



CONTENTS

Message from the Department of Science and Innovation
Message from the CISA Manager, Prof Linda Godfrey
Background and Objectives
Pictorial Summary of the Waste RDI Roadmap 5
Reflecting on Nine Years of Implementation (2015-2024)
Reflecting on 2023/248
UNLOCKING OPPORTUNITIES THROUGH
RESEARCH, DEVELOPMENT AND INNOVATION9
Project Portfolio
Funding Instruments
Circular Agriculture
Circular Cities
Circular Manufacturing
Cross-Cutting Circular STI
BUILDING NATIONAL CAPABILITY THROUGH HUMAN CAPITAL DEVELOPMENT
Portfolio of Students
Portfolio of Researchers
Research Outputs
SARChI Research Chairs
PARTNERSHIPS
South Africa
International
Science Communication
WASTE RDI ROADMAP FINANCIAL STATEMENT 23
MONITORING AND EVALUATION24

October 2024

[©] All rights reserved.

Compiled and written by: Linda Godfrey
Copy editing: CSIR Communications
Proofreading: DSI and CSIR Communications
Photographs: Dr Linda Godfrey and Shutterstock.com

Design: www.creativevision.co.za



MESSAGE FROM THE DEPARTMENT OF SCIENCE AND INNOVATION



Dr Henry Roman



Ms Alinah Mthembu



Ms Vivienne Gondwe

The DSI Team:

Dr Henry Roman

Director: Environmental

Services and

Technologies

Ms Alinah MthembuDeputy Director:
Green Economy

Ms Vivienne GondweActing Deputy Director:
Green Economy

The Waste Research Development and Innovation (RDI) Roadmap's main objective is to develop, strengthen and embed South Africa's waste RDI capability and capacity within and between research institutions, academic institutions, industry and government, which would enable the sector to make more effective decisions, put in place contextappropriate technologies and create opportunities for the export of strategic expertise and technology into the country, and beyond. This objective is strongly anchored on the 3 strategic pillars that frame the mandate of the DSI, which is human capital development, research and development, and innovation. The Waste RDI roadmap has provided a structured national approach to waste RDI over the last 9 years, as a means of supporting the implementation of national policy, strategy and planning on waste and secondary resources management in South Africa. The outcomes of the Waste RDI Roadmap have and will continue to provide a solid contribution to the National System of Innovation, as well as the National Development Plan.

This year marks the 9th year of the successful implementation of the Waste RDI Roadmap. This annual report provides an opportunity to reflect and share on the progress made in the implementation on the Waste RDI Roadmap in the 2023/24 financial year. There have been significant highlights in the implementation of the roadmap ranging from building national capability through research grants, and ongoing support for the coursework degrees, postgraduate student development, and the two SARChI Chairs. Driven by the potential to create local and regional benefit, the Waste RDI Roadmap has over the past 9 years presented a sound case for increased public and private investment in Waste RDI.

The Science, Technology and Innovation (STI) Decadal Plan has identified the Circular Economy as one of the new sources of growth. Circular approaches offer numerous opportunities for socio-economic growth and environmental protection. Scientific evidence indicates that the circular economy can contribute to GDP, provide a new source of employment, increase profit margins at firm level, and maximise resource utilisation efficiency. For a developing country like South Africa, the circular economy can reduce reliance on increasingly scarce resources, increase

disposable income for individuals, enhance utility and convenience, and improve living conditions and health. Therefore, intensifying the circularity of the economy provides a new model for sustained and resilient economic growth and job creation.

The Department of Science and Innovation (DSI) is at an advanced stage of developing the new Science Technology and Innovation for Circular Economy (STI4CE) Strategy, which largely builds on the outcomes of the Waste RDI Roadmap. Key to creating an enabling environment for the implementation of the STI4CE Strategy, Circular Innovation South Africa (CISA) was launched in the 2023/24 financial year. This was complemented by the launch of the Circular Economy Demonstration Fund, which aims to support the adoption of proven circular technologies, or innovative process improvements, that have yet to be widely deployed in South Africa. The Demonstration Fund will assist in fast-tracking the uptake of these circular interventions by the private sector and contribute to South Africa's transition to a more circular economy. A total of eight new demonstration fund projects were awarded in 2023.

As the Waste RDI Roadmap ushers into the 10th and final year of implementation, the work done through CISA will continue to support South Africa's transition to a more circular, low carbon economy through the application of science, technology and innovation. Furthermore, it will make significant contribution towards achieving the sustainable development goals and the country's national and international climate commitments.

Dr Mmboneni Muofhe

Deputy Director-General: Socio-Economic Partnerships

MESSAGE FROM THE CISA MANAGER, PROF. LINDA GODFREY

This annual report for the 2023/24 financial year, marks the ninth report on progress against the South African government's Waste Research Development and Innovation (RDI) Roadmap. It is also the final year of reporting on the Waste Roadmap as a standalone initiative. From April 2024, the activities of the Waste Roadmap will be incorporated into government's new Circular Economy Science, Technology and Innovation (STI) Strategy, which is currently at an advanced stage of development. The CE STI Strategy is a new strategy being developed by the Department of Science and Innovation (DSI) to give effect to government's circular economy STI aspirations as laid out in the STI White Paper (2019) and the STI Decadal Plan (2022-2032).

In preparation for the implementation of the CE STI Strategy in 2024, the Waste RDI Roadmap Implementation Unit (WRIU), the portfolio management unit hosted by the CSIR, and tasked by the DSI to implement the Waste RDI Roadmap, rebranded in 2023 as Circular Innovation South Africa (CISA). CISA was launched in May 2023 at a high-profile event attended by key collaborators and stakeholders.

The past year marked another successful year in the implementation of the Waste RDI Roadmap. The portfolio of 38 research grant projects which were managed this year, 20 of which received direct funding, supported 35 undergraduate and postgraduate students and 108 (non-unique) researchers. These grant projects produced 58 final deliverables, including dissertations, technical reports, journal publications, and conference papers and presentations.

As in previous years, funding support was also provided to students undertaking one of the dedicated post-graduate waste management degrees offered by the University of KwaZulu-Natal and North-West University. This support was provided through scholarship funding paid to the universities. A total of seven post-graduate students received scholarships in 2023/24. The waste coursework degrees offered by UKZN and NWU mentored a further 25 post-graduate students in 2023/24.

The two NRF SARChI Chairs in Waste & Society and Waste & Climate Change, further strengthened their research activities this year, including significant collaboration with local and international partners. The two chairs mentored an additional 35 post-

graduate students through their research activities in 2023/24. Prof Trois, the SARChI Chair in Waste & Climate Change, vacated the Chair in October 2023 to take up the position as Director of the Centre for Renewable and Sustainable Energy Studies at Stellenbosch University. We wish her all the best in this new role.

Between the grant projects, scholarships, coursework degrees, and SARChI Chairs, it is incredibly exciting to see the capability being built in young students. It is our wish that these students remain within the waste or environmental fields to support the improved management of waste in South Africa. We encourage the public and private waste sectors to engage with our universities to facilitate a career pipeline for students into employment.

A new funding instrument was launched by the DSI and CISA in 2023/24. In addition to the research grants which have been the main funding instrument for research over the past nine years, a new circular economy demonstration fund grant was launched. The aim of the demonstration fund is to bring academia and the private sector closer together. To utilise our national system of innovation, its capability and infrastructure to support the private sector in demonstrating, de-risking and scaling circular interventions in South Africa. Of the 14 new grant projects awarded in 2023/24, eight were demonstration fund grants.

As we look back on the past nine years, it's incredible to think that a total of 71 grant projects have been supported at 17 institutions (3 science councils and 14 universities). The total funding to the Waste RDI Roadmap over the period 2015-2024 was R125m. While this was only 3.2% of the original Roadmap ask of R3888m, the funding provided by the DSI has been instrumental in strengthening waste research, development and innovation across various public research institutions, including direct support to researchers and students, both local and international.

The work undertaken by the CSIR for the DSI, to better understand the drivers to transition to a more circular South African economy, and the current levels of adoption of circular practices provides exciting insights into the potential for a circular economy in a global south, developing country context. As such, we are excited to give effect to the new CE STI Strategy from 2024 and in building out our network to more research institutions across the country.



Prof Linda Godfrey

The CSIR Team:

Bongani Memela Manager: Hosted National Programmes

Prof Linda Godfrey Manager: Waste RDI Roadmap

Amit Ramsumair Management Accountant

Lulu MakapelaContracts Manager

Marcia LangaProject Administrator
Support



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.

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

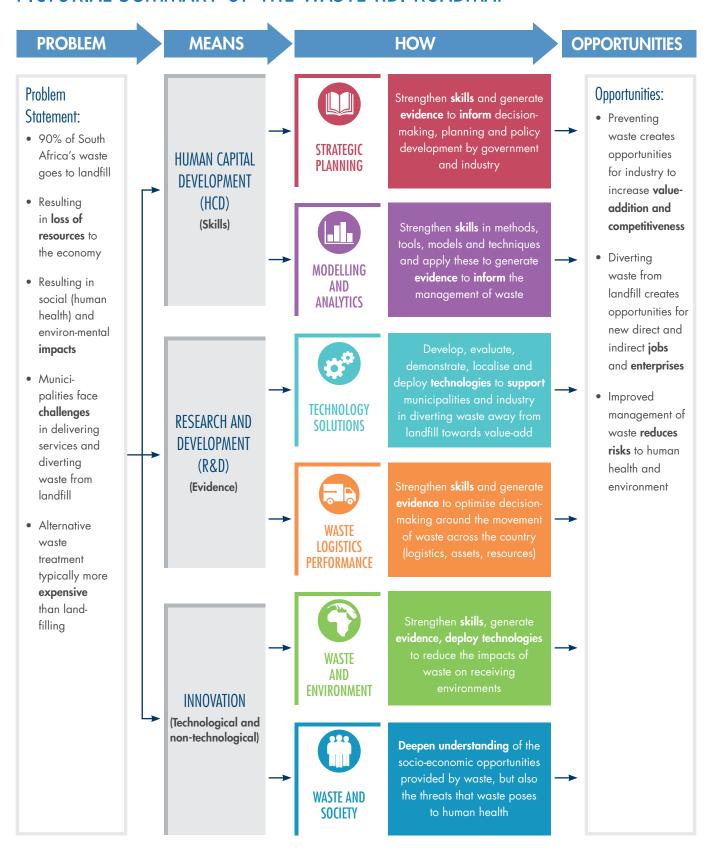


RESEARCH AND DEVELOPMENT



INNOVATION

PICTORIAL SUMMARY OF THE WASTE RDI ROADMAP





REFLECTING ON NINE YEARS OF IMPLEMENTATION (2015-2024)

TRENDS

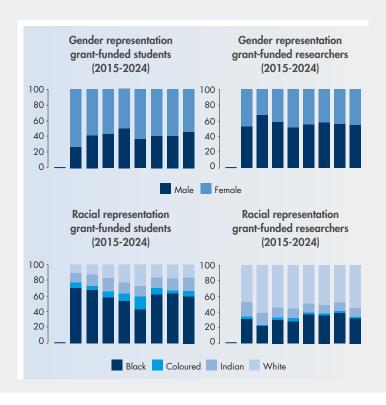
The 2023/24 financial year brought to an end, the ninth year of implementation of the Department of Science and Innovation's (DSI) Waste RDI Roadmap. This will be the final year for reporting on the Waste RDI Roadmap as a separate initiative, with government's Circular Economy STI Strategy (2024-2034) coming into effect in 2024.

TRENDS Total value of grant projects Annual transfer to RDI grants (new and ongoing RDI grants) (Rm) (2015-2024) (Rm) (2015-2024) 40 14 35 12 30 10 25 8 20 6 15 4 10 5 Number of RDI grants funded Grant-funded researchers financially supported (2015-2024)(2015-2024)30 25 160 20 120 15 80 10 40 Grant-funded students financially **Grant-funded students** supported (2015-2024) completed (2015-2024) 60 14 50 12 40 10 8 30 6 20 4 10 0 New scientific publications New technology packages registered (2015-2024) (2015-2024) 3 45 40 35 2 30 25 20 1.5 10 New Scientific Publications represents final dissertations, technical reports and peer reviewed journal papers

This section provides an overview of major indicator trends over the duration of the Waste RDI Roadmap implementation, for the period 2015 to 2024.

The total value of grant projects (new and ongoing) on the books in 2023/24 was R35.5m, the highest total portfolio of projects since the start of the Roadmap implementation. This is largely due to the portfolio of circular economy demonstration fund projects, which are partnerships between public research institutions and the private sector. These demonstration fund projects accounted for R25.4m of the total portfolio (71.5%). The transfer of funding to universities and science councils was also up on last year, from R8.2m to R12.1m due to ongoing support from the DSI. The circular economy demonstration fund has allowed the DSI to make a larger investment into a smaller number of grant projects, with only 20 grant projects financially supported in 2023/24.

The number of researchers supported in 2023/24 remained consistent from the previous year. The decline noted from 2021/22 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 below reflects funded researchers (108). Another 78 researchers collaborated and supported grant projects but were not directly funded.



Because of the inclusion of demonstration projects in the funding portfolio of 2023/24, fewer students were supported, as this was not a requirement of the shorter demonstration projects which are more implementation orientated. 35 undergraduate and post-graduate students were supported on grant projects, to varying degrees, during the year.

This year also produced 58 dissertations, scientific papers, technical reports, conference paper and presentations. These deliverables are made publicly available (where possible) on the Waste RDI Roadmap website.

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 nine 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 Waste Roadmap's six clusters over the past nine years is largely 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 65%. 'Waste Logistics Performance' remains an underfunded area (3% compared to 8% ask), with the WRIU struggling to find wastelogistics research projects that meet the criteria for funding under the Waste RDI Roadmap. The investment in Waste & Society related research remains strong at 11%, as originally planned.

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).

IMPACT

A total of 71 grant projects were supported over the nine years of the Waste RDI Roadmap. The total funding to the Waste RDI Roadmap over the period 2015-2024 was R125m (3.2%) of the original Roadmap ask of R3888m. While considerably less than what was required to give full effect to the Roadmap, this seed funding provided by the DSI has been instrumental in strengthening waste research, development and innovation across various public research institutions, including direct support to researchers and students, both local and international.

WASTE RDI ROADMAP CLUSTERS AND PERCENTAGE OF TOTAL INVESTMENT PER CLUSTER EXPECTED (2015-2025)				
	STRATEGIC PLANNING 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 6%	ACTUAL 8%	
	MODELLING AND ANALYTICS 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 10%	9%	
(\$\document{\phi}^{\text{o}}\)	TECHNOLOGY SOLUTIONS Design, development, evaluation, demonstration, localisation and deployment of technologies – both local and inbound – for customer-driven performance improvement	planned 55%	65%	
	WASTE LOGISTICS PERFORMANCE Optimisation of strategic, tactical and operational decision-making in respect of logistics objectives, assets and resources	PLANNED 8%	ACTUAL 3%	
	WASTE AND ENVIRONMENT 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 10%	4%	
	WASTE AND SOCIETY Deepen understanding of waste-related opportunities and threats, to increase the success of influencing perception and practice positively	PLANNED 11%	ACTUAL 11%	



REFLECTING ON 2023/24

HUMAN CAPITAL DEVELOPMENT

35 students supported through grant projects

post-graduate students supported through scholarships

post-graduate students mentored under the SARChI Chairs

post-graduate students mentored under the coursework degrees

WEBSITE

13 887 unique visitors

16 089

number of visits

106 097 pages visited

3218 number of documents downloaded

Top downloaded publications

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

COMMUNICATIONS IMPACT

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



presentations made

radio interviews

 \bigcirc television interviews

TOP 5 COUNTRIES ACCESSING THE WASTE RDI ROADMAP WEBSITE



** Incomplete comms data available for 2023/24

RESEARCH, DEVELOPMENT AND INNOVATION

FINAL DELIVERABLES PRODUCED



108 researchers supported on grant projects

38 research grant projects managed

R35.5m committed funding for new and ongoing grant projects

R29.1 m allocated to new grant projects

20

research grant projects funded (new and existing)

successful recipient research institutions (new and existing)

new grant projects awarded

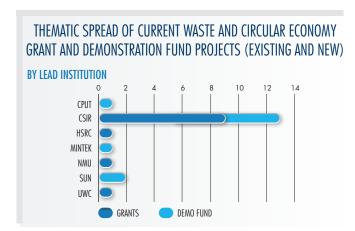
^{*} While every effort is taken to identify print articles referencing the Waste RDI Roadmap, there may be articles that have not been picked up by the CSIR or DSI's media services.





PROJECT PORTFOLIO

The DSI's investment in waste and circular economy related science, technology and innovation, 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.



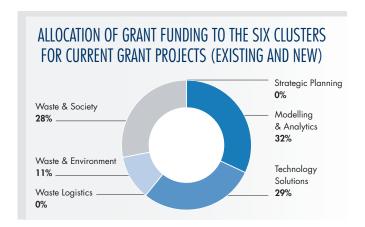
A brief outline of the 20 waste and circular economy grant and demonstration projects funded during 2023/24 is provided in the following pages. The section, including the above graph, also highlights a number of grant projects funded by the CSIR and managed under the portfolio of the Waste RDI Roadmap.

WASTE RDI ROADMAP GRANT PROJECTS

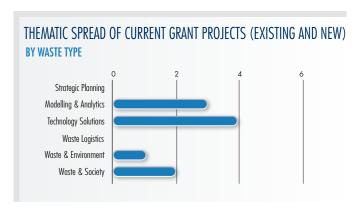
The profile of the current grant projects against the Waste RDI Roadmap clusters and priority waste streams is shown below.

Current projects

The WRIU held ten (10) waste-related grant projects under its portfolio in 2023/24, consisting of six (6) ongoing projects and four (4) newly awarded projects. The largest funding allocation (32%) was under the Modelling & Analytics cluster. No new grant projects were funded under the Strategic Planning or Logistics clusters in 2023/24. The Roadmap held a solid portfolio of projects in the Technology Cluster this year (29%).



The ten grant projects were split equally between municipal solid waste (MSW) and waste plastics, with the majority of grant projects (4) aligned with the Technology Solutions cluster of the Roadmap.



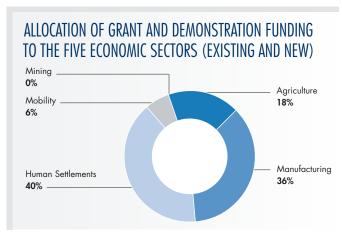
PROJECTS ENDING

Twenty-one (21) waste grant projects, most of which did not receive funding support during 2023/24, were successfully completed this year. This was the largest number of projects ending in one year since the start of the Roadmap implementation. This included all microgrant projects which were awarded in 2020. Many of these projects experienced delays due to the pandemic and university closures, and we are thrilled to receive the final research deliverables for these projects. The deliverables have been made publicly available on the Roadmap website under the respective project pages.

CIRCULAR ECONOMY GRANT AND DEMO PROJECTS

Current projects

Circular Innovation South Africa (CISA) also held a portfolio of 10 circular economy related research (2) and demonstration fund (8) grant projects in 2023/24. The majority of the funding for these projects (40%) was allocated in the human settlements sector, i.e., in the sustainable use of resources within our cities and towns. This was followed by circular manufacturing at 36% of the funding allocation.



FUNDING INSTRUMENTS

The DSI expanded the portfolio of funding instruments this financial year to create opportunity for the funding of both waste and circular economy related projects. This section reports on the traditional Waste RDI Roadmap funding instruments, e.g., the non-recoverable grants, as well as new circular economy instruments. The circular economy demonstration fund has absorbed a sizeable part of the 2023/24 grant budget, aimed at giving effect to the circular economy aspirations of the STI White Paper (2019) and STI Decadal Plan (2022-2032), and position the national system of innovation to better support the private sector in adopting, de-risking and scaling circular practices and technologies.

RDI GRANTS

Over the past nine 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. All proposals received under these calls, were evaluated by an independent panel of experts from government, business and academia.

No open grant call was issued in 2017, 2022 and 2023 due to a lack of funding for the Waste RDI Roadmap. This is not to say that new projects were not funded in these three years. Instead, applicants with high-scoring proposals from previous years, which could not be funded in that year due to insufficient funding, were invited to reconsider their proposals.

Grant applications received

Four applicants were invited to submit their research proposals,

THEMATIC SPREAD OF GRANT PROPOSALS AND AWARDS UNDER THE 2023 DEMO FUND CALL **BY LEAD** ARC INSTITUTION CPUT CSIR Mintek NMU SUN UCT Ш UKZN UL UniMpu IINISA UniVen AWARDED UWC APPLICATION WSU

with funding provided by the DSI and the CSIR to support these four projects. The DSI also provided additional funding support to the CSIR to complete the circular economy technical report series, focusing specifically on the circular economy in human settlements, and the circular economy in mobility.

Awarded grants

A total of six (6) new research projects were awarded in 2023/24. Two of these being waste related, and four projects related to the circular economy. The number of grants awarded was limited by the available funding, and not by the quality of proposals received.

DEMONSTRATION FUND GRANTS

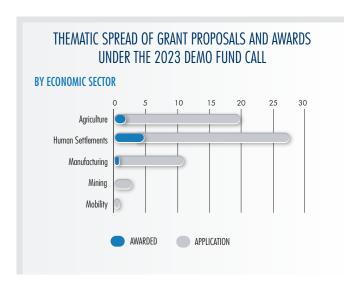
The DSI's circular economy demonstration fund is a new funding instrument implemented in 2023/24. The fund aims to bring universities and science councils closer to supporting the private sector in adopting, de-risking and scaling circular economy interventions, particularly technology solutions.

Grant applications received

A total of 63 demonstration fund proposals were received in 2023. The majority of these proposals (44%) were related to circular economy solutions applicable within our urban environment (human settlements). Most of these were waste or wastewater related. This was followed by circular agriculture practices (32%). It was encouraging to see that proposals were received for all of the main, resource-intensive, economic sectors.

Awarded demonstration fund grants

From the 63 proposals received, eight demonstration fund projects were awarded. All proposals received under this call, were evaluated by an independent panel of experts from government, business and academia. Proposals were received from 15 institutions, four of which were successful in securing demonstration funding.





CIRCULAR AGRICULTURE

In 2023/24, there were 2 research and demonstration fund projects aimed at supporting greater circularity in the agricultural sector



The Campus: A One Hectare Circular Farm and Learning Hub

M Swilling - SU

Non-recoverable grant: 2023/065

Project duration: 1/2024 - 12/2026

Field Demonstration of Biodegradable Mulch Films in South Africa

V Ojijo - CSIR

Non-recoverable grant: 2023/066

Project duration: 1/2024 – 6/2026

CIRCULAR CITIES

In 2023/24, there were 9 research and demonstration fund projects aimed at supporting greater circularity within our cities and towns



Identifying Circular Economy opportunities within the Human Settlements

J Gibberd - CSIR

Non-recoverable grant: 2023/062

Project duration: 1/2024 – 12/2024

Identifying Circular Economy opportunities within the Mobility sector

R Mokoena – CSIR

A Muswema - CSIR

Project duration:

Non-recoverable grant:

Non-recoverable grant: 2023/063

Project duration: 1/2024 - 12/2024



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

nonCrete – certification and demonstration of a modular zero-carbon roof and flooring system

C van Reenen - CSIR

Non-recoverable grant: 2023/069

Project duration: 1/2024 - 6/2025

Research outputs for projects using plastic waste in road construction

R Mokoena – CSIR

Non-recoverable grant: 2021/048

Project duration: 6/2021 - 12/2023

Low-fouling NiCMeRTM Ultrafiltration Membrane for water reclamation

2023/068

1/2024 - 12/2026

Green Bricks: Interlocking Blocks from Recovered

Construction and Demolition Waste and Glass

K Sikhwivhilu - Mintek

Non-recoverable grant: 2023/070

Project duration: 1/2024 - 6/2026



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

B Molema - CSIR

Non-recoverable grant: 2021/044

Project duration: 5/2021 – 7/2023 (extended)

Implementing governance and innovative interventions on village level to address indiscriminate diaper disposal

C Schenck - UWC

Non-recoverable grant: 2023/059

Project duration: 1/2024 - 3/2025



CIRCULAR MANUFACTURING

In 2023/24, there were 4 research and demonstration fund projects aimed at supporting greater circularity in the manufacturing sector



Beneficiation of used textiles in a circular economy

V Chunilall - CSIR

Non-recoverable grant: 2021/047

Project duration: 8/2021 – 12/2024

On-site, industrial demonstration of ethanol production from paper sludge waste

E van Rensburg - SU

Non-recoverable grant: 2023/067

Project duration: 1/2024 - 3/2025

Implementation of automated refill stations in the sale of fast-moving consumer goods (FMCG) in low-income environments

G Mans - CSIR

Non-recoverable grant: 2023/064
Project duration: 1/2024 – 6/2025

Textile-to-textile recycling using SMME scaled needle felting technology

S Patnaik – CPUT

Non-recoverable grant: 2023/071

Project duration: 1/2024 - 10/2025

CROSS-CUTTING CIRCULAR STI

In 2023/24, there were 5 research projects supported, cutting across various thematic areas and economic sectors



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

V Russo - CSIR

Non-recoverable grant: 2022/057

Project duration: 8/2022 - 12/2023

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

S Motala - HSRC

Non-recoverable grant: 2022/055

Project duration: 8/2022 - 12/2023

Towards a set of indicators for monitoring South Africa's transition to a Circular Economy

A Nahman - CSIR

Non-recoverable grant: 2022/060

Project duration: 1/2024 - 12/2024

Piloting the 'Building Circularity into NDCs: A Practical Toolbox' in South Africa

A Nahman - CSIR

Non-recoverable grant: 2023/061
Project duration: 1/2024 – 3/2025



Perspectives on the future of waste management in South African protected areas

C Roos - NWU

Non-recoverable grant: 2023/058
Project duration: 1/2024-12/2025



 ${\it Editorial\ credit:\ Richard\ van\ der\ Spuy\ /\ Shutterstock.com}$

"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 postgraduate students and post-doctoral researchers



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

Post-graduate 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.)

The WRIU and the CSIR are happy to contribute towards these two degrees through the lecturing of certain modules and guest lectures, and scholarship funding support.

Post-graduate scholarships

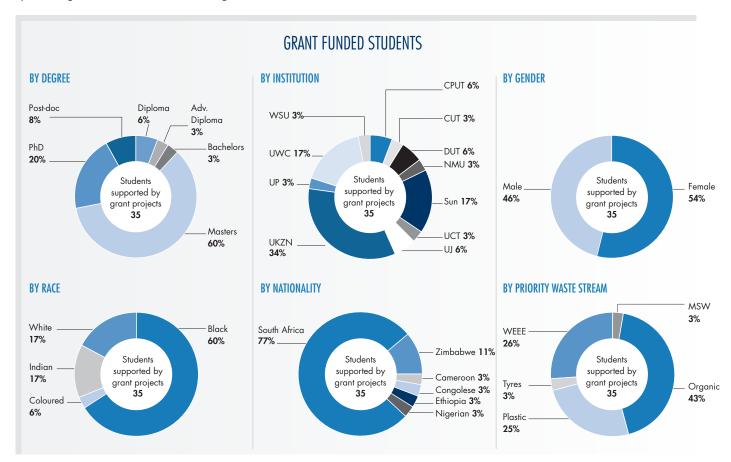
The Waste RDI Roadmap provided targeted scholarships to students undertaking one of the dedicated coursework Master's degrees in South Africa. The Roadmap provided funding for seven (7) scholarships in the 2023 academic year. Of the seven scholarships awarded, 43% were to young female students.

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

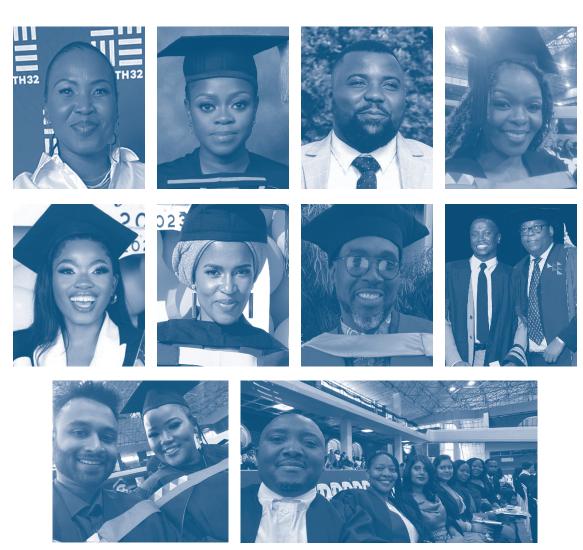
The Waste RDI Roadmap grant projects funded during the 2023/24 financial year supported 35 undergraduate and post-graduate



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 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 27 South African students (77%) supported on grant projects, an additional eight (8) students from other African countries were financially supported under the Waste RDI Roadmap. Grant-funded students were hosted across 11 academic institutions.

Previous years have seen a large percentage of post-graduate students working on organic waste related research projects. While this still holds true for grant funded student research projects in 2023/24 (43%), the focus started to shift in 2019/20, with a large number 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 25% in 2023/24 as the interest in and awareness of the environmental impacts of waste plastic has grown.

With the shift in the funding portfolio in 2023/24 from the more research orientated grants to the circular economy demonstration fund grant projects, there was a noticeable decrease in the number post-graduate students supported. The shorter duration of the demonstration projects, and their focus on practical implementation, does not always provide opportunity for academic studies. Research grants will remain part of the funding portfolio to support post-graduate students.



Some of the students supported partially or fully by the Waste RDI Roadmap, who graduated in 2023-24

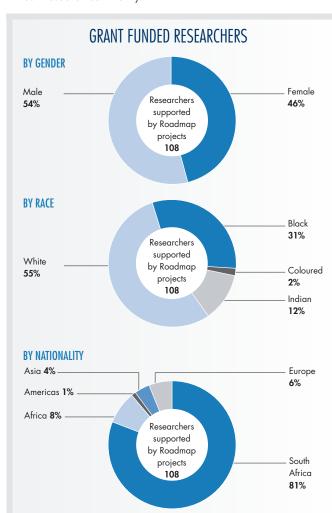


PORTFOLIO OF RESEARCHERS

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 WRIU managed a portfolio of 38 waste and circular economy related grant projects in 2023/24, 20 of which received funding during the financial year. These 38 projects provided funding support to 108 researchers and collaborators (non-unique), and collaboration opportunities (non-funded) to 78 researchers. A total of 186 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 (81%), an increase from 2022/23, but there are also researchers 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.

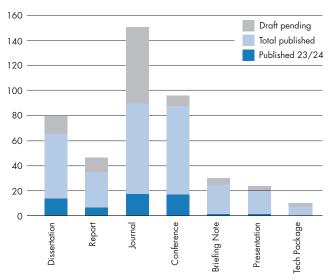


RESEARCH OUTPUTS

The portfolio of grant projects produced 58 final deliverables during 2023/24. This includes post-graduate dissertations, journal papers, technical reports, conference papers and presentations, and briefing notes.

- 14 Dissertations
- 7 Technical reports
- 18 Journal papers
- 17 Conference papers and presentations
- 1 Briefing note
- 1 Summary presentation

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



Baloyi, R.B., Sithole, B.B., Chunilall, V. (2024). Physicochemical Properties of Cellulose Nanocrystals Extracted from Postconsumer Polyester/Cotton-Blended Fabrics and Their Effects on PVA Composite Films. *Polymers*, 16, 1495. https://doi.org/10.3390/ polym16111495

Ranjan, A., Welz, P.J. & Mthethwa, T. (2024). Investigation of an effective acid pre-treatment method for the valorisation of Canola fines. *Biomass Conv. Bioref.* 14, 12013–12026. https://doi.org/10.1007/s13399-023-03946-y

Idamokoro, E. M., Hosu, Y. S., Oyedeji, O. O., Miya, G. M., Kuria, S. K., and Oyedeji, A. O. (2023). Components of citrus pulp waste (eureka lemon and clementine) and yellow maize commonly used as livestock feed by south African farmers. *Bioagro*, 35(3), 271-278. https://doi.org/10.51372/bioagro353.10

Pal, I., Naicker, A. and Grobbelaar, H. (2023). Investi-gating the Behaviour and Practices of Household Food Waste Disposal of Consumers in the KwaDukuza Munici-pality, South Africa. *Curr Res Nutr Food Sci*; 11(3). http://dx.doi.org/10.12944/ CRNFSJ.11.3.27

Tawonezvi, T., Nomnqa, M., Petrik, L., Bladergroen, B.J. (2023). Recovery and Recycling of Valuable Metals from Spent Lithium-lon Batteries: A Comprehensive Review and Analysis. *Energies*, 16, 1365. https://doi.org/10.3390/en16031365

SARCHI RESEARCH CHAIRS

The Waste RDI Roadmap SARChI Chairs in Waste and Society and Waste and Climate Change, 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 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. In addition, the Waste Community of Practice (COP) including Prof Petersen, Prof Schenck, Prof Trois, Prof Starke and Prof Mostert was approved until 2024.

The SARChI Chair has undertaken a number of very relevant, and highly impactful research projects in 2023/24. These included research on disposal diapers (nappies); informal tyre dealers operating across South Africa; informal e-waste repairers and refurbishers in townships; and backyard dwellers and waste in Fisantekraal.

Recent publications by the Chair include:

- Schenck, C.J., Blaauw, D., Theodore, N. et al. (2023) Informal Tyre Dealers in South Africa: an Assessment of Their Contributions to a Circular Economy. *Urban Forum* 35, 65-81.
- Schenck, C., Chitaka, T., Tyrrell, H. and Couvert, A. (2023).
 Disposable Diaper Usage and Disposal Practices in Samora Machel Township, South Africa. Sustainability, 15(2): 9478.

- Kadhila, T., De Wit, M. and Schenck, C. (2023). A conceptual framework for sustainable waste management in small municipalities: The cases of Langebaan, South Africa and Swakopmund, Namibia. Environmental Science and Pollution Research, 30: 125088–125103.
- Schenck, C., Nell, C. and Chitaka, T. (2023). Exploring disposable diaper usage and disposal practices in rural areas. UWC Technical Report, Cape Town.

The Chair has provided an excellent platform for its three post-doctoral students. Dr Chitaka is now appointed as a post-doc at the University of Bordeaux, France. Dr Hoffmann has since been appointed as a senior lecturer at UCT, and Dr Matlala appointed as a lecturer at UJ.

The Chair partnered with the One Health Network to develop a three-year strategy (2023-2026) to inform the absorbent hygiene products (AHP) waste management industry role-players in South Africa.



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. The Chair is also a member of the recently renewed Waste Community of Practice (COP). Prof Trois also joined, as co-PI, a new NRF-COP on "Climate Change Research with Society", in collaboration with the Presidential Climate Commission, Prof Hewitson (UCT) and Prof Vogel (Wits).

The Chair completed an assessment of GHG emission mitigation strategies for the eight metropolitan municipalities in South Africa on behalf of the World Bank.

Recent publications by the Chair include:

 Trois, C., Abera, Y., Dell'Orto, A., Kissoon, S., and Gómez-Sanabria, A. (2023). Application of the WROSE Model for Promoting Effective Decision-Making and Sustained Climate Change Stabilization in the South African Waste Sector. In: Waste Management in Developing Countries, Springer.

 Kissoon, S. and Trois, C. (2023). Optimized Organic Waste Management Strategies for Sustained Carbon Emissions Reduction and Climate Change Stabilization in the Garden Route District of South Africa. In: Waste Management in Developing Countries, Springer.

Unfortunately, Prof Trois vacated the SARChI Chair in Waste and Climate Change in October 2023, to take up the position as Director of the Centre for Renewable and Sustainable Energy Studies at Stellenbosch University. We wish her all the best in this new role.



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 2023/24 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, such as the National Cleaner Production Centre (NCPC-SA) during 2023/24 regarding the opportunities to transition to a more circular South African economy.

Business and Industry

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 2023/24. The new Circular Economy Demonstration Fund has provided a funding instrument to incentivise a closer working relationship between universities and science councils and the private sector. The demonstration fund is aimed at providing the private sector with access to capabilities and infrastructure within our national system of innovation to support them in adopting, de-risking and scaling circular interventions, in particular circular technologies. Researchers from universities and science councils have also independently worked closely with private sector partners this year on various Roadmap funded STI grant projects.

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, municipal solid waste, 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 130 researchers working in solid waste management and associated fields across South African public research institutions.

Exciting developments included participating in the Project Advisory Group for the Grape4Green project. A project of South Africa Wine undertaken by the South African Grape and Wine Research Institute and the Chemical Engineering Department of Stellenbosch University. The research looks into the status of the circular economy in the South African Grape and Wine industry.

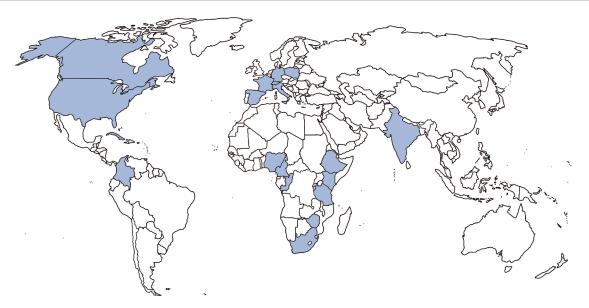
INTERNATIONAL

International and regional partnerships are important to ensure that waste and circular economy related 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 (and now CISA) continues to develop and strengthen international relationships in support of the Roadmap. Some of the engagements during 2023/24 included:

Government and non-governmental organisations

Royal Academy of Engineering, UK

Prof. Godfrey, from the WRIU, serves as a member of the Royal Academy of Engineering's Safer End of Engineered Life (SEEL) programme board. 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 recent grant funded project on "Assessing the impacts of burning of waste on communities living in the vicinity of landfills in the Free State Province" and the findings of the Pathways modelling project on the leakage of waste plastic in the terrestrial and aquatic environments in South Africa.



South Africa-international waste RDI partnerships (researchers and students) active in 2023/24

United Nations (UN) Agencies

The WRIU participated in a number of engagements with UN Agencies during 2023, on various topics relating to waste and the circular economy. These engagements are important for ensuring that current global thinking and policy development is integrated back into local activities.

- CTCN: technical assistance towards the development of the South African government's Circular Economy STI Strategy
- FAO: plastics in agriculture,
- ILO: Key resource on the ILO "Promoting green jobs in a circular economy" training programme
- UNEP and UNDP: Voluntarily piloting the Toolbox to build circularity into NDCs
- UNIDO: Steering Committee "Strengthened adaptation capacity for a green and resilient economy in South Africa"

The DSI and CSIR would like to particularly acknowledge the technical assistance provided by the UN Climate Technology Centre and Network (CTCN) towards the development of the South African government's new Circular Economy Science, Technology and Innovation (STI) Strategy. The work undertaken by the ACEN Foundation will provide input to the final strategy under development.

International Solid Waste Association (ISWA)

Prof. Godfrey remains a member of the ISWA Women-of-Waste Advisory Network. We are pleased to see that the ISWA annual conference will be held for the first time on the African continent in September 2024. This provides an opportunity for South African researchers to showcase their work to international peers.

World Resources Forum

Prof. Godfrey was pleased to serve as a member of the World Resources Forum (WRF 2023) Scientific Committee in 2023. The conference "Rethinking Value – Resources for Planetary Wellbeing" provided valuable insights on global circular economy perspectives, sustainable value chains, sufficiency perspectives;

and critical and strategic raw materials, amongst others. We are pleased to see the participation of South African academics in the conference, including current Roadmap grant holders.

Academic

This year provided several opportunities to strengthen circular economy STI collaboration and knowledge sharing with various organisations in Australia. These included:

Southern Cross University, Australia

Prof Godfrey was invited by Southern Cross University, to present the keynote address at their Circular Economy Impact Forum held in Lismore, Australia in May 2023. Engagements were also held with university staff and students, including from the ReCirculator Programme hosted by the university. This provided an opportunity to showcase the work undertaken by the CSIR that explores the circular economy opportunities across various resource intensive sectors of the economy – which has relevance to Australia.

Circularity '23, Monash University, CSIRO,

Prof Godfrey attended, and presented at, Circularity '23, held in Melbourne Australia in November 2023. This provided further opportunity to strengthen south-south circular economy collaboration. The presentation outlined South Africa's approach to CE STI. The conference was followed by the Circular Economy Research Network of the Asia-Pacific (CERN-APac) conference, held in Melbourne Australia and hosted by Monash University. Visits were also made to CSIRO in Canberra to share information on our respective circular economy research. In lead up to these events, virtual meetings were held with representatives of these organisations, including Australia's new Ministerial Advisory Group on the Circular Economy.

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.



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 and circular economy STI 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 and the circular economy at a number of events in 2023/24. Some of the highlights include:

- "Collaboration with governments and industry stakeholders to develop and implement circular economy policies and regulations in the SADC region", Southern African Industrialisation Forum 2024, 27 February 2024.
- "Facilitating and strengthening a circular economy in Africa -Creating Circular Industries", NCPC-SA & ARSCP Colloquium, 5 October 2023
- "Circular economy landscape in South Africa", Netherlands Mission Event, 18 October 2023
- "A more circular South African economy The role of publicly

funded research institutions", NSTF/Science Councils and Statutory Bodies Discussion Forum, 17 October 2023

- "Waste & Climate Change a New Chapter", Festival of Circular Economy, 16 November 2023
- "Why National Systems of Innovation are critical to our transition to a Circular Economy", Circularity '23 Conference, Melbourne, 21 November 2023
- "The landscape to further circular economy STI in South Africa", CERN-APac Conference, Melbourne, 22 November 2023
- "A more resilient, efficient and sufficient South African economy - Transitioning to a more circular economy", Circular Economy in the Textile & Garments Sector, 29 November 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 2023/24". Engagement with the media is an important element of supporting knowledge transfer to key stakeholders, including the public.

A number of grant holders also received excellent media coverage this year around their own research projects, and the projects being undertaken by their students.

Particularly exciting was the launch of Circular Innovation South Africa (CISA) on the 10 May 2023, which was well attended by collaborators and representatives of key organisations. The launch received excellent media coverage and further engagement from interested stakeholders.

OPERATIONS AND FINANCE

WASTE RDI ROADMAP FINANCIAL STATEMENT

The DSI was able to direct a larger pool of funding towards the Waste RDI Roadmap and new circular economy activities in the 2023/24 financial years, up on previous years. The CSIR also provided funding support for two of the new circular economy related grant projects. Approximately R10m more funding was available in 2023/24 compared to 2022/23. This additional funding allowed the Roadmap to invest in the eight new circular economy demonstration fund projects in partnership with the private sector. This seed funding from the DSI is catalytic in developing and strengthening STI in the waste and circular economy fields in South Africa.

The recent grant closure reports also highlighted that the grant funding provided by the DSI has been instrumental in unlocking new funding for continuing research from local and international public and private funders. An example is a R1.5m grant project that unlocked R5m in further funding which allowed the research findings to be taken into implementation in South Africa.

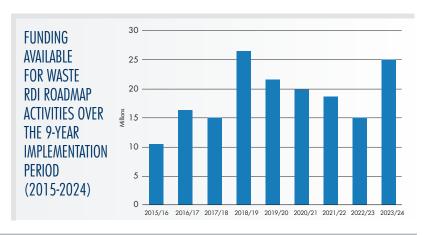
While impactful, the funding is still significantly below that required to implement the Waste RDI Roadmap. This has a direct bearing on the extent and magnitude of the activities of the Roadmap.

REVENUE	2023/24	2022/23	
DSI seed funding	14 782 608.70	13 913 043.47	
Other revenue	10 463 072.59	1 146 914.33	
Total Revenue	25 245 681.28	15 059 957.80	
EXPENSES			
Communications	73 198.91	44 319.01	
CSIR Project Management Unit	3 246 265.17	2 956 833.35	
Non-recoverable innovation grants	0.00	0.00	
Non-recoverable R&D grants	12 140 962.83	8 208 761.24	
Targeted RDI projects	0.00	0.00	
Post-graduate scholarships/internships	984 590.25	318 900.00	
SARChI Research Chairs	0.00	0.00	
Travelling	135 253.66	24 593.35	
Workshops and general running	0.00	0.00	
Total Expenses	16 580 270.82	11 553 406.95	
Income for continuing operations (1)	8 665 410.46	3 506 550.85	
Net Income	0.00	0.00	

All financial figures are exclusive of VAT.

Notes to financial statement:

- Income for continuing operations is committed funding for grant projects awarded during 2018-2022, for which disbursements will be made in the 2024/25 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:

