects awarded in 2016 (starting in 2017)
    - Strong focus on "**WEEE**" (priority waste stream)
- Consolidating existing R&D in South Africa
  - Planned DST Academic book series
  - First book in process on the beneficiation of **biomass and organic waste** in South Africa

Strengthening Innovation in South Africa

Waste
Innovation
(technological
and non-technological)

Driving **technological and non-technological innovation** to improve the management of waste in South Africa and to unlock the social, environmental and economic opportunities in resource recovery

Developing technological solutions unique to South African conditions

- Issued Open Innovation Call for upscaling technologies in 2015 (no call in 2016)
  - 5 Grant Applications received
  - 1 Project awarded starting in 2016
- Targeted projects *(discussed later)*
- Industry-meets-science *(discussed later)*

Projects funded – 2015/16

Lessons from **Waste Picker** Integration Initiatives – Development of evidence-based Guidelines
[Dr M Samson, University of Witwatersrand, Johannesburg]

A decision-support tool for implementing municipal waste **separation at source**
[A Nahman, CSIR NRE, Stellenbosch]

Beneficiation of **forestry biomass** waste streams
[Prof B Sithole, CSIR NRE, Durban]

Valorisation of **waste chicken feathers**
[Prof B Sithole, CSIR NRE, Durban]

Projects funded – 2015/16

Sustainable utilization and conversion of post-harvest **agricultural waste** residues into value added materials [Dr M John, CSIR MSM, Port Elizabeth]

Value recovery from **solid confectionary waste** [Prof S Harrison, UCT, Cape Town]

Reactor design for industrial furfural production from **sugar cane** agricultural residues [Prof J Görgens, SUN, Stellenbosch]

Biogas and volatile fatty acids biorefinery by co-digestion of **fruit juice wastes** with lignocellulosic biomass [Prof J Görgens, SUN, Stellenbosch]

Projects funded – 2015/16

Production of novel cellulose nanocomposites from **organic waste**
[Dr A Chimphango, SUN, Stellenbosch]

Amino acid leaching of metals from **printed circuit board** waste
[Prof C Dorfling, SUN, Stellenbosch]

Extraction of value from solid waste by **pyrolysis conversion**: Pilot scale optimisation
[Prof J Görgens, SUN, Stellenbosch] (Innovation Project)

Projects funded – 2016/17

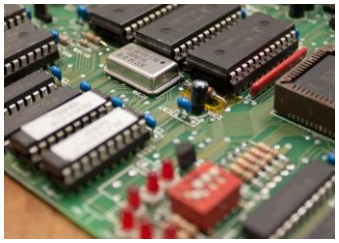
Recycling **rare earth elements** from fluorescent lamps
[Prof C Dorfling, SUN, Stellenbosch]

Sequential **extraction and recovery of valuable metals** from waste electrical and electronic equipment (WEEE)
[Prof S Harrison, UCT, Cape Town]

Lithium ion battery (LIB) recycling process
[Dr G Akdogan, SUN, Stellenbosch]

Projects funded – 2016/17

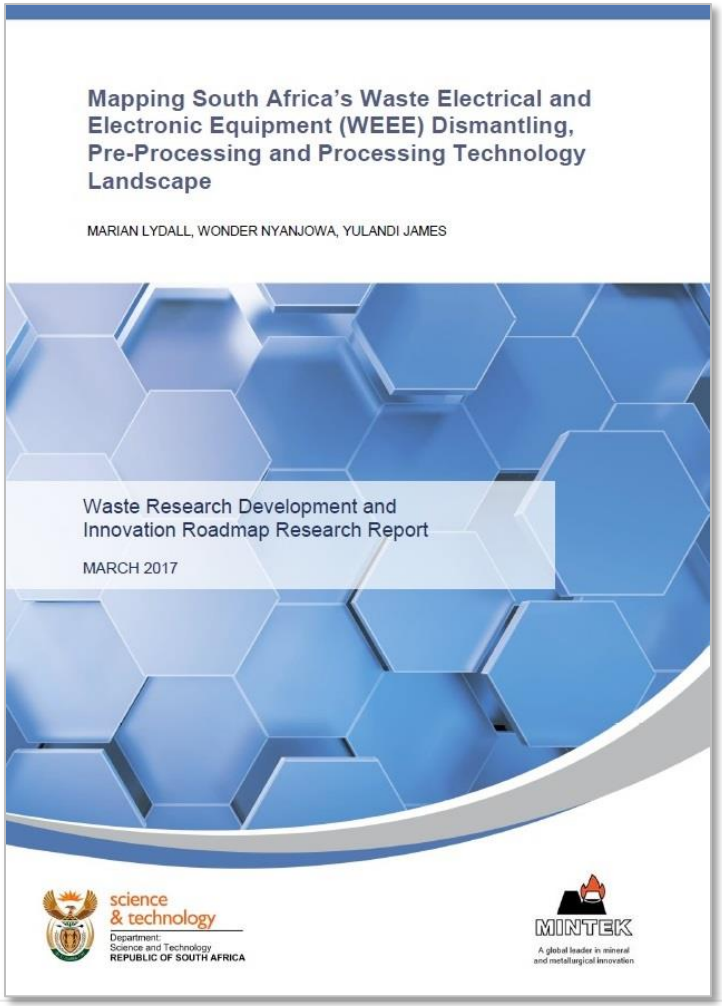
Thermal treatment of printed circuit board waste
[Prof C Dorfling, SUN, Stellenbosch]



Use of **PCB leach residue** as reductant in pyrometallurgical operations
[Dr G Akdogan, SUN, Stellenbosch]

3. Evidencing decision-making

Targeted research projects



- Mapping South Africa's waste electrical and electronic equipment (WEEE) dismantling, pre-processing and processing technology in South Africa
- Research undertaken by Mintek and completed in March 2017
- Aimed at informing future technology uptake in the e-waste recycling sector
- Publicly available on the Waste RDI Roadmap website

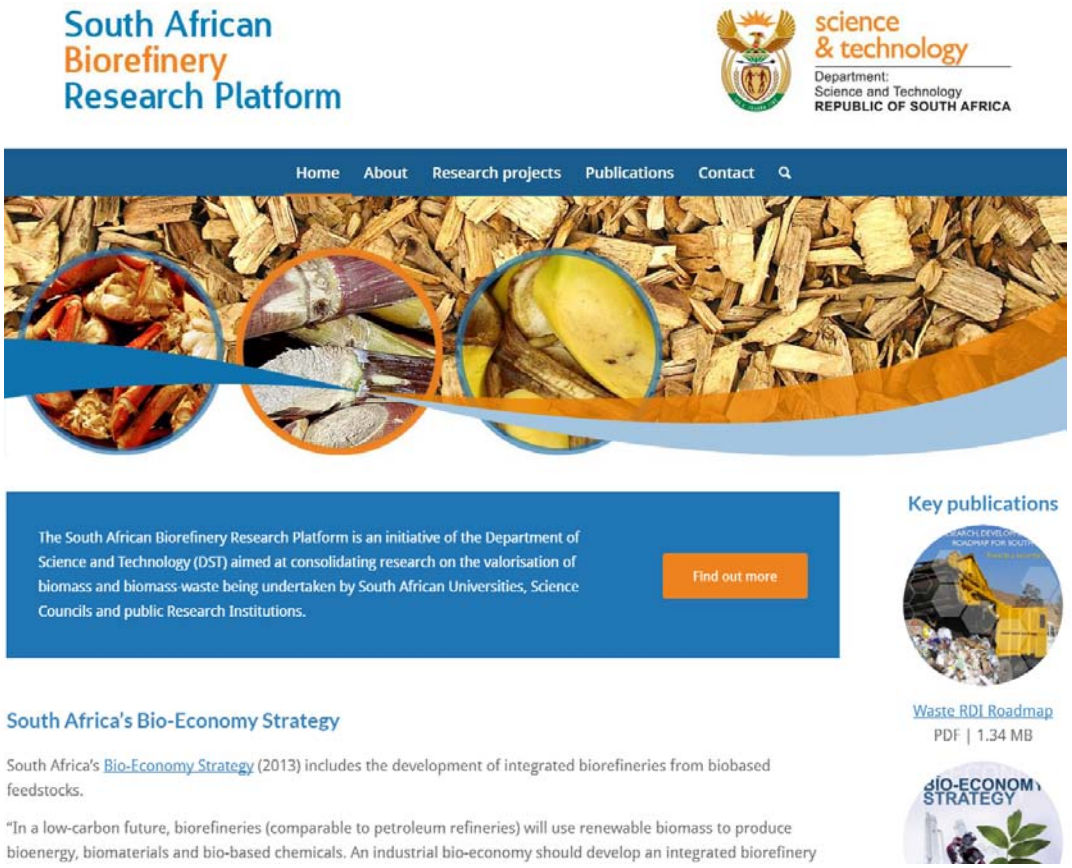
www.wasteroadmap.co.za

South African Bioplastics Forum

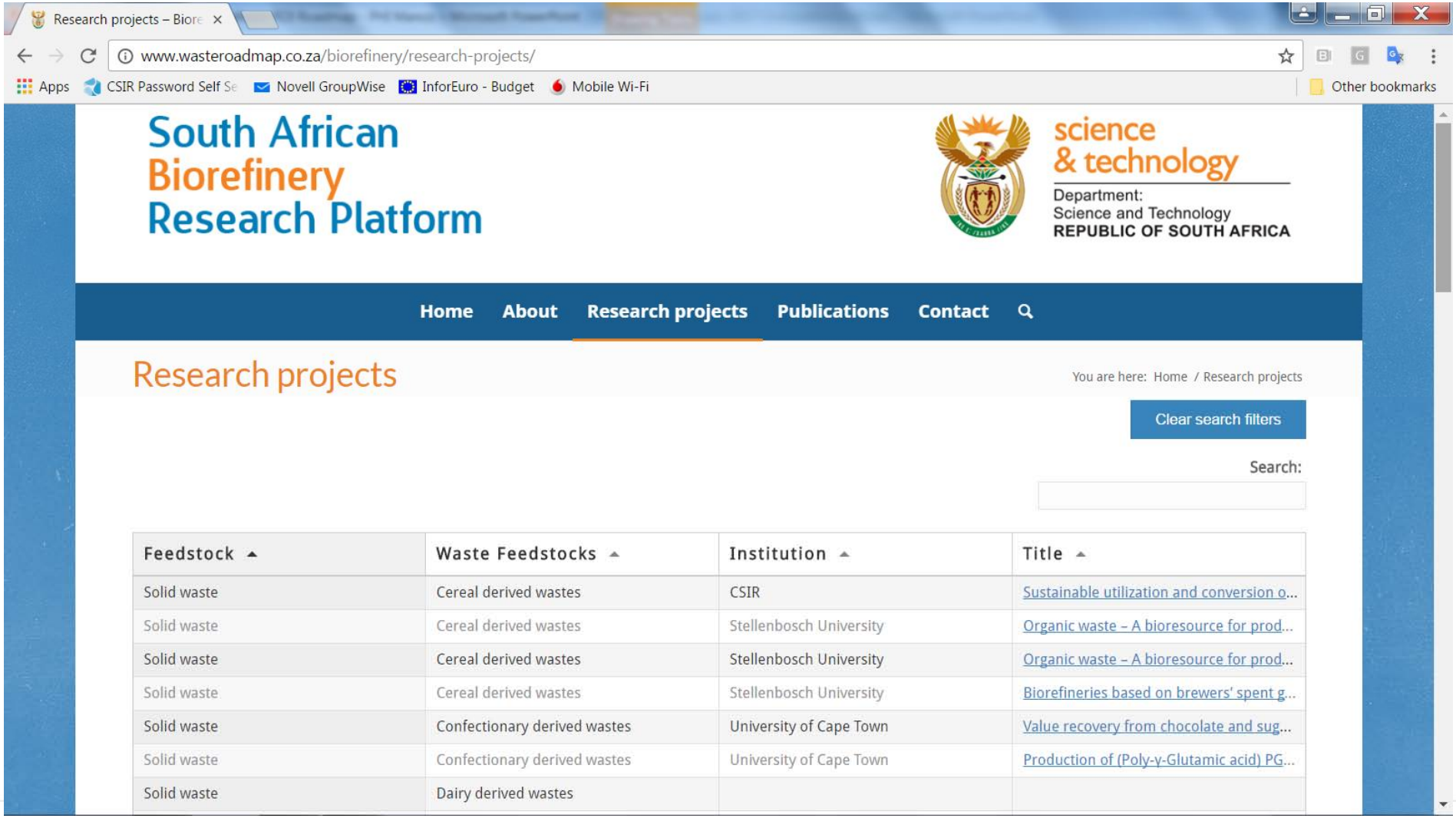
- The South African Bioplastics Forum was launched by Plastics|SA, in partnership with the CSIR and the DST, at the Bioplastics Industry-meets-Science workshop held in Durban in January 2016.
- The aim of this forum is to support the growth of the bioplastics economy in South Africa.

SA Biorefinery Research Platform

- Launch of the South African **Biorefinery Research Platform** in support of the Waste RDI Roadmap and Bio-Economy Strategy
- Allows users to search for waste-related biorefinery research in South Africa
- Currently hosts information on 54 current or completed research projects on the **valorisation of organic waste** streams



SA Biorefinery Research Platform



4. Strengthening partnerships (between industry and science and within research community)

Strengthening partnerships

- Partnerships (local and international) are key to strengthening waste RDI in South Africa
  - **Government** (national, provincial and local)
    - Evidence to support decision-making, policy development and implementation
  - **Business**
    - Supporting the sector through evidence and skills to drive waste into alternative waste treatment solutions and increased value recovery
    - Ensuring RDI is relevant to addressing the challenges facing the sector
  - **Academia** (Universities and Science Councils)
    - Undertaking the waste RDI in support of the Roadmap

Industry-meets-Science Workshops

- The aim of this Industry-meets-Science workshop is –
  - To bring industry and academia together – to make sure that South Africa's research **remains relevant** and that research finds **uptake**
  - To create a **knowledge sharing and leadership platform** to share and learn
  - To highlight the **challenges** facing the sector that can **inform** direct research
  - To **showcase current research** and **solutions** that may benefit industry/business; and
  - To jointly **identify priority actions** and **research needs** to support reduced food waste as we move forward.

Industry-meets-Science Workshops

- The DST has to date held 4 Industry-meets-Science workshops
- And has used the outputs of these previous ImS workshops to

Focus area	Date	Activities
Organic waste	26 Nov 2015	Informed the 2015/16 **Call for post-graduate Scholarships** and **Call for Research Proposals**, from which the DST awarded 4 (of 8) **scholarships** and 8 (of 11) **research grant** projects in organic waste beneficiation / biorefinery (organic waste programme)
Bioplastics	21 Jan 2016	Established the **SA Bioplastics Forum**, currently engaging with how we strengthen this potential new economic sector in South Africa
Electronic waste (WEEE)	8 Mar 2016	Informed a targeted research project on the SA WEEE Technology Landscape and the 2016/17 **Call for Proposals** from which the DST awarded five (5) new **research grant** projects (WEEE programme)
Food waste	15 Feb 2017	Inform a **future, targeted RDI Call** on food waste (food waste programme) – *dependant on sourcing RDI funding*

Industry-meets-Science Workshops

- Series of workshop reports

So what does this all mean for the sector?

What does RDI mean for the sector?

- Improving operational efficiencies of current operations
  - What are the top 3 “unknowns” in your business where **research partnerships** could improve your operational efficiency?
- Finding new end-use markets
  - Material organisations, producers, etc. will need to find **new end-use markets** as diversion targets increase
  - Partner with research institutions to undertake **solution driven** RDI
- Investing in research
  - Industry Waste Management Plans (IndWMPs)
  - Request made by Department of Science and Technology (DST) that IndWMPs allocate **at least 2%** of the funding raised through EPR levies to RDI – to drive technological and social innovation in their sector

The way forward

Future activities

- Preparing to launch the first two SARChI research chairs in solid waste in 2018
  - Waste and climate change
  - Waste and society
- Increasing waste **RDI activity** and **collaboration**
  - through industry and government partnerships
  - between South Africa and Africa, and other key international partners
  - Strengthening the **investment** in local waste RDI
- Managing our existing projects and supporting calls for new grant projects and post-graduate scholarships
- **Targeted RFPs** to gather evidence to support future activity under the Roadmap

Contact details

- **Prof Linda Godfrey**
  Manager: Waste Roadmap PMU
  E-mail: LGodfrey@csir.co.za

- **Dr Henry Roman**
  Director: Environmental Services and Technologies
  E-mail: henry.roman@dst.gov.za

- **Ms Magamase Mange**
  Deputy Director: Environmental Technologies
  E-mail: magamase.mange@dst.gov.za

www.wasteroadmap.co.za

Waste RDI Roadmap

Outlines the proposed interventions, progression paths and the related instruments, and the required RDI investment over time

Trends

Describes the local and global trends in waste management and approach adopted in arriving at the priority waste streams for the Roadmap

Capabilities

Maps the nature, availability and maturity of waste RDI capability and capacity in South Africa

Opportunities

Provides an overview of the Market Opportunities we see, how attractive they are and what is required to realise them