

SCIENCE, TECHNOLOGY AND INNOVATION  
FOR A CIRCULAR ECONOMY

**2022/23**  
ANNUAL PROGRESS REPORT



Waste Research Development  
and Innovation Roadmap  
South Africa



science & innovation

Department:  
Science and Innovation  
REPUBLIC OF SOUTH AFRICA



**CSIR**  
Touching lives through innovation



SCIENCE,  
TECHNOLOGY  
AND INNOVATION  
FOR A CIRCULAR  
ECONOMY

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## MESSAGE FROM THE DEPARTMENT OF SCIENCE AND INNOVATION



*Dr Henry Roman*



*Ms Vivienne Gondwe*

In 2012 the Department of Science and Innovation (DSI) then known as the Department of Science and Technology (DST), recognised a need for a dedicated research and innovation programme for the South African waste sector. Prior to developing the Waste Research, Development and Innovation (RDI) Roadmap, the DSI through the Council for Scientific and Industrial Research (CSIR) analysed the waste sector in terms of human capacity development, research capability and innovation capabilities. This was the foundation upon which the Roadmap was developed between 2013 and 2014. The implementation of South Africa's Waste RDI Roadmap started in 2015.

Over these ten years the Waste RDI system in South Africa has developed into a more mature system than existed in 2012. The Waste Research Implementation Unit (WRIU) hosted by the CSIR, now has an extensive database of researchers throughout the country and across the continent, driving waste R&D and innovation. The Roadmap has enhanced RDI capability in South Africa to the extent that a Community of Practice on Waste Management was established between different Research Chairs under the National Research Foundation (NRF). The waste National System of Innovation (NSI) has been enhanced over the last decade into a more coherent RDI network that is aligned and responsive to the Roadmap. This is due, to a large degree, to having a dedicated office at the CSIR and a dedicated and passionate Manager, Prof Linda Godfrey, to oversee this system.

This past year saw a change in reporting for researchers supported through grant funding. The change was to distinguish between researchers directly supported with grant funding and those researchers that collaborate on projects but do not receive funding. This resulted in 107 (non-unique) researchers directly supported with 78 collaborating on grant funded projects, the highest number of researchers in the NSI contributing to Waste RDI. In terms of human capital development, 59% of the grant funded students were female, and 83% were black.

Amongst the projects concluded during the 2022/23 financial year, there was a strong focus on plastic in the environment, including the marine environment.

CSIR completed three projects including modelling South Africa's approach to near zero plastic leakage to our oceans; understanding the impact of marine plastic debris on ecosystem services and the economy in South Africa; and exploring end-of-life options of biobased plastic materials and its biocomposites in landfill, compost and marine water conditions. The importance of this work cannot be understated, as the world is seeking solutions to manage plastic leakage to the environment and specifically to the oceans.

In response to the recently approved Science, Technology and Innovation (STI) Decadal Plan, the DSI will be developing a new strategy on STI for Circular Economy (STI4CE). Circular Economy (CE) has been identified as a new source of socio-economic growth for South Africa, and the strategy is a response to informing a national framework on CE through evidence based in science.

The shift from the dominant linear economy paradigm to the circular economy necessitates a system change. Such a transformation is not something that will happen quickly; however, it is the view of the DSI that such a shift is required over the next fifteen to twenty years if we are to realise a net-zero world by 2050. It will also take an extraordinary effort from SA Inc. to realise this ambition. To this end the DSI has already established an inter-governmental working group to oversee the development of the STI4CE, as this transformation of the economy will require a concerted effort not only of government, but of private sector as well as civil society.

In closing the DSI is proud of the work achieved over the last decade in developing and implementing the Roadmap in partnership with the CSIR. We look forward to continuing the groundbreaking work through the upcoming STI4CE Strategy.

### **Dr Mmboneni Muofhe**

Deputy Director-General:  
Socio-Economic Partnerships

### **The DSI Team:**

#### **Dr Henry Roman**

Director: Environmental Services and Technologies

#### **Ms Vivienne Gondwe**

Acting Deputy Director:  
Green Economy



## MESSAGE FROM THE WRIU MANAGER, PROF LINDA GODFREY

The Waste Research Development and Innovation (RDI) 10-year Roadmap (2015-2025), has successfully completed its eighth year of implementation. The team was faced with the lowest operational budget in 5-years, resulting in no grant call being issued for 2022. Despite this, the Waste RDI Roadmap Implementation Unit (WRIU), hosted by the CSIR on behalf of the Department of Science and Innovation (DSI), managed a portfolio of 33 grant projects (ongoing and new), with a total portfolio of projects worth R34.6 million. The bulk of this year's budget (55%) was directed towards non-recoverable grant projects, held across 15 recipient grant institutions, directly supporting 58 students and 107 researchers. The Roadmap was also able to support scholarships for 14 post-graduate students studying towards one of the dedicated waste management degrees offered by North-West University and the University of KwaZulu-Natal.

With a number of grant projects coming to their end, the Roadmap produced 67 deliverables during the year, including dissertations, technical reports, journal papers, conference papers and presentations, and technology demonstrators. The highest reported number of scientific deliverables in a year since the start of the Roadmap implementation in 2015.

After the dip experienced between 2020-2022 as a result of the pandemic, it is encouraging to see the increased number of students now completing their degrees in 2022/23. We extend our congratulations to all of the students who persisted through what was trying conditions for Universities as a result of the global pandemic. The pandemic did however result in delays, with a number of the grant projects approved for no-cost extensions to allow for the successful completion of research, and associated deliverables.

The two waste SARChI Chairs, in Waste & Society (Prof C Schenck, UWC) and Waste & Climate Change (Prof C Trois, UKZN), underwent their 5-year review with the National Research Foundation (NRF) in late 2022. After very favourable reviews, the Chairs were approved for a second 5-year term. The Waste & Society Chair, held by Prof Schenck, was upgraded from a Tier II to a Tier I Chair in response to the excellent research undertaken by this team over the past five years.

A number of very interesting, and potentially impactful studies were completed during 2022/23. These included, amongst others –

- *“Municipal waste at household level: Demand estimation and service design”* (J Joubert, UP). The project aimed to design cost-efficient residential waste collection services for municipalities by using the household and individual attributes of the synthetic population, to estimate the distribution of waste generated in a municipality.
- *“Booms, grids and nets: Intercepting macroplastic debris in rivers”* (P Ryan, UCT). The aim of the project was to assess interventions currently used in South Africa to screen macroplastic litter from waste water and urban rivers, and to evaluate the effectiveness of these interventions.
- *“Development and piloting of a national Informal Reclaimer Registration System to inform reclaimer integration in South Africa”* (E Ramphine, CSIR and M Samson, UJ)
- *“Modelling South Africa’s approach to near zero plastic leakage to our oceans”* (S Oelofse, CSIR). The aim of this project was to apply the Pathways Model, developed for the ‘Breaking the Plastic Wave’ global study, to model South Africa’s response to achieving near zero plastic leakage to the marine environment, using best available data.
- *“Exploring disposable diaper usage and disposal practices in rural areas”* (C Schenck, UWC). This project explored the current disposable diaper usage and disposal practices in unserved rural areas, and the resultant environmental impacts.

These projects, completed in 2022/23, highlight not only the diversity of waste research funded under the Roadmap, but also the potential impact of this research to inform responses, including policy responses to improve the state of waste management in South Africa, and to unlock the opportunities of waste as resource.

As the Waste RDI Roadmap moves towards closure in 2025, we look forward to the emerging Circular Economy Science, Technology and Innovation (STI) which will be driven by the DSI in support of Government’s 10-year STI Decadal Plan (2022-2032).



Prof Linda Godfrey

### The CSIR Team:

#### **Bongani Memela**

Manager: Hosted National Programmes

#### **Prof Linda Godfrey**

Manager: Waste RDI Roadmap

#### **Siphe Ngobese**

Project Administrator: Waste RDI Roadmap

#### **Amit Ramsumair**

Management Accountant

#### **Lulu Makapela**

Contracts Manager

## Vision

Development and deployment of performance improvements in waste management has delivered a significant contribution to the strengthening of a sustainable regional secondary resources economy in South Africa.

## Mission

This has been achieved by means of a National Waste RDI Programme that supports maximisation of 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.

## BACKGROUND AND OBJECTIVES

The Waste Research, Development and Innovation (RDI) Roadmap is an initiative of the Department of Science and Innovation (DSI) aimed at guiding South Africa's public and private sector investment in waste research, development and innovation over the period 2015-2025.

### BACKGROUND

The DSI recognised the role that RDI could play in achieving the objectives of national waste policy and transforming the South African waste sector in a way that could provide direct environmental, social and economic benefit for the country.

In 2012, the DSI, in partnership with the CSIR, embarked on a process to develop the Waste RDI Roadmap. This process, which was shaped by business, industry, government and academia, culminated in the publication of South Africa's first Waste RDI Roadmap (2015-2025) in early 2015.

The Waste RDI Roadmap is available to review online at [www.wasteroadmap.co.za](http://www.wasteroadmap.co.za).

### OBJECTIVES

With an investment ask of approximately R3.9 billion over 10 years, the successful implementation of the Roadmap is expected to assist government and industry in significantly increasing the diversion of waste away from landfill towards value-adding alternatives, through more effective decision-making; faster insertion of context-appropriate technology; export of know-how and technology; and strengthened RDI capability and capacity.

**The Roadmap, which is anchored in the mandate of the DSI, is structured around three core pillars:**

- Human capital development (HCD)
- Research and development (R&D)
- Innovation (technological and social)

**The Roadmap aims to address issues relating to five priority waste streams:**

- Municipal solid waste
- Waste electrical and electronic equipment (WEEE)
- Plastic waste
- Organic waste
- Waste tyres

**It does this within six broad areas or clusters of activity:**

- Strategic planning
- Modelling and analytics
- Technology solutions
- Waste logistics performance
- Waste and the environment
- Waste and society

### IMPLEMENTATION

The CSIR was appointed by the DSI to implement the Waste RDI Roadmap from 1 April 2015. The intention is for the CSIR, through the Waste RDI Roadmap Implementation Unit (WRIU), to drive human capital development (HCD), research and development (R&D) and innovation, in partnership with government, industry and academia; and to actively engage opportunities (local and international) for waste RDI collaboration and co-investment.



HUMAN CAPITAL DEVELOPMENT



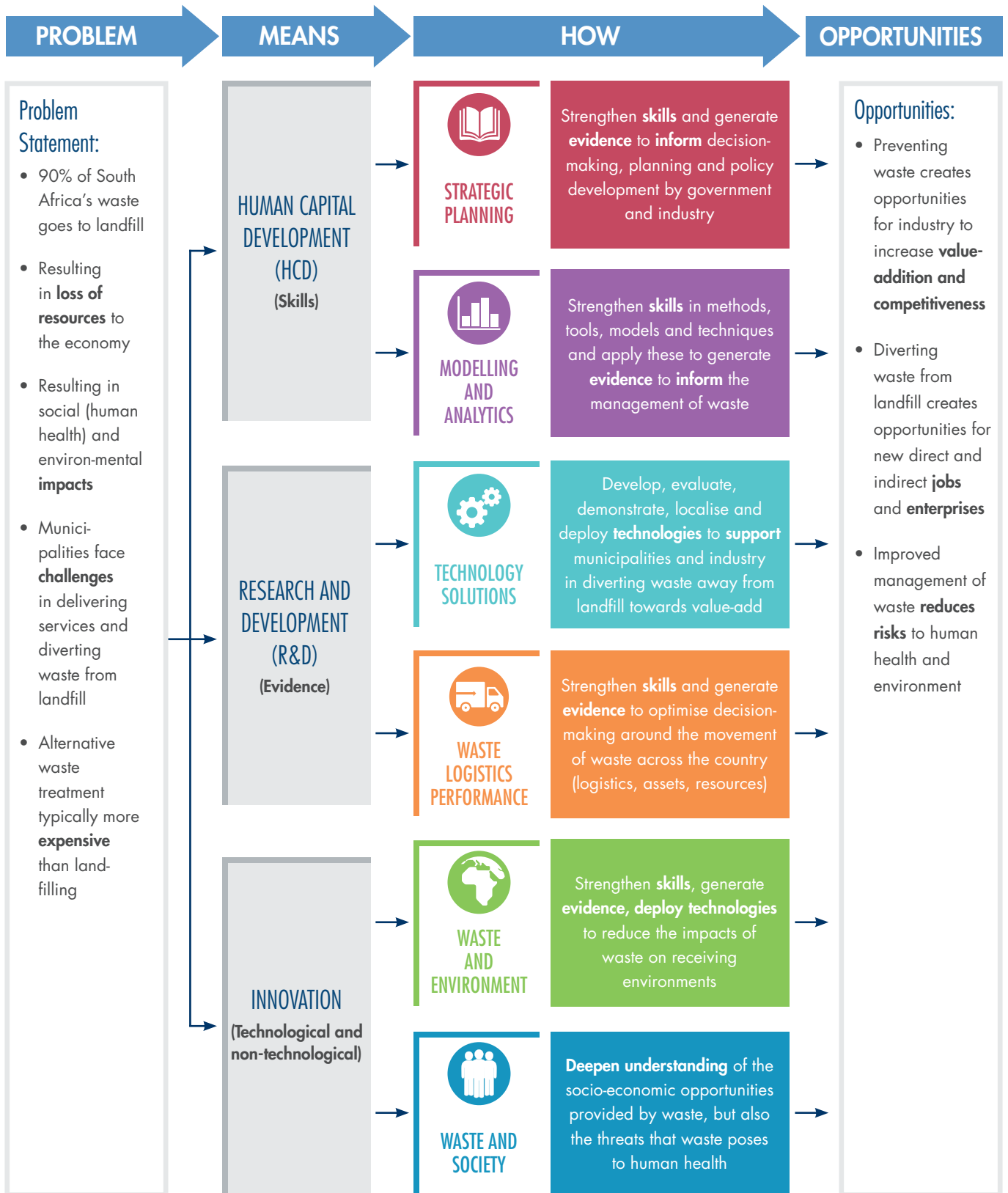
RESEARCH AND DEVELOPMENT



INNOVATION



# PICTORIAL SUMMARY OF THE WASTE RDI ROADMAP



# REFLECTING ON EIGHT YEARS OF IMPLEMENTATION (2015-2023)

## TRENDS

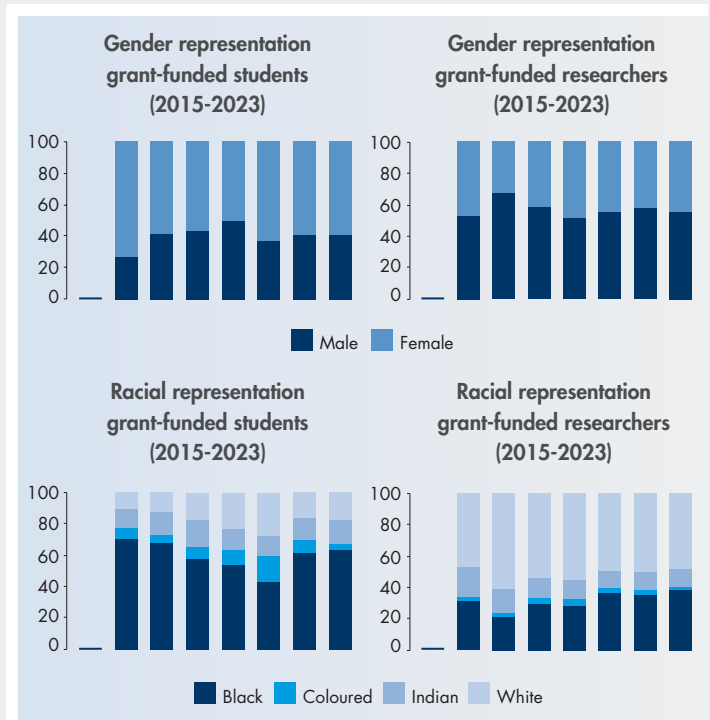
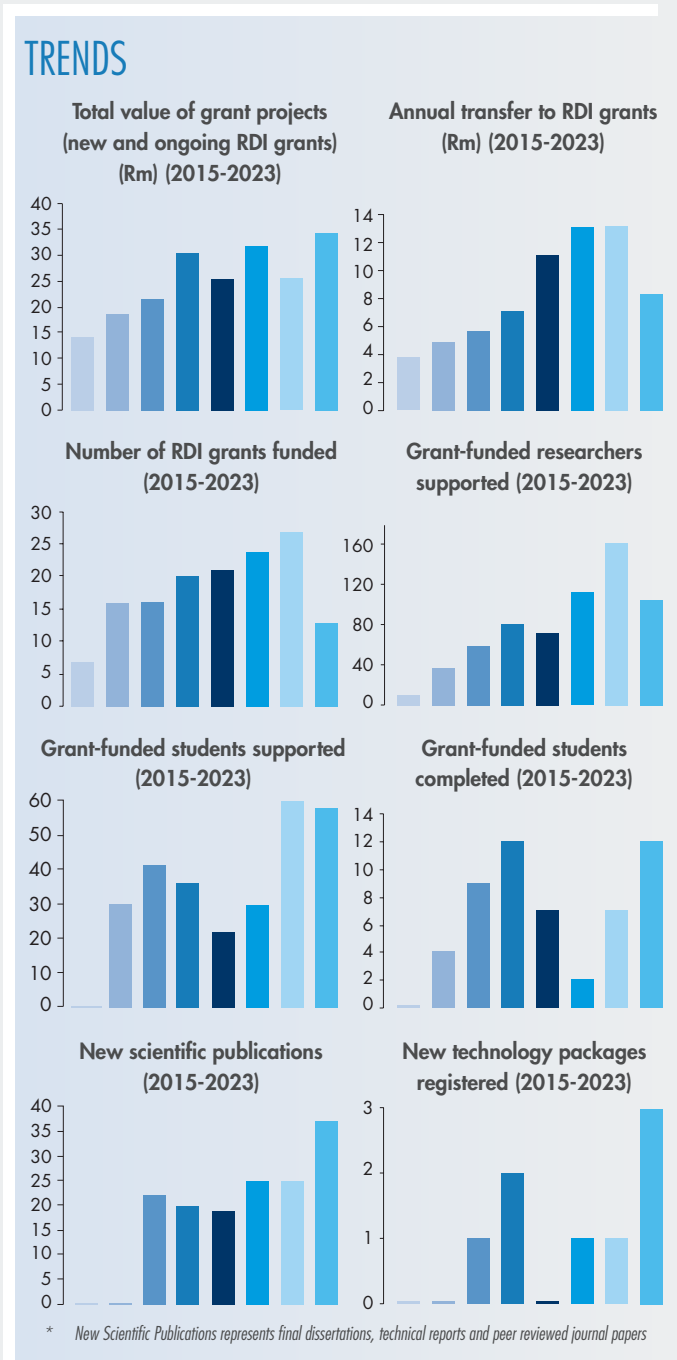
The Waste RDI Roadmap aims to support the improved management of waste and the increased diversion of waste away from landfill towards value-adding opportunities, thereby maximising the potential environmental, social and economic benefits, while remaining true to the mandate of the DSI.

The 2022/23 financial year brought to an end, year eight of the 10-year Waste RDI Roadmap. A number of grant projects were completed this year, which saw an increase in the number of grant-funded post-graduate students completing their degrees, as well as the finalisation of an increasing number of scientific publications. This section provides an overview of major indicator trends over the duration of the Waste RDI Roadmap implementation.

However, a number of grant projects which were due for completion at the end of 2022 and 2023 were delayed due to the pandemic. These grant projects were approved for no-cost extensions, which resulted in a large portfolio of grant projects on the books, but limited transfer of funds to recipient institutions. Actual grant projects funded in 2022/23 was the lowest since 2015/16. This trend of a declining number of grant projects is expected to continue as we move towards closure of the Waste RDI Roadmap in 2025.

A large number of students completed their studies in 2022/23. This resulted in an increase in the number of scientific deliverables (dissertations, technical reports and journal papers) published in 2022/23 – the highest number since the start of the Roadmap in 2015.

The number of researchers supported in 2022/23 appears to have declined. However, this is a result of a change in reporting, with grant holders requested to distinguish between “Researchers supported with funding from the grant project” and “Researchers collaborating on the project but not supported with funding”.







The graph to the left reflects funded researchers (107). Another 78 researchers collaborated and supported grant projects, but were not funded, bringing the total to its highest number since 2015.

### EQUITY

In line with national imperatives, including the White Paper on Science Technology and Innovation, which calls for a responsible research and innovation approach to support ethical science, technology and innovation, and an inclusive National System of Innovation (NSI), the Waste RDI Roadmap is committed to supporting gender and racial equity.

Mapping the Waste RDI Roadmap investment in post-graduate students and researchers over the past eight years, shows very good transformation of the sector, although noting the differences in representation between the students and the more experienced researchers.

### INVESTMENT

The split in grant funding across the Roadmap's six clusters over the past eight years is in line with the original intention of the Waste RDI Roadmap. The largest share of funding (55%) was planned for investment in 'Technology Solutions'. The actual spend to date is 60%. 'Waste Logistics Performance' remains an underfunded area (4% compared to 8% ask), with the WRIU struggling to find waste-logistics research projects that meet the criteria for funding under the Waste RDI Roadmap. The investment in Waste & Society related research remains strong at 14% against a planned 11%.

While the trend in funding per cluster is in line with the original intention of the Roadmap, the total investment amount in the Waste RDI Roadmap, from all partners, has not been realised (see financial section).

## WASTE RDI ROADMAP CLUSTERS AND PERCENTAGE OF TOTAL INVESTMENT PER CLUSTER EXPECTED (2015-2025)

	<b>STRATEGIC PLANNING</b> Build and strengthen the basis and application of strategic analysis and advice for the purposes of evidence-based decision-making to inform strategy formulation, planning and its execution and management	PLANNED <b>6%</b>	ACTUAL <b>7%</b>
	<b>MODELLING AND ANALYTICS</b> Develop and use methods, tools, techniques, platforms, systems and frameworks for the analysis, monitoring and evaluation of technical, economic, social and environmental opportunities and impacts associated with secondary resources	PLANNED <b>10%</b>	ACTUAL <b>10%</b>
	<b>TECHNOLOGY SOLUTIONS</b> Design, development, evaluation, demonstration, localisation and deployment of technologies – both local and inbound – for customer-driven performance improvement	PLANNED <b>55%</b>	ACTUAL <b>60%</b>
	<b>WASTE LOGISTICS PERFORMANCE</b> Optimisation of strategic, tactical and operational decision-making in respect of logistics objectives, assets and resources	PLANNED <b>8%</b>	ACTUAL <b>4%</b>
	<b>WASTE AND ENVIRONMENT</b> Strengthen the ability to identify, monitor, evaluate and report on environmental impacts of waste and its management, in order to inform better targeted and more effective responses	PLANNED <b>10%</b>	ACTUAL <b>5%</b>
	<b>WASTE AND SOCIETY</b> Deepen understanding of waste-related opportunities and threats, to increase the success of influencing perception and practice positively	PLANNED <b>11%</b>	ACTUAL <b>14%</b>



## REFLECTING ON 2022/23

### HUMAN CAPITAL DEVELOPMENT

**58** students supported through grant projects

**14** post-graduate students supported through scholarships

**41** post-graduate students mentored under the SARCHI Chairs

**18** post-graduate students mentored under the coursework degrees



### WEBSITE

**75 304** pages visited

Top downloaded publications

**10 477** number of visits

**8 310** unique visitors

**55 777** number of documents downloaded

- Waste Picker Integration Guidelines
- Food losses and waste technical report
- Li-ion battery presentation
- Li-ion battery technical report
- Reducing plastic pollution: Pathways report

### COMMUNICATIONS IMPACT

**54** print articles highlighting the Waste RDI Roadmap\*



**15** presentations made

**5** radio interviews

**2** television interviews

### TOP 5 COUNTRIES ACCESSING THE WASTE RDI ROADMAP WEBSITE



### RESEARCH, DEVELOPMENT AND INNOVATION

**67** FINAL DELIVERABLES PRODUCED

**R8.2m** committed funding for new and ongoing grant projects

**R3.9m** allocated to new grant projects



**107** researchers supported on grant projects

**33** research grant projects managed

**13** research grant projects funded (new and existing)

**15** successful recipient research institutions (new and existing)

**3** new grant projects awarded

\* While every effort is taken to identify print articles referencing the Waste RDI Roadmap, there may be articles that have not been picked up by the CSIR or DSI's media services.

*“Research and science have a fundamental role to play in the circular economy: providing fact based knowledge that can help dictate policy and business decisions, as well as propelling technological and know-how development” (CMCC, 2020)*



## Unlocking opportunities through Research, Development and Innovation

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

Supporting the development of new technology and adapting technology to South African conditions through RDI

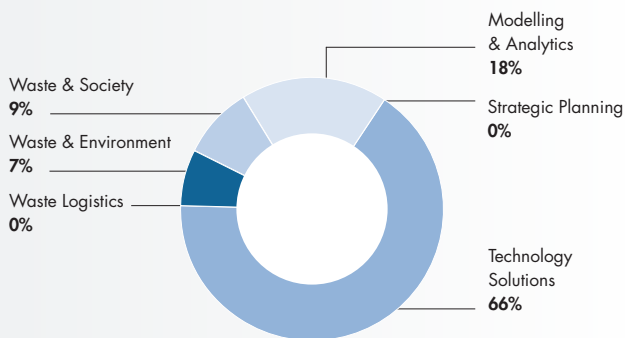
## PROJECT PORTFOLIO

The DSI’s investment in waste RDI, together with other local and international public and private sector partners, is aimed at supporting the generation of new, relevant, scientific evidence that will inform policy, planning and decision-making, and fast-track the development and uptake of new technological and social innovations in South Africa.

### CURRENT PROJECTS

The WRIU held 33 grant projects under its portfolio in 2022/23, consisting of 30 ongoing projects and 3 newly awarded projects that started at various times during the financial year. The largest funding allocation (66%) was under the Technology Solutions cluster. No new grant projects were funded under the Strategic Planning or Logistics clusters in 2022/23. The Roadmap held a solid portfolio of projects in the Modelling Cluster this year.

### ALLOCATION OF GRANT FUNDING TO THE SIX CLUSTERS FOR CURRENT GRANT PROJECTS (EXISTING AND NEW)



The WRIU continued to manage a portfolio of grant projects funded by other organisations (5 of the 33).

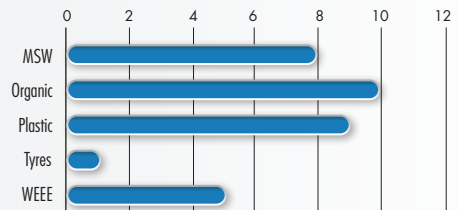
The profile of the current grant projects against the Waste RDI Roadmap clusters and priority waste streams is shown to the right.

Organic waste remains the dominant waste stream in terms of grant-funded research projects (10), followed by waste plastic, with the majority of grant projects (18) aligned with the Technology Solutions cluster of the Roadmap. A total of 15 universities and science councils received grant funding in 2022/23.

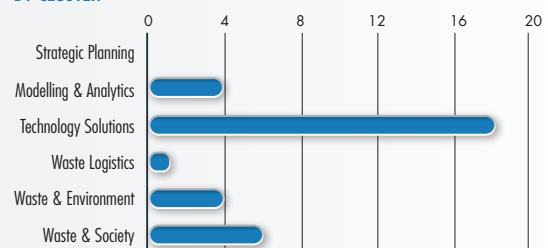
A brief outline of the 33 grant projects supported during 2022/23 is provided in the following pages.

### THEMATIC SPREAD OF CURRENT GRANT PROJECTS (EXISTING AND NEW)

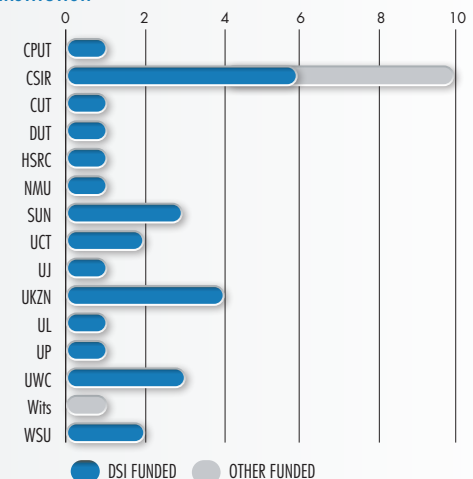
#### BY WASTE TYPE



#### BY CLUSTER



#### BY LEAD INSTITUTION



### PROJECTS ENDING

Eight grant projects were successfully completed in 2022/23. The final research deliverables have been made publicly available on the Roadmap website under the respective project pages:

- Municipal waste at household level: Demand estimation and service design (Prof. JW Joubert, UP)
- End-of-life options of biobased plastic materials and its biocomposites in landfill, compost and marine water conditions (Dr. S. Muniyasamy, CSIR)
- Booms, grids and nets: intercepting macroplastic debris in rivers (Prof. P. Ryan, UCT)
- Towards understanding the impacts of marine plastic debris on ecosystem services and the economy in South Africa (A. Nahman, CSIR)
- Modelling South Africa’s approach to near zero plastic leakage to our oceans (Prof. S. Oelofse, CSIR)
- Exploring disposable diaper usage and disposal practices in rural areas (Prof. C. Schenck, UWC)



# FOOD AND NON-FOOD BIOMASS



In 2022/23, there were 9 Roadmap-funded research projects aimed at supporting greater circularity for food and non-food biomass waste



## Medicinal and economic potentials of citrus waste

**Prof. A Oyedeji – Walter Sisulu University**

Non-recoverable grant: 2020/031

Project duration: 1/2021 – 3/2023 (extended)



## Production of high-value dissolving wood pulps from sawdust waste material

**Dr J Andrew – CSIR**

Non-recoverable grant: 2019/25

Project duration: 4/2020 – 3/2023 (extended)

## Curbing post-harvest losses using methane from anaerobic digestion of organic waste to drive the cold chain

**Dr E van Rensburg – Stellenbosch University**

Non-recoverable grant: 2019/27

Project duration: 1/2020 – 12/2023 (extended)

## Bioplastics from local agri-industrial residues

**Dr P Welz – Cape Peninsula University of Technology**

Non-recoverable grant: 2020/033

Project duration: 1/2021 – 12/2023 (extended)

## Evaluation of supermarket food waste as partial replacement of commercial feed in Mozambique tilapia

**Prof. G Okuthe – Walter Sisulu University**

Non-recoverable grant: 2020/036

Project duration: 1/2021 – 10/2023 (extended)

## Waste-to-energy practices on small-scale farms

**C du Plessis – University of Limpopo**

Non-recoverable grant: 2020/039

Project duration: 1/2021 – 6/2023 (extended)

## Converting sugarcane waste into mannosylerythritol lipids

**Prof. R Pott – Stellenbosch University**

Non-recoverable grant: 2021/050

Project duration: 1/2022 – 12/2023

## Engineering an antimicrobial yeast as industrial platform for non-sterile bioprocesses

**Prof. R den Haan – University of the Western Cape**

Non-recoverable grant: 2021/053

Project duration: 1/2022 – 12/2023



## Impact of food literacy on household food waste

**Dr A Naicker – Durban University of Technology**

Non-recoverable grant: 2020/040

Project duration: 1/2021 – 3/2024 (extended)

## PLASTICS AND TYRES



In 2022/23, there were 11 Roadmap-funded research projects aimed at supporting greater circularity for plastic and tyre waste



### Modelling South Africa's approach to near zero plastic leakage to our oceans

**Prof. S Oelofse – CSIR**

Non-recoverable grant: 2021/046  
Project duration: 4/2021 – 11/2022 (extended)

### Guidelines and Product Category Rules to enable and expedite the application of LCA under the EPR Regulations in South Africa

**Dr V Russo – CSIR**

Project duration: 8/2022 – 12/2023



### End-of-life options of biobased plastic materials and its biocomposites in landfill, compost and marine water conditions

**Dr S Muniyasamy – CSIR**

Non-recoverable grant: 2019/29  
Project duration: 1/2020 – 3/2023 (extended)

### Valorisation of non-recyclable mixed plastic waste by low temperature pyrolysis

**Dr K Moodley – University of KwaZulu-Natal**

Non-recoverable grant: 2020/034  
Project duration: 1/2021 – 12/2023 (extended)

### Compatibilization of polyethylene – waste tyre crumb rubber blends for usable TPEs

**Dr S Hlangothi – Nelson Mandela University**

Non-recoverable grant: 2020/035  
Project duration: 1/2021 – 12/2023 (extended)

### Beneficiation of used textiles in a circular economy

**Dr. V Chunilall – CSIR**

Non-recoverable grant: 2021/047  
Project duration: 8/2021 – 12/2024

### Research outputs for projects using plastic waste in road construction

**G Mturi – CSIR**

Non-recoverable grant: 2021/048  
Project duration: 6/2021 – 12/2023

### Studies on changes in chemical structure and emissions of volatile organic compounds

**Dr M John – CSIR**

Non-recoverable grant: 2021/049  
Project duration: 4/2022 – 12/2023



### Booms, grids and nets: intercepting macroplastic debris in rivers

**Prof P Ryan – University of Cape Town**

Non-recoverable grant: 2020/041  
Project duration: 1/2021 – 3/2023

### Optimisation of the Umgeni River/estuary litter-boom system for climate change resiliency and sustainability

**Prof. C Trois – University of KwaZulu-Natal**

Non-recoverable grant: 2020/042  
Project duration: 1/2021 – 3/2023 (extended)

### Towards understanding the impacts of marine plastic debris on ecosystem services and the economy in South Africa

**A Nahman – CSIR**

Non-recoverable grant: 2020/043  
Project duration: 1/2021 – 3/2023



# CIRCULAR CITIES



In 2022/23, there were 8 Roadmap-funded research projects aimed at supporting greater circularity for various waste streams generated in cities and towns, or at a cross-sectoral level



## A comprehensive waste management model for promoting effective decision-making and sustained climate change stabilisation

**Prof. C Trois – University of KwaZulu-Natal**

Non-recoverable grant: 2021/051  
Project duration: 1/2022 – 12/2023

## Waste Sector Human Capacity Development (HCD) Programme Track and Trace Impact Evaluation Study

**Dr S Motala – HSRC**

Non-recoverable grant: 2022/055  
Project duration: 8/2022 – 12/2023



## Municipal waste at household level: Demand estimation and service design

**Prof. J Joubert – University of Pretoria**

Non-recoverable grant: 2019/28  
Project duration: 1/2020 – 7/2022 (extended)



## Assessing the impacts of burning of waste on communities in the vicinity of landfills in the Free State

**Dr H Roberts – Central University of Technology**

Non-recoverable grant: 2020/036  
Project duration: 1/2021 – 3/2023



## Development of a South African Informal Waste Reclaimer Registration system (Phases 1 & 2)

**E Ramphine – CSIR**

Non-recoverable grant: 2021/044  
Project duration: 5/2021 – 7/2023 (extended)

## Piloting of a national Informal Reclaimer Registration System to inform reclaimer integration in South Africa

**Prof. M Samson – University of the Witwatersrand**

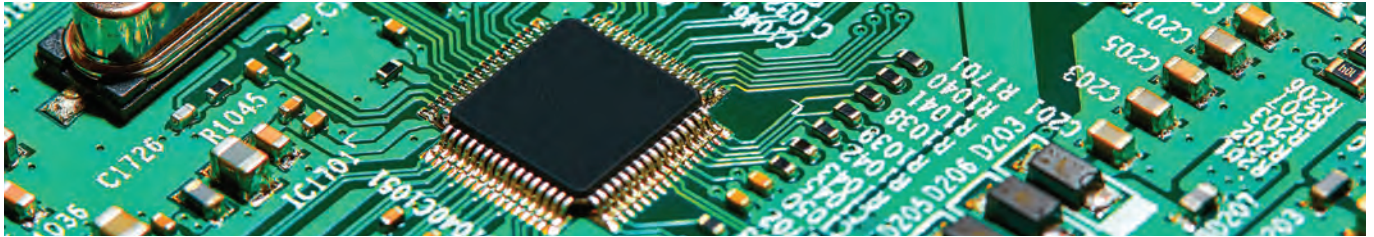
Non-recoverable grant: 2021/045  
Project duration: 5/2021 – 7/2022 (extended)

## Exploring disposable diaper usage and disposal practices in rural areas

**Prof. C Schenck – University of the Western Cape**

Non-recoverable grant: 2021/054  
Project duration: 1/2022 – 3/2023

## ELECTRONICS



In 2022/23, there were 5 Roadmap-funded research projects aimed at supporting greater circularity for electrical and electronic equipment



### Co-processing of PCB leach solutions with effluent streams from PCB manufacturing

**Prof. J Petersen – University of Cape Town**

Non-recoverable grant: 2019/26  
Project duration: 1/2020 – 12/2023 (extended)

### Urban mining of Nd, Dy and Sm from rare earth magnets

**Dr K Moodley – University of KwaZulu-Natal**

Non-recoverable grant: 2020/032  
Project duration: 1/2021 – 12/2023 (extended)

### Metal recovery from Li ion battery waste

**Prof. B Bladergroen – University of the Western Cape**

Non-recoverable grant: 2021/052  
Project duration: 1/2022 – 12/2023

### Thermal treatment of printed circuit board waste and its effect on downstream metal recovery processes

**Prof. C Dorfling – Stellenbosch University**

Non-recoverable grant: 2017/015  
Project duration: 1/2017 – 12/2022 (extended)



### Training of the informal sector and household participation in the e-waste sector

**Dr T Schoeman – University of Johannesburg**

Non-recoverable grant: 2020/038  
Project duration: 1/2021 – 12/2023 (extended)



*“The transition to the circular economy will depend on the skills available, as well as shape the skills that are needed in the labour market. Skilling for the circular economy requires both practical and academic education pathways, across all fields of knowledge”  
(Circle Economy, 2020)*



## Building national capability through human capital development

Providing a pipeline of qualified post-graduate students into the waste and secondary resources sector with the skills to drive alternative waste treatment and unlock opportunities

Increasing the supervisory capacity to mentor post-graduate students and post-doctoral researchers

## PORTFOLIO OF STUDENTS

The DSI recognises the importance of investing in skills to support South Africa's transition to a more circular and sustainable economy. A capable public and private waste sector creates a strong foundation from which to achieve the objectives of national waste policy, including the National Waste Management Strategy (NWMS), and transform the South African waste economy. Strengthening skills in waste management is, therefore, a cornerstone of the Waste RDI Roadmap.

The Roadmap has adopted the following funding instruments to support skills development in South Africa:

- Direct scholarships for post-graduate students
- Partial or full funding under Waste Roadmap grant projects
- Partial or full funding under SARChI Research Chairs
- Internships

Students have two routes to consider when furthering their studies in the field of waste management in South Africa, namely, a Master's degree by coursework or a Master's or PhD by research.

### POST-GRADUATE DEGREE BY COURSEWORK

Both North-West University (NWU) and the University of KwaZulu-Natal (UKZN) successfully offered their coursework Master's degrees specialising in waste and resources management in 2022.

- Master's in Environmental Management: Specialising in Waste Management (NWU) (M.Env.Man.)
- Master of Science in Engineering: Waste and Resources Management (UKZN) (MSc. Eng.)

### Post-graduate scholarships

The Waste RDI Roadmap provided targeted scholarships to students undertaking one of the dedicated coursework Master's degrees in South Africa. The Roadmap provided funding for 14 scholarships in the 2022 academic year. Of the 14 scholarships awarded, 50% were to young female students.

### POST-GRADUATE DEGREE BY RESEARCH

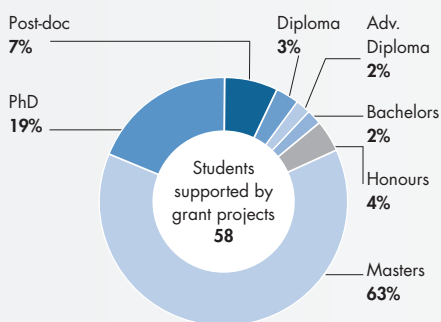
Students are able to undertake waste-related Honours, Master's or Doctoral degrees by research at most universities in South Africa. There are also opportunities available for post-doctoral training.

### Grant-funded post-graduate students

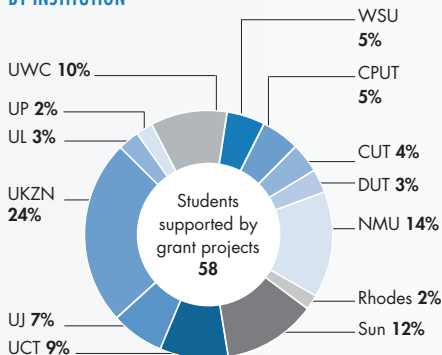
The 33 Waste RDI Roadmap grant projects funded during the 2022/23 financial year supported 58 undergraduate and post-graduate students (partially or fully). The grant projects remain an important mechanism for building capacity at the post-graduate level in South Africa. While the Waste RDI Roadmap scholarship

## GRANT FUNDED STUDENTS

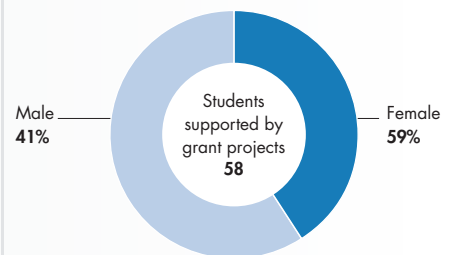
### BY DEGREE



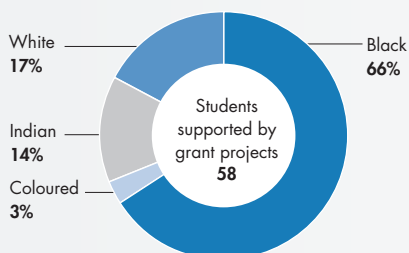
### BY INSTITUTION



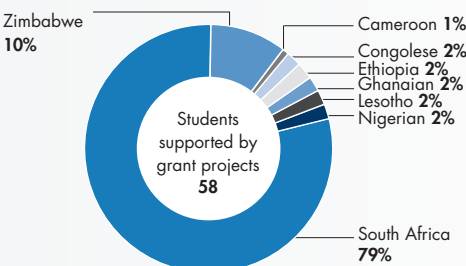
### BY GENDER



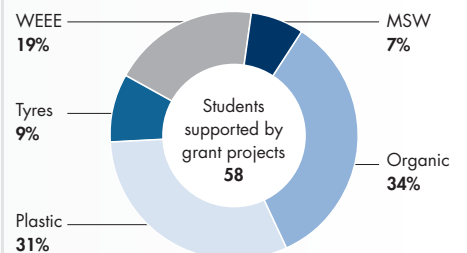
### BY RACE



### BY NATIONALITY



### BY PRIORITY WASTE STREAM





funding is only open to South African citizens and South African permanent residents, the grant projects are able to fund any student studying at an accredited, public higher education institution in South Africa. In this way, the Waste RDI Roadmap is able to support the strengthening of waste skills, not only of South Africans, but of students from across Africa and beyond. In addition to the 46 South African students (79%) supported on grant projects, an additional 12 students from other African countries were financially supported under the Waste RDI Roadmap. Grant-funded students were hosted across 13 academic institutions.

Previous years have seen a large percentage of post-graduate students working on organic waste related research projects. The focus started to shift in 2019/20, with the majority of grant-funded students working on municipal solid waste (MSW) and WEEE, the

direct result of the targeted grant calls that were published in 2016 (on WEEE) and 2018 (on MSW). Student research in waste plastic has grown significantly from ~3% in 2017/18 to 31% in 2022/23 as the interest in and awareness of the environmental impacts of waste plastic has grown.

### INTERNSHIPS

The Waste RDI Roadmap provided funding support for eight (8) interns, through the recently established Human Sciences Research Council (HSRC) and WRIU partnership. The internship programme is aimed at supporting the placement of specialist waste-sector graduates with industry and business. Through this programme, graduates are offered an opportunity to acquire practical workplace experience and transfer their specialist waste knowledge to host institutions.



*Some of the students supported partially or fully by the Waste RDI Roadmap, who graduated in 2022-23*

## PORTFOLIO OF RESEARCHERS

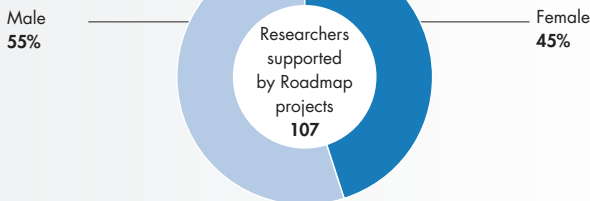
Developing, strengthening and embedding South Africa’s waste research, development and innovation capability and capacity within and between research institutions, industry and government, will enable the sector to make more effective decisions, insert context-appropriate technologies and create opportunities for the export of know-how and technology into the African continent and beyond.

The 33 Waste RDI grant projects funded in 2022/23 provided funding support to 107 researchers and collaborators (non-unique), and collaboration opportunities (non-funded) to 78 researchers. A total of 185 researchers, the highest number of researchers active on grant projects since the implementation of the Waste RDI Roadmap.

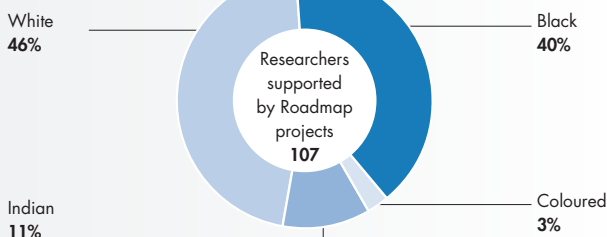
Researchers supported on grant projects stem predominantly from South Africa (79%), but there are also some from other African countries, the Americas, Asia and Europe. This is positive for the South African waste sector, as not only is the Roadmap helping to build international capability and networks, but it is also ensuring that new ideas are introduced into the South African research community.

### GRANT FUNDED RESEARCHERS

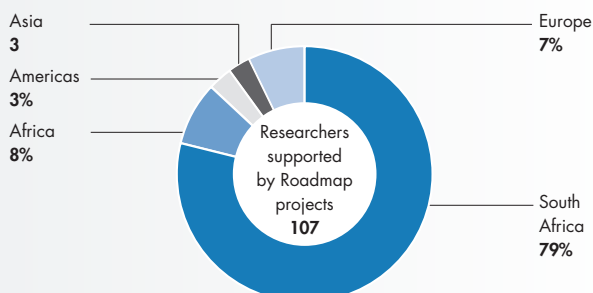
#### BY GENDER



#### BY RACE



#### BY NATIONALITY

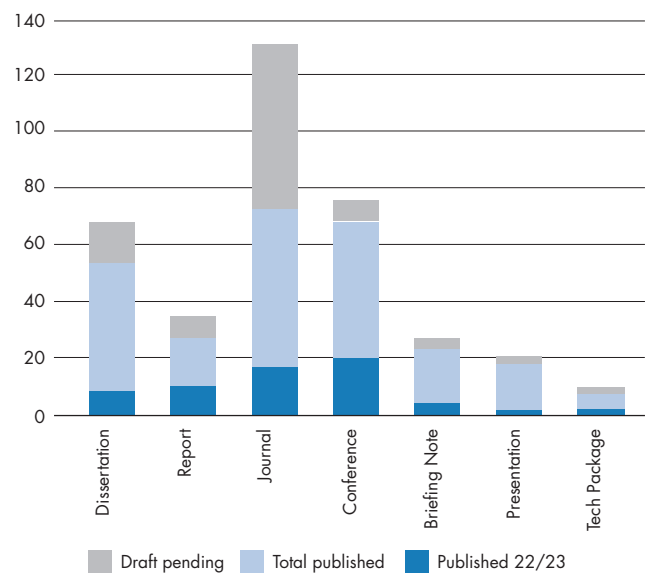


## RESEARCH OUTPUTS

The portfolio of grant projects produced 67 final deliverables during 2022/23. This includes post-graduate dissertations, journal papers, technical reports, conference papers and presentations, and briefing notes.

- 9 Dissertations
- 11 Technical reports
- 17 Journal papers
- 20 Conference papers and presentations
- 5 Briefing notes
- 2 Summary presentations
- 3 Technology packages

The current status of published RDI Roadmap project deliverables and draft deliverables is shown in the figure below.



All grant project deliverables can be accessed on the Waste RDI Roadmap website, under each of the respective grant project pages.

Select Roadmap funded deliverables published during 2022/23 include:

Balkissoon, S., Andrew, J. and Sithole, B. (2022). Dissolving wood pulp production: A review. *Biomass Convers. Biorefin.*

Schenck, C., Grobler, L., Blaauw, D. and Nell, CM. (2022). Reasons for littering: Social constructions from lower income communities in South Africa. *SAJS* 118: 1-9.

Ranjan, A., Welz, PJ. And Mithethwa, T. (2023). Investigation of an effective acid pre-treatment method for the valorisation of Canola fines. *Biomass Convers. Biorefin.*

Tawonezvi, T., Nomnqa, M., Petrik, L. and Bladergroen, B. (2023). Recovery and Recycling of Valuable Metals from Spent Lithium-Ion Batteries: A Comprehensive Review and Analysis. *Energies*, 16(3): 1-33.



# SARChI RESEARCH CHAIRS

The Roadmap co-funded SARChI Chairs in Waste and Climate Change, and Waste and Society, continue to make good progress in achieving their objectives. Research Advisory Committee meetings were held with each Chair in November 2022 and provided an opportunity for the Chairs to present their progress for 2022 and plans for 2023.



## PROF C TROIS

Waste and Climate Change  
Tier I SARChI Research Chair  
University of KwaZulu-Natal

<https://sarchiwasteandclimate.ukzn.ac.za/>

The objective of the Waste and Climate Change Research Chair is to develop and implement a research programme that delivers evidence to support the improved understanding of the:

- Climate impacts associated with the generation and disposal of waste in South Africa
- Measures (including technologies) to mitigate these impacts
- Impact of climate change on the waste sector

The Waste & Climate Change SARChI Chair was successfully renewed by the NRF until 2028. In addition, the Waste Community of Practice (COP) including Prof Petersen, Prof Schenck, Prof Starke and Prof Mostert was approved until 2024.

The Chair has signed or renewed a number of exciting MoUs and collaboration agreements during the year. These include:

- MoA with the International Institute for Applied System Analysis (IIASA) (Austria) as co-investigator on the Waste RDI Roadmap grant project to develop a stabilisation climate change strategy for the waste sector
- Partnership with the South African National Space Agency (SANSA), Placemarks (Italy) and the USA-EPA for the use of remote sensing to quantify GHG emissions from landfills in South Africa.

### Recent publications by the Chair include:

- Dell’Orto A. and Trois C. (2022). Considerations on bio-hydrogen production from organic waste in South African municipalities: A review. *SAJS*, 118.
- Moodley, P. and Trois, C. (2022). Current status of biofuel production systems. In: P, Moodley, RC. Ray, EB. Gueguim Kana (Eds), *Advances in Lignocellulosic Biofuel Production Systems*. 1st Edition, Elsevier, Netherlands
- Srivastava, S. and Trois, C. (2022) Characterisation of waste FOG for sustainable treatment options with emphasis on gross heat value. 6th Symposium on Circular Economy and Urban Mining. Capri, Italy. 18-20 May 2022.



## PROF C SCHENCK

Waste and Society  
Tier I SARChI Research Chair  
University of the Western Cape

<http://wasteandsociety.co.za/>

The objective of the Waste and Society Research Chair is to develop and implement a research programme that delivers evidence to support the improved understanding of the:

- Opportunities to create jobs and improve livelihoods through the transition away from landfilling
- Business models to support a secondary resources economy, with a focus on SMMEs
- Required behaviour change to drive the transition away from landfilling, including appropriate behaviour change interventions, such as awareness and communication strategies for South Africa as a developing country

The Waste & Society SARChI Chair was successfully renewed by the NRF until 2028. The Chair is also a member of the recently renewed Waste Community of Practice (COP).

The SARChI Chair Holder and a number of students, undertook successful international visits to collaborating institutions during the year. These included Frankfurt University of Applied Sciences; EMF workshop, Rwanda; Tata Institute of Social Sciences, India; SA-Norway exchange programme.

A highlight of the past year, was the involvement of the team in the India project. Prof Schenck facilitated a participatory research workshop with Prof Kumar, from the Tata Institute of Social Sciences, Mumbai, in participation with the Frankfurt University of Applied Sciences and the Jagori Charitable Trust. The 5-day workshop

included transect walks and mapping the illegal dumping of waste with the communities, interviews and workshops. This research complements the research of the SARChI Chair on understanding illegal waste dumping behaviour in South Africa.

### Recent publications by the Chair include:

- Schenck, C., Nell, C. and Blaauw, D. (2022). Waste management in rural South Africa – Perspectives from Manfred Max-Neef’s Human Scale Development framework. *USD.*, 25(1/2): 30-52.
- Chitaka, TY., Moyo, T., Gihring, K. and Schenck, C. (2022). The myth of livelihoods through urban mining: the case of e-waste pickers in Cape Town. *SAJS*, 118.
- Schenck, C., Grobler, L., Blaauw, D., Nell, CM. (2022). Reasons for littering: Social constructions from lower income communities in South Africa. *SAJS*, 118.

## FUNDING INSTRUMENTS

### RDI GRANTS

Over the past eight financial years, the WRIU has issued three open grant calls (2015, 2019, 2021) and three targeted grant calls (WEEE, 2016; MSW, 2018; marine plastic pollution, 2020). The WRIU also published an open micro-grant call in 2020, targeting historically disadvantaged institutions, universities of technology, and universities that had not previously been awarded grant projects under the Waste RDI Roadmap in previous years. The intention was to expand national research capability in the waste sector.

No grant call was issued in 2017 and 2022 due to a lack of funding for the Waste RDI Roadmap.

### AWARDED GRANTS

Given the limited funding available in 2022, applicants with high scoring proposals from the 2021 grant call were approached. Following this approach, three new grant projects were awarded, with a total funding allocation of R3.9 million. The projects, of varying duration, commenced in August 2022.

The three new grant projects each address multiple waste streams, with a focus on waste & society; modelling and technology development.



*People are sorting waste at a landfill*



## PARTNERSHIPS



*“Waste research, development and innovation cannot, on its own, transform the waste sector. The Roadmap is one mechanism being implemented by government, through the Department of Science and Innovation, to move waste away from landfilling. To ensure success, the Roadmap must be adopted as part of a suite of public and private sector responses aimed at addressing the challenges currently facing the waste sector.”*

Building local, regional and international partnerships with government, academia and business is important to achieving the long-term objectives of the Waste RDI Roadmap. The following section highlights just some of the engagements with key stakeholders during the 2022/23 financial year.

### SOUTH AFRICA

#### Government

Collaboration with national government departments remains an important element of ensuring the Waste RDI Roadmap research outputs support decision-making, policy development and implementation. As the line department responsible for waste, the Department of Forestry, Fisheries and the Environment (DFFE) is an important partner in this regard. The WRIU has had active engagement with DFFE over the past year through various waste and circular economy-related meetings and workshops, including requests to provide specialist review/input on DFFE-funded waste projects.

The WRIU also engaged with the Department of Trade Industry and competition and its entities during 2022/23 regarding the opportunities to transition to a more circular South African economy.

The WRIU is a member of the National Treasury Solid Waste Management Technical Advisory Group (TAG). The TAG provided oversight to a number of waste-related projects on waste plastic, and on the informal waste sector in 2022.

The WRIU had various engagements with provincial government departments this year, discussing matters related to both waste and the circular economy, particularly regarding unlocking much-needed local development and job opportunities.

#### Business

As an intended recipient of much of the research directed and funded under the Waste RDI Roadmap, business has been instrumental to the activities of the WRIU in 2022/23. The CSIR worked closely with a number of Producer Responsibility Organisations (PROs) this past year, to support the integration of informal waste pickers within the South African waste economy. Researchers from universities and science councils have also, in many instances, worked closely with private sector partners this year to ensure relevance and uptake of the research.

Meetings were held between the WRIU and a number of businesses, sector associations, professional services companies, and financiers this past year to discuss waste-stream-specific solutions, for example, for waste plastic, packaging, tyres, e-waste, etc.

#### Academia

Universities and science councils are core to the Waste RDI Roadmap, undertaking much of the RDI necessary to evidence national decision-making and inform policy development and implementation. The response of academia to the Waste RDI Roadmap calls remains very positive and of a high standard. The WRIU currently has a network of over 150 researchers working in solid waste management and associated fields across South African public research institutions.

## INTERNATIONAL

International and regional partnerships are important to ensure that waste issues facing South Africa and Africa are appropriately represented on the international stage, and to bring international thinking and experience into the African context. In addition to direct research collaboration between South African researchers and their international counterparts, the WRIU continues to develop and strengthen international relationships in support of the Roadmap. Some of the engagements during 2022/23 included:

### European Union

The WRIU partnered with various EU institutions during this financial year. These included, amongst others, a joint webinar with the EU Delegation to South Africa, the CSIR and the Black Business Council on “*Inclusive Circular Economy Business Models*”, held virtually on the 1 June 2022. The webinar, which was well attended with over 70 delegates joining, provided an opportunity to highlight new types of business models envisaged within the circular economy.

### OECD

The CSIR partnered with the OECD to hold a very successful hybrid workshop on the 21-22 November 2022, entitled “*Ensuring economic, social and environmental gains of a Circular Economy transition*”. The two-day workshop provided an opportunity to share recently released OECD reports (Global Plastics Output, Global Material Resources Outlook), the findings of the recently completed DSI-funded, Pathways study, and to launch the #SolvePlasticsAfrica STI Hub and the final Pathways report.

### The PEW Charitable Trusts, USA

The CSIR worked closely with the Pew Charitable Trusts and Oxford University this year, to apply the Pathways model to the South African context. This follows the successful completion of the global ‘*Breaking the Plastic Wave*’ study in 2020. The final report was released in November 2022, and we look forward to the results informing South Africa’s response to dealing with waste plastic pollution in the aquatic and terrestrial environments.

### Royal Academy of Engineering, UK

Prof. Godfrey, from the WRIU, serves as a member of the Technical Advisory Group (TAG) of the Royal Academy of Engineering’s *Safer End of Engineered Life* (SEEL) programme. The programme has provided substantial support to further the global knowledge base on the opening burning of waste, including, the extent of open burning in Africa. This has particular relevance to South Africa, given the findings of the recent Pew/Oxford/CSIR Pathways study, which showed that the opening burning of plastic waste is a significant source of plastic pollution in the country.

### United Nations (UN) Agencies (UNIDO, UNEP, ILO)

The WRIU participated in a number of engagements with UN Agencies during 2022, on various topics relating to waste or the circular economy. This engagement is important for ensuring that current global thinking and policy development is integrated back into local activities.

- Member of the UNEP International Environmental Technology Centre (IETC) Advisory Board
- Stockholm +50 Leadership Dialogue
- Open-ended Working Group Multi-stakeholder Dialogue
- UNEP IETC 30th Anniversary virtual webinar on “*Gender and Waste*”, in which the WRIU had the opportunity to showcase the work of the Waste RDI Roadmap in supporting transformation through investment in female students
- Key resource for the UN ILO training programme on “*Promoting green jobs in a circular economy*”

### International Solid Waste Association (ISWA)

Prof. Godfrey of the WRIU was appointed by ISWA Women-of-Waste, to undertake the statistical analysis of the 2nd Global Survey 2022. The final report was launched on International Women’s Day on the 8 March 2023 in a joint webinar with USAID.

### Academia

*Southern Cross University, Australia*

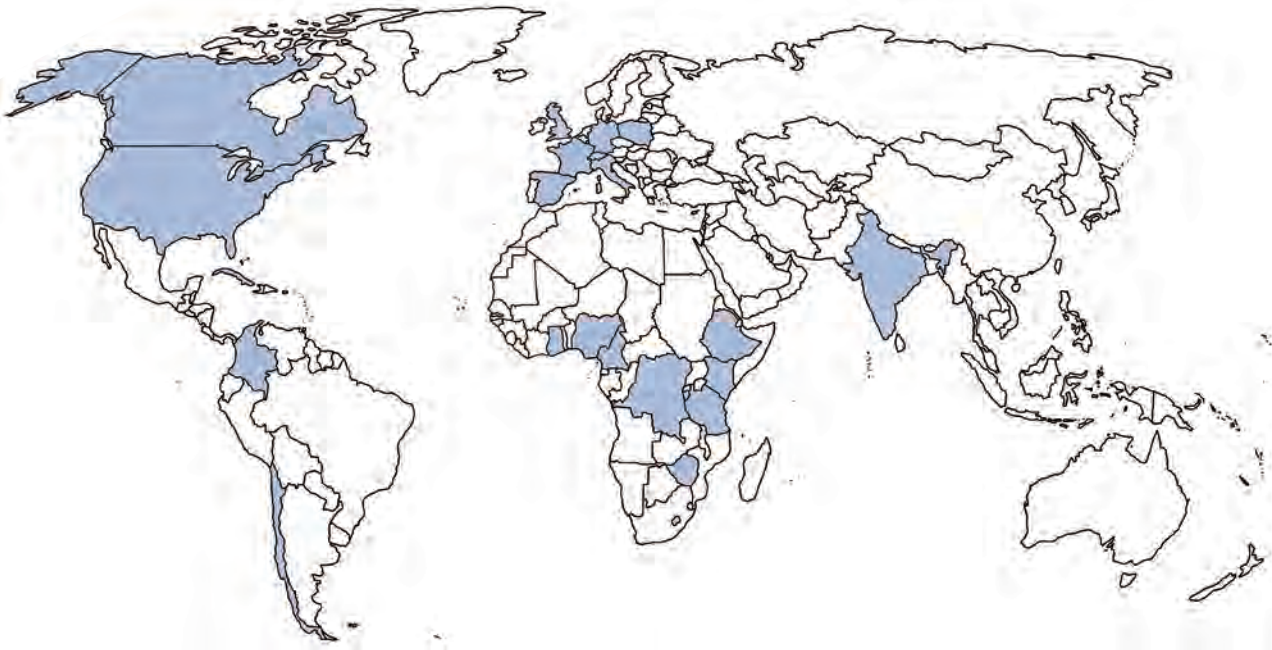
The WRIU and CSIR hosted a delegation from Southern Cross University’s ReCirculator Programme in early 2022. The ReCirculator program is a Federal Government-funded initiative which supports information exchange, research, and technology implementation to accelerate the adoption of circular economy principles in the Northern Rivers Region of New South Wales, Australia. The visit provided an opportunity to share information between the various institutions on the support to the private sector in transitioning to a more circular economy.

*PISCES, UK*

The WRIU is represented on the PISCES Advisory Board. The PISCES project is a UK-funded project, hosted by Brunel University, London, aimed at addressing plastic waste pollution (initially) in south-east Asia. There are interesting insights under this project that have relevance to other countries, including South Africa and the broader African continent.

The WRIU would also like to acknowledge the many local, regional and international organisations with which it has had the privilege of engaging this past year, and which are not mentioned here by name. These engagements have been invaluable in strengthening our shared understanding of the waste sector and the opportunities within a more circular economy.





South Africa-international waste RDI partnerships (researchers and students) active in 2022/23

## SCIENCE COMMUNICATION

### PLATFORMS FOR LEARNING AND KNOWLEDGE EXCHANGE

South Africa has developed considerable expertise in waste and resources management in the context of a developing country and a circular economy, which is of growing interest to the local, regional and international waste community. Science communication by the WRIU and its partners provides an opportunity to:

- Showcase South Africa’s waste RDI locally and internationally
- Build local and international capacity based on South African learning
- Strengthen local and international partnerships

Creating and participating in platforms for knowledge exchange and learning is important to achieving the objectives of the Roadmap, in particular, strengthening human capital.

#### WRIU engagements

The WRIU had the opportunity to share the South African perspective on waste management at a number of events in 2022/23. Some of the highlights include:

- “Transforming the formal waste management sector in South Africa: The role of Science, Technology and Innovation?”, IETC@30 Webinar on Gender and Waste, 7 September 2022
- “Addressing the (plastic) waste problem in Africa”, 2nd African Marine Waste Network Conference, Port Elizabeth, 23 May 2022

- “The challenges facing the South African waste sector”, International Entrepreneurship Summer/winter School at University of Pretoria, 5 July 2022
- “Opportunities in the Circular Economy and status of South African readiness”, 5th Biennial Industrial Efficiency Conference, Pretoria, 26 May 2022
- “What does a Circular Economy look like for South Africa?”, World Circular Economy Forum, Cape Town, 6 December 2022
- “The Circular Economy – Opportunities for innovation, the need for collaboration”, Innovate UK KTN Business Mixer, 8 March 2023
- “Science, technology and innovation for a circular economy (STI4CE) – status and way forward for South Africa”, Bilateral Circular Economy Cooperation South Africa – Finland, 24 March 2023

The WRIU also continues to play a mentorship role to local and international post-graduate students in shaping their research projects. This includes identifying potential research topics of local, regional or international importance to ensure impact through research.

### MEDIA ENGAGEMENT

A summary of the media engagement over the past year is provided in the section “Reflecting on 2022/23”. Engagement with the media is an important element of supporting knowledge transfer to key stakeholders, including the public.

## OPERATIONS AND FINANCE

### WASTE RDI ROADMAP FINANCIAL STATEMENT

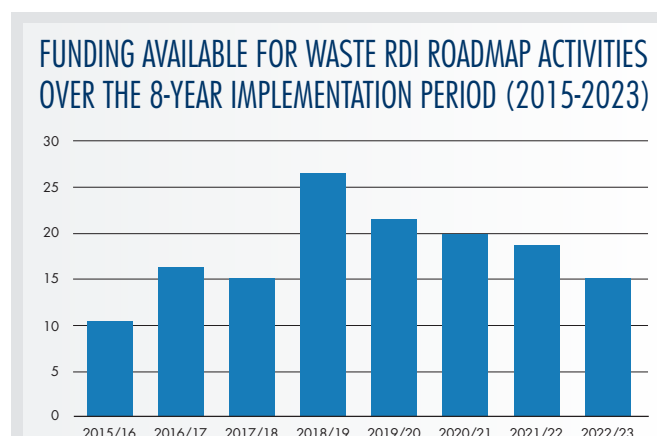
The 2022/23 financial years, marks the fifth consecutive year of declining revenue for the Waste RDI Roadmap. This unfortunately resulted in no new grant call in 2022/23. Approximately R11m less funding was available in 2022/23 compared to 2018/19. However, the WRIU was able to maintain the funding support to

grant projects and scholarships through savings in other areas, and with co-funding from the CSIR and other funding organisations.

The funding is still significantly below that outlined in the Waste RDI Roadmap. This has a direct bearing on the extent and magnitude of the activities of the Roadmap.

REVENUE	2022/23	2021/22
DSI seed funding	13 913 043.47	14 782 608.71
Other revenue	1 146 914.33	3 929 306.62
<b>Total Revenue</b>	<b>15 059 957.80</b>	<b>18 711 915.32</b>
<b>EXPENSES</b>		
Communications	44 319.01	35 950.00
CSIR Project Management Unit	2 956 833.35	3 090 935.76
Non-recoverable innovation grants	0.00	0.00
Non-recoverable R&D grants	8 208 761.24	13 090 830.40
Targeted RDI projects	0.00	0.00
Post-graduate scholarships	318 900.00	350 000.00
SARChI Research Chairs	0.00	1 705 200.00
Travelling	24 593.35	3 739.16
Workshops and general running	0.00	0.00
<b>Total Expenses</b>	<b>11 553 406.95</b>	<b>18 276 655.32</b>
<b>Income for continuing operations <sup>(1)</sup></b>	<b>3 506 550.85</b>	<b>435 260.00</b>
<b>Net Income</b>	<b>0.00</b>	<b>0.00</b>

All financial figures are exclusive of VAT.



#### Notes to financial statement:

- (1) Income for continuing operations is committed funding for grant projects awarded during 2018-2022, for which disbursements will be made in the 2023/24 financial year. This includes CSIR co-investment into the Waste RDI Roadmap.
- (2) The NRF took over full funding for the two waste SARChI Chairs in 2022/23, creating an opportunity for this funding to be invested into other activities of the Waste RDI Roadmap.



# MONITORING AND EVALUATION

## STRUCTURES

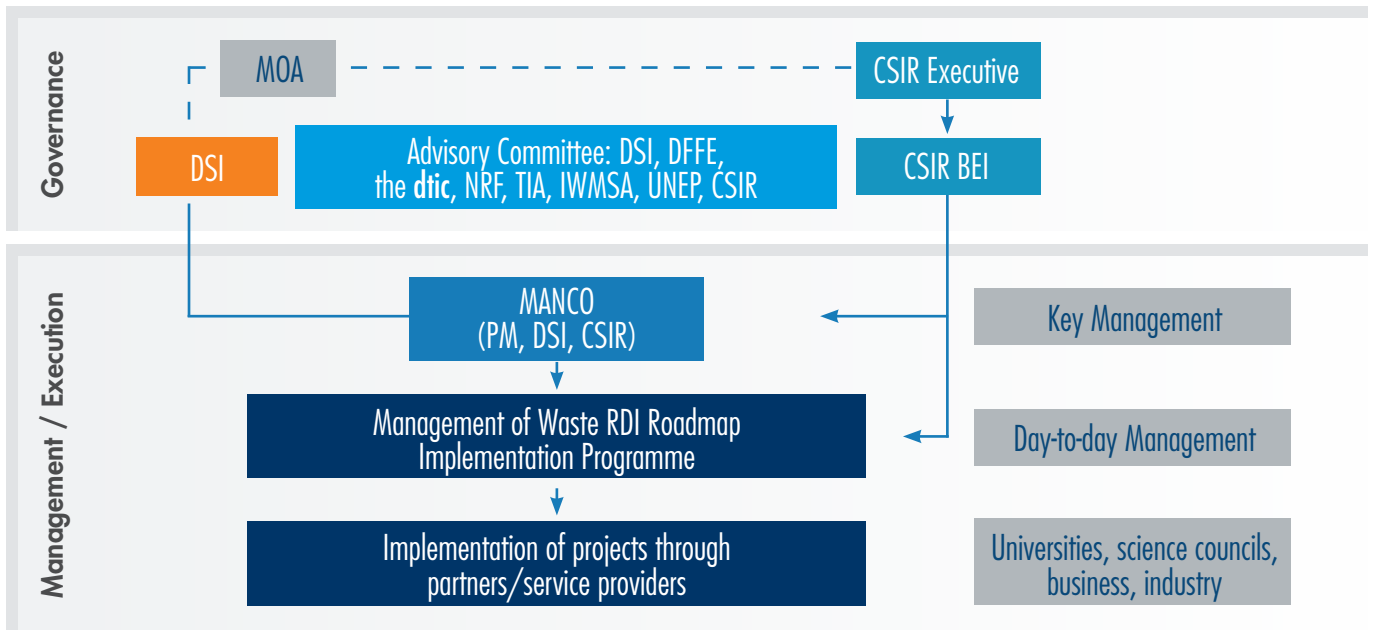
The Waste RDI Roadmap is implemented by the CSIR’s WRIU in partnership with the DSI, DSI entities, other government departments, universities and science councils, business and industry. Effective governance and oversight of activities within the WRIU is important to the Roadmap’s successful implementation. The Waste RDI Roadmap governance structure is as follows:

- An **Operations Committee**, made up of the DSI Director: Environmental Services and Technologies and the WRIU Manager
- A **Management Committee**, made up of senior representatives of the DSI and CSIR-hosted National Programmes
- An advisory **Steering Committee**, made up of representatives of government, government entities and the waste sector

## REPORTING

The Waste RDI Roadmap portfolio of funding is monitored through regular reporting. All grant holders are contractually required to submit quarterly progress reports to the WRIU. These reports cover technical, operational and financial progress for the quarter. Twice a year, grant holders are required to submit proof of registration for all post-graduate students supported on grant projects. All information is consolidated by the WRIU and reported quarterly to the DSI on the overall implementation of the Waste RDI Roadmap. In addition to the quarterly reporting, annual progress meetings are also held with all grant holders.

The Waste RDI Roadmap governance structure is as follows:



## WASTE RDI ROADMAP IMPLEMENTATION UNIT

### PRETORIA

#### Council for Scientific and Industrial Research (CSIR)

Hosted National Programmes

Meiring Naudé Road, Brummeria,  
Pretoria, South Africa

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[www.wasteroadmap.co.za](http://www.wasteroadmap.co.za)

[www.circulareconomy.co.za](http://www.circulareconomy.co.za)

#### Department of Science and Innovation

Directorate: Environmental Services  
and Technologies

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Pretoria, South Africa

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Science and Innovation  
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