13 CLIMATE ACTION

Tshwane University of Technology Research on SDG:13 Climate Action

A PEOPLE'S university
that makes
KNOWLEDGE work

Tshwane University of Technology
We empower people

Office of the DVC: Research, Innovation and Engagement, Dr Vathi Papu-Zamxaka

History, Shape and Size

- Established on the **1st of January 2004** through the merger of the former Technikon Northern Gauteng, Technikon North-West and Technikon Pretoria.

- Its geographic footprint covers four of South Africa's nine provinces – **Gauteng, Mpumalanga, Limpopo and the North-West Province**

Facts and Figures

- Approximately **60 thousand** students.

- **PhDs** = ~700 & **Masters** = ~1666

- **7 Faculties**: (1) Arts (2) Engineering & the Built Environment (3) Science (4) Humanities (5) Management Sciences (6) ICT (7) Economics and Finances.

- **6 Campuses**

International Rankings: Subject Rankings 2023

In 2022, Times Higher Education (THE) ranked TUT in the :

- **2nd band (501-600) in the Engineering Subject** compared to other universities in South Africa

- **3rd band (800+) in Physical sciences**; and
- **2nd band (501-600) in Computer sciences subjects**

International Rankings: Subject Rankings 2023

Engineering

University	Ranking
North-West Unviersity	401-500
University of South Africa	401-500
Stellenbosch University	401-500
University of Johannesburg	501-600
Tshwane University of Technology	501-600
University of Cape Town	601-800
University of KwaZulu Natal	601-800
University of Pretoria	601-800
University of the Witwatersrand	601-800
Durban University of Technology	801-1000

Computer Science

University	Ranking
University of Cape Town	401-500
University of the Free State	401-500
North-West University	401-500
Rhodes University	401-500
Stellenbosch University	401-500
University of the Western Cape	401-500
University of KwaZulu Natal	501-600
Tshwane University of Technology	501-600
University of Johannesburg	601-800
University of Pretoria	601-800
University of South Africa (Unisa)	601-800

Physical Science

University	Ranking
Stellenbosch University	401-500
University of Cape Town	601-800
University of Johannesburg	601-800
University of KwaZulu Natal	601-800
North-West University	601-800
University of Pretoria	601-800
University of the Witwatersrand	601-800
University of South Africa (Unisa)	801+
Tshwane University of Technology	801+

International Rankings

- In 2021, Times Higher Education (THE) ranked TUT at No. **11 in South Africa out of 26 Universities.**

- In 2019-2020, the World University Ranking, at **No. 13 Nationally.**

- Ranked **No. 1 University** in its teaching of **ICT and Engineering Subjects.**

Research and Innovation

Research Chairs

- 15 Research Chairs: (9 SARChI, 1 Gibela, 1 EWSETA, 1 MICT SETA, 1 TETA, 1 CASSTI, 1 UNESCO) which are externally funded and 3 internally funded Research & Development Platforms.

National Research Foundation (NRF) Rates Researchers

- 59 NRF Rated Researchers *

Niche Areas

- Five Active Niche Areas.

A people's university producing IMPACTFUL RESEARCH

Centres, Institutes & Technology stations

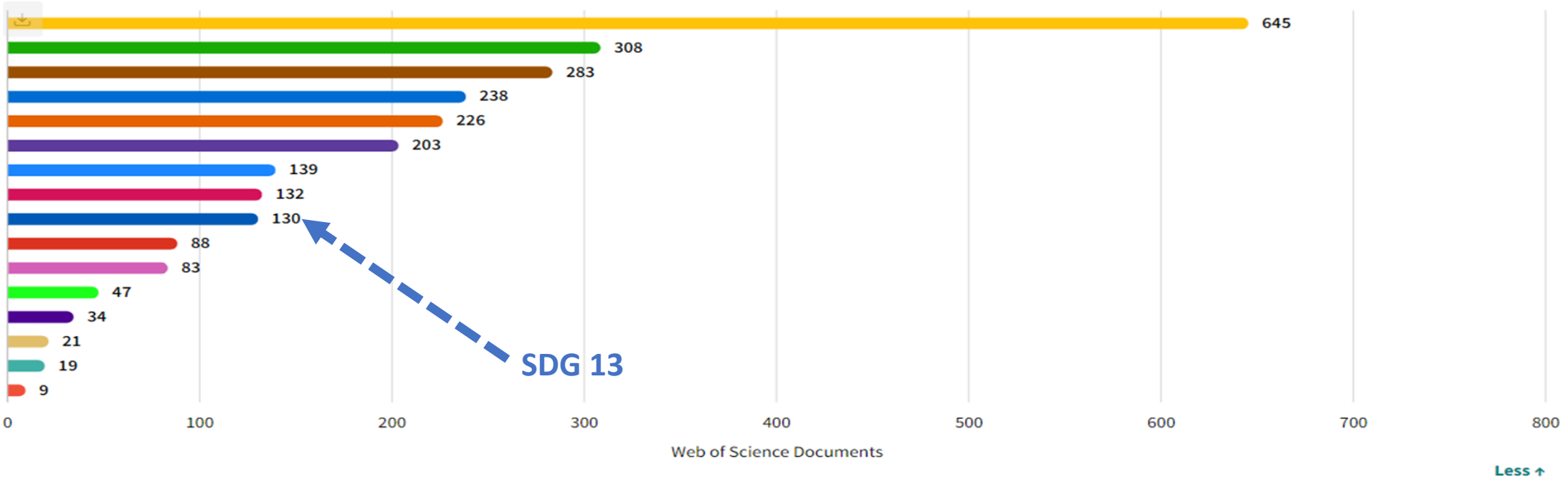
- 8 Centres, 4 Institutes & 3 Technology Stations

Institutional Position towards Climate Action

The Senate of the Tshwane University of Technology established a **task team on Climate Change** that

- Engages more deeply through its research and innovation, teaching and learning, and its community engagement programmes with the epistemic and ontological implications of contemporary conjuncture.
- Captures and collate current climate change activities to assess the sufficiency of TUT's contributions,
- Encourages and assists Faculties in compiling consolidated and comprehensive action plans on climate change, and
- Makes recommendations to the Green Campus Committee, and other environmental transformative initiatives seeking to reduce harmful emissions, protect biodiversity, and increase the visibility of TUT's contribute to the global discourse on climate change.

Overview of TUT's Research towards SDGs: 2018 to 2022



Clarivate™

03 Good Health and Well-being
07 Affordable and Clean Energy
13 Climate Action
01 No Poverty
06 Clean Water and Sanitation
12 Responsible Consumption and Production
02 Zero Hunger
10 Reduced Inequality
14 Life Below Water
04 Quality Education
15 Life on Land
08 Decent Work and Economic Growth
11 Sustainable Cities and Communities
09 Industry, Innovation and Infrastructure
05 Gender Equality
16 Peace and Justice Strong Institutions

- TUT contributed 130 web of science documents towards SDG 13: Climate Action between 2018 and 2022.

Overview of TUT's Research towards SDGs: 2018 to 2022

Research Area	Web of Science Documents	Times Cited	% Documents Cited	Category Normalized Citation Impact
03 Good Health and Well-being	645	5,884	78.76%	1.16
06 Clean Water and Sanitation	308	6,688	93.51%	1.45
14 Life Below Water	283	8,203	97.88%	2.11
11 Sustainable Cities and Communities	238	2,286	72.69%	0.93
07 Affordable and Clean Energy	226	2,566	64.16%	1.08
12 Responsible Consumption and Production	203	1,461	78.33%	0.95
04 Quality Education	139	323	53.96%	0.53
09 Industry, Innovation and Infrastructure	132	656	71.97%	0.78
13 Climate Action	130	961	76.92%	0.88
02 Zero Hunger	88	663	78.41%	0.7
15 Life on Land	83	486	73.49%	

Clarivate™

International Partnerships towards SDG 13

TUT has partnered with various international partners to combat climate change.

MoUs have been signed with the following institutions:

1, Weihenstephan-Triesdorf University of Applied Science, Germany

- Partnership in Student and staff exchanges in climate change initiatives.
- Duration: **2022 to 2027**

2, Finland University, Finland

- Partnership in the fields of pharmacy, toxicology, public health and nutrition, food and **environmental policy.**
- Duration: **2022 to 2027**

3, Leuven University, Belgium

- Collaboration initiated to explore the toxicity of South African medicinal plants using the Zebrafish bioassay
- Duration 2017 to 2022

4, Häme University of Applied Sciences, Finland (coordinator), Aalto University, Finland, Inland Norway University of Applied Sciences, Norway

- Forest21 Project (slide 12 and 13)

Institutional Research Structures on Climate Action

Research Niche Areas responding to Climate Action

1. Climate Change, Water Security and Disaster Management

- The research niche area seeks to analyse and mitigate against the potential impacts of climate and land use changes on water resources and the environment.

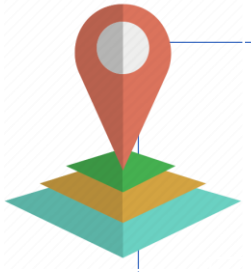
2. Applied Refrigeration and Thermal energy Systems (ARETS)

- The research niche area focuses on the energy sector in terms of energy sources, energy conversion, energy in transportation, energy storage, energy utilisation, and climate impact.

Research Niche Area: Climate Change, Water Security and Disaster Management

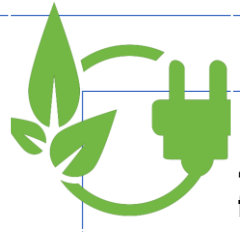
The Research Niche Area Focuses on :

1) Use of recycled waste material for infrastructure construction



2) Use of GIS and Remote Sensing for real time development of early warning systems for floods

3) Use of Wireless Technology for real time monitoring of water quality and quantity and hence give early signs of distress before a disaster (either diseases or pollution) occurs, thus saving lives



4) Use of alternative (green) energy for infrastructure requiring use of electricity for their operations.

5) Use of construction material that absorbs greenhouse gases from the environment, thus minimizing the gases and their effects from the environment.

Research Niche Area: Climate Change, Water Security and Disaster Management

Outcomes from the Research Area:

1) Publications

More than 30 Articles published by the Niche Area

2) Graduates

More than 10 PhD and 25 Masters

3) Innovation

Real-Time Groundwater Quality and Quantity Sensor using GoT (Successfully tested under controlled environment and currently under development for external testing)

4) National Partnerships

*Water Research Commission

*University of Kwa-Zulu Natal

*Agricultural Research Commission (ARC)

*University of the Western Cape

5) International Partnerships

*Mbeya University of Technology, Tanzania

* University of eSwatini, eSwatini

*University of Turku, Finland

*Dedan Kimathi University of Technology, Kenya

*Bahir Dar University, Bahir Dar, Ethiopia

Research Niche Area: Applied Refrigeration and Thermal energy Systems (ARETS)

The Research Niche Area Focuses on :

1) Green Refrigeration systems and equipment (Cold Chain)

2) Heat pump systems (space cooling and heating, water heating, and biomaterials drying)

3) Environmentally and climate friendly alternative refrigerants with zero ozone depletion and global warming potential

4) Energy efficiency of power plant and green Industrial thermal energy systems

5) Building energy and improving indoor air quality

Research Niche Area: Applied Refrigeration and Thermal energy Systems (ARETS)

Outcomes from the Niche Areas:

1) Publications

More than 40 Publications and 2 Intellectual Property

2) Graduates:

17 Masters, 7 Doctors, 1 Postdoctoral Research Fellows

3) Products and Innovation

*Mobile cold rooms

*Solar dryer;

*Geothermal heat pump for space heat and water heating equipment

4) Partnerships

*Transfig GIZ

*Frigoglass

*Tianjin University, Tianjin University

*Tshwane Market

*Eskom

*Grigoglass Transfrig

TUT Research Chairs towards Climate Action

1, NRF SARChI: Acid Mine Drainage Treatment

- Facilitates applied research on mine water management and treatment, and prevention of mine water pollution; and
- Focuses on passive treatment technologies in remote areas and active treatment where local water sources or people may be directly affected by the pollution

2, *EWSETA – Wastewater & Solid Waste Management

***NRF SARChI: Water Quality and Wastewater Management**

- Focuses optimal processing and harvesting of waste including energy to waste at a high level;
- Fostering an ecosystem in energy and water that creates inclusive economic development; and
- Educates to create community awareness, particularly to energy and water stakeholders, on the responsible handling of wastewater and solid waste throughout the material cycle with the initial focus on "end-of-pipe management".
- The research Chairs contributes towards an integrated management approach of water and wastewater.

TUT Research Chairs towards Climate Action

1, *NRF SARChI: Future Transport Manufacturing Technologies

***TETA Research Chair in Agile Transportation Industry**

- The Chairs conduct research on skill development and green transport solutions.
- Focus on finding eco-friendly and economical solutions including research informed strategies in the areas of operations that cut across rail, aerospace, maritime, road freight, road passenger, taxi, freight handling, and forwarding and clearing subsectors

FOREST21 initiative

Forest 21
Climate-Smart Forestry Entrepreneurs

FOREST21 is a joint project for strengthening capacity in South African higher education in forestry. The project is implemented in collaboration of five higher education institutions (HEIs) in South Africa and Europe with ongoing research in Forestry Management.

The FOREST21 project has three (3) key pillars which include:

- Climate-smart solutions in forestry for sustainability in the sector
- Curriculum development and pedagogy revolution through Problem-Based Learning; and
- Entrepreneurship mainstreaming in forestry education for graduates to widen their scope from employment seekers to innovative job creators.

Co-funded by the Erasmus+ Programme of the European Union

Aalto University

HAMK HÄMEEN AMMATTIKORKEAKOULU HÄME UNIVERSITY OF APPLIED SCIENCES

Inland Norway University of Applied Sciences

NELSON MANDELA UNIVERSITY

UNIVERSITEIT STELLENBOSCH UNIVERSITY

Tshwane University of Technology

University of Venda

TUT & City of Tshwane Metropolitan Municipality Climate Conference

TUT in collaboration with the City of Tshwane (CoT) hosted a two-day thought-provoking **Climate Change Research Conference**, Pretoria, from 9 – 10 March 2023.

The conference was aimed at finding resolutions on how the City of Tshwane can mitigate and adapt to climate change and to further stimulate new areas of research to enhance the implementation of the **Climate Action Plan**.

Solar powered Car: The Sun Chaser 4

As part of outstanding innovation at the university, the **Faculty of Engineering and Built Environment** led the invention of a solar car.

- **SunChaser4** (the current version) is the fourth-generation solar electric car which a mixture of staff and students from TUT has designed, built and driven on public roads since 2014.
- The invention is solar powered and does not generate polluting emissions, such carbon dioxide, into the atmosphere.
- This is an excellent alternative for mitigating climate change and improving air quality.
- The TUT solar car team is currently **ranked no1 in Africa according to the Sasol Solar Challenge 2018**.

Acceleration of SDG 13

TUT Research, Innovation and Engagement supports calls for urgent action to combat climate change and its impact.

Acceleration of efforts on SDG 13 would assist in attainment of other linked SDGs such as Zero Hunger; Good health and well-being; clean water and sanitation etc:

THANK YOU

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