



**OFFICIAL GUIDE TO SOUTH AFRICA 2017/18**

# Science and Technology

The Department of Science and Technology (DST) seeks to boost socio-economic development in South Africa through research and innovation. To achieve its goals, the department provides leadership, an enabling environment and resources for science, technology and innovation.

Through its programmes and several entities, the DST is accomplishing groundbreaking science and enhancing the well-being of all South Africans.

The department has made meaningful progress since the introduction of the *White Paper on Science and Technology* in 1996, and related policy documents like the National Research and Development Strategy and Ten-Year Innovation Plan, aimed at transforming the science, technology and innovation system to serve all South Africans, expanding and transforming human resources, increasing financial resources and promoting innovation to support socio-economic development.

### Tshwane Khulelwe project

During 2017/18, the Department supported the Tshwane Khulelwe project, an initiative that aims to curb maternal mortality. The primary objective of the project was to evaluate the clinical significance and benefit of routine screening with Umbiflow, a portable umbilical artery Doppler device developed by the South African Medical Research Council (SAMRC) and the Council for Scientific and Industrial Research (CSIR), of an unselected population in a low-resource primary health care setting.

The device is meant to assist in detecting foetuses at risk of stillbirth, and is cost-effective compared to other such devices. Funding has been secured from the World Health Organisation to expand the project into other African countries.

### Improved access to sanitation

Water supply and sanitation in South Africa remains a challenge, particularly in rural areas faced with growing service delivery backlogs. To contribute towards addressing these challenges, the DST in collaboration with the Bill and Melinda Gates Foundation invested in a programme aimed at piloting innovative sanitation technologies.

This programme has provided access to decent and appropriate sanitation services to previously underserved rural communities.

It is also contributing to technology localisation and unlocking industrialisation opportunities for South Africa. An innovative, water-efficient sanitation technology solution from Loughborough University in the UK is also being localised in the country.

The South African team, spearheaded by the DST, had developed and constructed a local prototype. During 2017/18, the product entered the testing phase. Once it has been tested and optimised, the model for mass production will be developed.

### Renewable Energy Hub and Spoke Programme

During 2017/18, SolarTurtle, a spin-off company of the Renewable Energy Hub and Spoke Programme at Stellenbosch University, built on the success of the Technology for Rural Education and Development programme in Cofimvaba, in the Eastern Cape, by expanding its footprint to other rural areas in South Africa and the Southern African region.

In 2017, in partnership with Nedbank, the SolarTurtle team launched its 100% renewable energy powered “mobile bank in a shipping container” in Mncwasa village in the remote Mbhashe Local Municipality in the Eastern Cape.

This cashless, wireless enabled branch is a pilot that seeks to understand the feasibility of switching away from the Telkom and Eskom networks, which are vulnerable to factors such as cable theft and unscheduled downtimes.

The lessons will be used to guide a possible roll-out in remote rural areas in South Africa and the rest of the continent. The SolarTurtle initiative also received support from the European

Union, securing a contract for the roll-out of the initiative in Lesotho to empower women entrepreneurs with access to clean forms of energy.

### Square Kilometre Array (SKA)

The SKA project is an important endeavour for Africa, with huge potential to contribute to and raise the profile of science, technology and innovation. The SKA Project is an international enterprise to build the largest and most sensitive radio telescope in the world, and will be located in Africa and Australia.

Supported by 10 member countries – Australia, Canada, China, India, Italy, New Zealand, South Africa, Sweden, The Netherlands and the United Kingdom – SKA Organisation has brought together some of the world's finest scientists, engineers and policy makers and more than 100 companies and research institutions across 20 countries in the design and development of the telescope. The MeerKAT, a precursor to the SKA Project, was being constructed near Carnarvon in the Northern Cape. The final MeerKAT will comprise 64 antennas, and will be integrated into the mid-frequency component of the SKA Phase 1.

Until the SKA is completed, the MeerKAT will be the most sensitive radio interferometer in the L-Band in the world. The sensitivity is expected to be more than 300 square metre per Kelvin ( $m^2/K$ ), well above the 220  $m^2/K$  originally specified.

By mid-2017, a total of 45 antennas and 57 pedestals had been installed as part of Meerkat. About 75% of MeerKAT components have been sourced locally.

### Hydrogen Fuel Cell Technology (HFCT)

Local HFCT development holds the promise of boosting manufacturing capacity and competitiveness in South Africa.

This forms part of the technologies identified in government's Nine-Point Plan, which seeks to boost the economy and create much-needed jobs. HFCT has been identified as a clean and reliable alternative energy source to fossil fuels.

The DST is making good progress in implementing the Hydrogen SA (HySA) Strategy, demonstrating fuel cell technology as a viable source of clean energy in South Africa.

In the 2017/18 financial year, the DST installed the first HySA-developed fuel cell system at Poelano Secondary School in the North West. The system is providing reliable power for lighting and computer equipment. This initiative demonstrates how renewable energy can meet the needs of communities without access to the main electricity grid.

### Titanium metal powder project

The DST supports the Titanium Metal Powder Project, which has a potentially significant economic impact for South Africa.

Titanium is used in industries such as aerospace, medical applications, transport and chemical processing to create high-performance, lightweight parts.

The titanium powder is also used in 3D printing, which is considered an alternative mode of manufacturing.

### National Bio-economy Strategy

The DST's Bio-economy Strategy positions bio-innovation as essential to the achievement of government's industrial and social development goals.

The strategy provides a high-level framework to guide biosciences research and innovation investments, as well as decision-making as South Africa adapts to the realities of global transition to a low-carbon economy.

Through the Bio-economy Strategy, bio-innovation would be used to generate sustainable economic, social and environmental development. The DST was aiming to have biotechnology make up 5% of the country's gross domestic product by 2050.

The strategy focused on three sectors namely agriculture, health and industrial applications and is also closely linked to other policies such as the Industrial Policy Action Plan, the NDP and the New Growth Path.

The department seeks to use bio-innovation to contribute to the achievement of government's industrial, health and social development goals, as well as to the development of indigenous knowledge applications.

## Entities

### **Academy of Science of South Africa (ASSAf )**

The ASSAf aspires to be the apex organisation for science and scholarship in South Africa, recognised and connected both nationally and internationally.

Through its membership, which represents the collective voice of the most active scholars in all fields of scholarly enquiry, ASSAf aims to generate evidence-based solutions to national problems.

As the only national science academy to be officially recognised by the South African government, ASSAf recognises and rewards excellence; promotes innovation and scholarly activity; provides effective, evidence-based scientific advice to government and other stakeholders; promotes public interest in and awareness of science and science education; and promotes national, regional and international linkages.

### **Council for Scientific and Industrial Research**

The CSIR is a world-class African research and development organisation, which was established through in 1945. It undertakes directed, multidisciplinary research and technological innovation that contributes to the improved quality of life of South Africans.

The organisation plays a key role in supporting government's programmes through directed research that is aligned with the country's priorities, the organisation's mandate, and its science, engineering and technology areas of competence.

### **Human Sciences Research Council (HSRC)**

The HSRC is mandated to initiate, undertake and foster strategic basic and applied policy research in the human sciences, and to gather, analyse and publish data relevant to developmental challenges in South Africa, elsewhere in Africa and in the rest of the world.

### **National Advisory Council on Innovation (NACI)**

The NACI, established by the NACI Act of 1997, is a statutory advisory board that advises the Minister of Science and Technology, and through the Minister, the Cabinet, on the role and contribution of science, mathematics, innovation and technology in promoting and achieving national objectives. The Act gives NACI a broad policy (advisory) mandate over all matters intrinsic to the functioning of the national system of innovation (NSI)

### **National Research Foundation (NRF)**

The primary objective of the NRF is to contribute to the improvement of the quality of life of all the people of the country through the promotion of a knowledge economy based on the generation, transfer and use of knowledge. The organisation therefore promotes and supports research through the provision of grants and bursaries, research infrastructure, international and industry collaboration opportunities and mobility through all the stages of a researcher's

career, across the spectrum of basic, applied, and strategic research, with an appropriate mix of programmes and funding mechanisms, in alignment to national priorities.

The NRF also supports and promotes awareness of and engagement with science to improve the level of science literacy and public participation in science, technology, engineering, mathematics and innovation.

### **South African Council for Natural Scientific Professions (SACNASP)**

The SACNASP is the regulatory body for natural science practitioners (professional natural scientists, natural scientists in training, natural science technologists and natural science technologists in training) in South Africa.

### **South African National Space Agency (SANSA)**

SANSA is mandated to promote the peaceful use of space; support the creation of an environment conducive to industrial development in space technology; foster research in space science, communications, navigation and space physics; advance scientific, engineering and technological competencies and capabilities through human capital development, outreach programmes and infrastructure development; and foster international cooperation in space-related activities.

SANSA provides space weather knowledge, expertise, products and services through the SANSA Space Weather Centre, which is the only Regional Warning Centre for Africa under the International Space Environment Service. It is also the only organisation performing compass swings in South Africa, making it an invaluable service to the nation and ensuring the safety of thousands of planes every year.

### **Technology Innovation Agency (TIA)**

TIA is mandated to provide customer-centric technology development funding and support, to provide an enabling environment for technology innovation in collaboration with other role players, and to develop an effective and efficient internal environment for the execution of the strategy.

### **Research and science bodies**

#### **South African Bureau of Standards (SABS)**

The SABS provides standardisation and conformity assessment services to protect the integrity of the South African market, protect consumers, create a competitive advantage for South African industry, and facilitate access by South Africans to local and international markets. The bureau is the sole publisher of South African national standards.

#### **National Intellectual Property Management Office (NIPMO)**

NIPMO provides support to the offices of technology transfer at publicly funded research institutions, which has led to significantly improved intellectual property management in universities and other research institutions.

#### **Agricultural Research Council (ARC)**

The ARC conducts fundamental and applied research with partners to generate knowledge, develop human capital, and foster innovation in agriculture by developing technology and disseminating information.

### **Mintek**

Mintek, South Africa's national mineral research organisation, develops appropriate and innovative technology for transfer to the minerals industry; and provides the industry with test work, consultancy, analytics and mineralogical services.

### **Council for Geoscience (CGS)**

As a scientific research council, the CGS provides for the promotion of research and the extension of knowledge in the field of geoscience as well as the provision of specialised geoscientific services.

### **South African Medical Research Council**

The SAMRC is an independent statutory body that coordinates health and medical research activities throughout South Africa. The scope of the organisation's research projects includes tuberculosis, HIV and AIDS, cardiovascular and non-communicable diseases, gender and health, and alcohol and other drug abuse.

With a strategic objective to help strengthen the health systems of the country, in line with that of the Department of Health, the SAMRC constantly identifies the main causes of death in South Africa.

The SAMRC distinguishes and awards scientific excellence with its annual Scientific Merit Awards Gala Ceremony. These awards acknowledge the contributions of established scientists on the one hand, while recognising fresh scientists with ground-breaking efforts in their individual fields of science, engineering and technology.

### **National Health Laboratory Service (NHLS)**

The NHLS is the largest diagnostic pathology service in South Africa with the responsibility of supporting the national and provincial health departments in the delivery of healthcare.

The NHLS provides laboratory and related public health services to over 80% of the population through a national network of laboratories. Its specialised divisions include the National Institute for Communicable Diseases, National Institute for Occupational Health, National Cancer Registry and Antivenom Unit.

### **Bureau for Economic Research (BER)**

The BER primarily focuses on the South African macro economy and selected economic sectors. It monitors and forecasts macroeconomic economic and sector trends, and identifies and analyses local and international factors that affect South African businesses.

### **National Institute for Tropical Diseases**

The National Institute for Tropical Diseases in Tzaneen, Limpopo, is responsible for the ongoing assessment of malaria-control programmes carried out by various authorities in South Africa. A malaria-reference service is also provided. Malaria tests are carried out by the institute, and statistical analyses of data pertaining to the programme is undertaken.

### **South Africa's National Energy Development Institute (SANEDI)**

The main function of SANEDI is to direct, monitor and conduct applied energy research and development, demonstration and deployment as well to undertake specific measures to promote the uptake of Green Energy and Energy Efficiency in South Africa.

### **National Agricultural Research Forum (NARF)**

The mission of the NARF is to facilitate consensus and integrate coordination in the fields

of research, development, and technology transfer to agriculture in order to enhance national economic growth, social welfare and environmental sustainability.

### **Water Research Commission (WRC)**

The WRC aims to develop and support a water-related knowledge base in South Africa, with all the necessary competencies and capacity vested in the corps of experts and practitioners within academia, science councils, other research organisations and government organisations (central, provincial and local) which serve the water sector.

The WRC provides the country with applied knowledge and water-related innovation, by continuously translating needs into research ideas and, in turn, transferring research results and disseminating knowledge and new technology-based products and processes to end-users.

### **Institute for Water Research (IWR)**

The IWR is a multidisciplinary research department of Rhodes University. The objectives of the IWR are to contribute to the knowledge of and promote the understanding and wise use of natural water resources in southern Africa.

### **South African Environmental Observation Network (SAEON)**

SAEON is a research facility that establishes and maintains nodes (environmental observatories, field stations or sites) linked by an information management network to serve as research and education platforms for long-term studies of ecosystems that will provide for incremental advances in the understanding of ecosystems and the ability to detect, predict and react to environmental change.

### **Fluorspar industry**

South Africa has the world's largest reserves of fluorspar, with estimated reserves of 41 million tons. The country supplies around 10% of the fluoride requirements to the global fluorochemicals industry.

### **South African Women in Science Awards (SAWiSA)**

The DST has been hosting the prestigious event since 2003 to recognise the achievements of women scientists and provide motivation for the increased participation of women in research.

The awards profile women scientists and researchers, and encourage and reward the next generation of young women who are starting their careers as researchers and scientists.

The 2018 edition of SAWiSA was held in Polokwane on 23 August 2018 under the theme: "100 years of Mama Albertina Sisulu: Women united in moving South Africa forward".

In 2018, the DST introduced an Astronomy category, and kickstarted this category with the presentation of a Minister's Special Award, the Commemorative MeerKAT Award.

This special award celebrated the launch of the completed 64-dish MeerKAT telescope array in the Northern Cape on 13 July, and the significant achievements of women in the field of astronomy.

As part of celebrating the centenary year of Struggle stalwart Mama Albertina Sisulu, who formed part of the Women's March to Pretoria in 1956, the DST also renamed its Fellowships category for Master's and Doctoral students to the DST-Albertina Sisulu Fellowships.

The personal prizes have been increased by R15 000 per award, and Tata Africa has also increased the value of the Tata Scholarships by R15 000 per award (from R60 000 to R75 000). Winners of the Distinguished Women Scientists Awards:

- Dr Mathabatha Evodia Setati – Natural (Physical and Life) and Engineering Sciences.

- Prof Maureen Nokuthula Sibiyi – Humanities and Social Science.

Winners of the Distinguished Young Women Scientists Awards:

- Prof Adrienne Edkins – Natural (Physical and Life) and Engineering Sciences.
- Prof Nicolene Barkhuizen – Humanities and Social Sciences.
- Prof Keolebogile Shirley Motaung – Research and Innovation.
- Prof Susan Ilani Loubser – Astronomy.

The winner of the Commemorative MeerKAT Award:

- Prof Renée Kraan-Korteweg.

Winners of the DST-Albertina Sisulu Fellowships (Doctoral) Award:

- Ms Isa Lambrechts – Natural (Physical and Life) and Engineering Sciences.
- Ms Zakeera Docrat – Humanities and Social Sciences.

The winner of the DST-Albertina Sisulu Fellowships (Master's) Award:

- Ms Innocensia Mokgohlwe Mangoato – Natural (Physical and Life) and Engineering Sciences.

The winner of the Tata Scholarships (Doctoral) Award:

- Ms Edith Phalane.

The winner of the Tata Scholarships (Master's) Award:

- Ms Olayile Ejekwu.

### International partnership

The year 2018 marked a decade since South Africa entered into a collaboration with the European Organisation for Nuclear Research (CERN), best known for major breakthroughs such as the discovery of the Higgs-Boson particle in 2012.

The research programme in fundamental physics at CERN's Large Hadron Collider has brought many opportunities for South Africa's science community.

South Africa has since established a very strong footprint and visibility at CERN, and also made a significant contribution to the discovery of the Higgs boson. The particle completed the Standard Model of Particle Physics, the current best theory of understanding nature at the level of particles.

South African researchers have been involved in several activities at CERN, and as a result of support from the DST, a fifth group, the SA-CERN Technology Transfer Group, was by end of 2018 being established to exploit the great potential of technology transfer to the South African industry.

By mid-2018, there were 80 South African students working at CERN, with several more eager to join the programme.

Black student representation was also expected to increase from 35% in 2014 to 65% in 2019, and women representation is expected to increase from 30% in 2013 to 50% in 2019.