



Science and technology

South Africa's science and research are world-class. The Department of Science and Technology seeks to realise the full potential of science and technology (S&T) in social and economic development, through the development of human resources (HR), research and innovation.

The department's budget over the Medium Term Expenditure Framework (MTEF) has increased by 26%, most of which will be used to fund new scientific research infrastructure such as the Centre for High Performance Computing.

Strategies

The department's Research and Development (R&D) Strategy, which was launched in 2002, enhances the National System of Innovation through which a multitude of role-players collaborate to pursue the goals of economic development and progress.

Government has recommitted itself to the R&D Strategy of 1% of gross domestic product to be invested by both public and private sectors by 2008. This implies an additional R2-billion investment across both sectors.

The department continues to develop strategies in new areas of knowledge and technology. Strategies for indigenous knowledge, nanotechnology, astronomy and intellectual property, derived from publicly-funded research, have been developed.

Biotechnology innovation centres (Brics)

The National Biotechnology Strategy (NBS), which was launched in 2001, sets the agenda for the development of South Africa's biotechnology industry.

Other initiatives include establishing regional Brics, namely: BioPAD, Cape Biotech, LIFElab and the Plant Biotechnology

Fact:

The Southern African Large Telescope at Sutherland in the Northern Cape, is one of South Africa's flagship scientific projects. It is the largest single optical telescope in the southern hemisphere.

Innovation Centre (PlantBio). Brics were created to act as instruments for the implementation of the NBS.

The Brics' focus areas cover a wide spectrum of the subdisciplines in biotechnology. These include human and animal health, biopharmaceuticals, industrial bioprocessing, mining biotechnology, bioinformatics and plant biotechnology. One of the challenges facing the South African biotechnology sector is the public's lack of understanding and knowledge of biotechnology applications and benefits.

Another programme initiated due to the NBS is the Public Understanding of Biotechnology Programme, which provides South Africans with information to participate meaningfully in debates about biotechnology and to make informed decisions.

Nanotechnology

In April 2006, the Deputy Minister of Science and Technology, Mr Derek Hanekom, officially launched South Africa's National Nanotechnology Strategy.

It recognises the needs of local industry and focuses on the essential building blocks of nanoscience, namely synthesis, characterisation and fabrication. The strategy is aimed at increasing the number of nanotechnology characterisation centres in South Africa with an investment of R170 million over the next three years, with the initial R15 million invested in 2005/06.

Known as 'the technology of the very small' (i.e. about 1/80 000 of the diameter of a human hair), nanotechnology comprises a wide range of technologies, techniques and multidisciplinary research efforts for application in a range of cross-cutting industries and activities. These include aerospace, manufacturing and automotive industries; energy conversion, storage and distribution; the hydrogen



economy; chemicals; electronics and information processing; as well as biotechnology and medicines, among other things.

South African industry and researchers have been key players in nanotechnology and the practical application of nanoscience for a number of years, for example, Sasol's chemical processing by catalysis.

New generations of nanotechnology-based products that are emerging in the world today require that South Africa develops its ability to derive more benefits from global advances in this area. The National Nanotechnology Strategy positions South Africa as a global player in this emerging area of S&T and seeks to strengthen the integrated development focus of government.

The strategy's main objectives are to:

- support long-term nanoscience research that will lead to a fundamental understanding of the design, synthesis, characterisation, modelling and fabrication of nanomaterial
- support the creation of new and novel devices for application in various areas
- develop the required HR and supporting infrastructure
- stimulate new developments in technology missions such as material for advanced manufacturing, nanobiomaterial for biotechnology, precious metal-based nanoparticles for resource-based industries, and advanced material for information and communications technologies.

The biotechnology sector is attracting a fast-growing portion of research and development funding. Funding for genetic engineering grew by 360% between 2002 and 2004. Investment growth in the related fields of biochemistry, genetics and molecular biology, microbiology, genetic engineering and biotechnology exceeded 46%. South Africa has a very high level of commitment to biotechnology, underpinned by a vibrant research sector.

Fact:

South Africa has been shortlisted as one of two sites to host the ambitious Square Kilometre Array (SKA) radio telescope, which will have multiple receiving surfaces and will provide radio astronomers with one million m² of collecting area. The Northern Cape is an ideal location for the SKA's core array.

Supporting innovators

Technology for Human Resources for Industry Programme (Thrip)

The programme aims to increase participation by small, medium and micro enterprises (SMMEs), Black Economic Empowerment entities, black and female researchers and students; as well as to increase the share of the Thrip budget allocation to historically disadvantaged individuals and universities of technology.

The MTEF budget allocation for Thrip was R143 million in 2005/06.

Innovation Fund (IF)

The IF was created to promote technological innovation, increase networking and cross-sectoral collaboration, increase competitiveness, improve quality of life, ensure environmental sustainability and harness information technology.

Tshumisano

The Tshumisano partnership programme encourages a closer partnership between technology stations based at participating universities of technology and SMMEs. The Tshumisano Trust, a joint venture between government, the German Agency for Technical Co-operation and the Committee of University of Technology Principals, is generating stronger working relationships between the departments of science and technology and of labour.

The Department of Science and Technology's Centre for High Performance Computing will support a diverse base of researchers and scientists, and facilitate the collaboration and multidisciplinary approach needed to solve complex computational problems. Its research objectives will be to provide high-end computing expertise for all research in South Africa in natural science, medicine, engineering and social sciences. Its first major capacity will be located at the University of Cape Town.

The Tshumisano Technology Station Programme (TSP) is advancing technology transfer and skills development to enhance equitable economic development. In this regard, the Higher Education sector has a vital role in supporting SMMEs to become engines of growth. The Tshumisano Trust is collaborating with universities of technology in particular to promote the development of industries in manufacturing, chemicals and textiles, and by supporting innovation within SMMEs and student skills development.

The Tshumisano TSP has increased its stations from three in 2001 to 10 in May 2006. The sectors that the programme supports include:

- mechanical engineering and chemicals
- material and processing
- clothing and textiles
- electronics and chemicals
- metal casting
- metal value-adding
- reinforced plastics.

By June 2006, Tshumisano had handled more than 482 projects, trained 134 students in various aspects of technology transfer and supported 356 small and medium-sized enterprises in technology applications, of which many are owned and run by entrepreneurs who were previously excluded from the economic mainstream.

National research facilities

The National Research Foundation (NRF) manages South Africa's national research facilities. It promotes and supports basic and applied research.

The NRF oversees the following national research facilities:

- South African Astronomical Observatory
- Hartebeesthoek Radio Astronomy Observatory

Fact:

The national survey of financial and human resource input into research and development (R&D) found that South Africa spent about R12 billion, or 0,87% of gross domestic product (GDP), on R&D in 2004/05 representing an improvement on the 2003/04 R&D survey, which recorded R&D expenditure as R10,1 billion, or 0,81% of GDP. The Department of Science and Technology commissioned the survey.

- Hermanus Magnetic Observatory
- South African Institute for Aquatic Biodiversity
- South African Environmental Observation Network
- National Zoological Gardens
- iThemba Laboratory for Accelerator-Based Sciences (iThemba Labs).

Science councils

Council for Scientific and Industrial Research (CSIR)

The CSIR is one of the largest scientific and technology research, development and implementation organisations in Africa. The organisation undertakes and applies directed research and innovation in S&T to improve the quality of life of South Africans.

Mintek

Mintek, South Africa's national mineral research organisation, is one of the world's leading technology organisations specialising in mineral processing, extractive metallurgy and related areas.

SumbandilaSat, South Africa's new low Earth-orbiting satellite, was expected to be launched into space from a submarine in Russia in December 2006.

SumbandilaSat is part of a multimillion rand, three-year integrated national space programme developed by the Department of Science and Technology and carried out by the University of Stellenbosch, Sunspace and Information Systems, and the Satellite Application Centre. The University of Stellenbosch was responsible for managing the project and training students. Sunspace and Information Systems was tasked with building the satellite and the Satellite Application Centre was responsible for operations, telemetry, tracking, control as well as data capturing.

The programme will give South Africa affordable access to space technology and useful data, thus serving as a research tool to support in monitoring and managing disasters and determining the extent of floods, oil spills and fires, among other things.

The intensity of R&D expenditure (measured as the percentage of GDP spent on R&D) is a good indication of the competitiveness of a country's economy.

In South Africa, women researchers comprise 38,3% of all researchers. Most South African R&D is done in the major research field of engineering sciences (23,9% of total R&D), followed by the natural sciences (20,8%) and the medical and health sciences (14,8%).

Collaborating with industry and other R&D institutions, Mintek provides service testwork, process development, consulting and innovative products to clients worldwide.

Mintek is an autonomous statutory organisation and reports to the Minister of Minerals and Energy. About 35% of the annual budget of R275 million is funded by the State Science Vote, with the balance provided by contract R&D, sales of services and products, technology licensing agreements and joint-venture operating companies.

Human Sciences Research Council (HSRC)

The HSRC is South Africa's statutory research agency and conducts research that generates critical and independent knowledge relative to all aspects of human and social development. Alleviating poverty and developing and implementing policy are central to its research activities. The HSRC's research also extends beyond South Africa through projects and collaborations in other African countries.

Medical Research Council (MRC)

The MRC conducts research through six national programmes, and collaborates with most of the world's top health-research agencies to improve the nation's health status and quality of life.

The MRC disseminates research information through the National Health Knowledge Network. The council has established the African Biotechnology Information Centre in co-operation with various universities.

The MRC's National HIV and AIDS Lead Programme co-ordinates the South African AIDS Vaccine Initiative (Saavi).

Saavi has grown from a small core group of researchers into a large biotechnology consortium, which works on various aspects of developing and testing novel HIV vaccines.

Fact:

The International Science, Innovation and Technology Exhibition (Insite) was held in September 2006, six years after 119 countries, including South Africa, signed up for the millennium development goals (MDGs) at the United Nations. Insite 2006 focused on three themes that directly affect South Africa's ability to address the MDGs:

Agricultural Research Council (ARC)

The ARC is committed to promoting agriculture and related sectors through research and technology development and transfer.

Council of Geoscience (CGS)

The CGS supplies the country with geoscience data to establish a safe cost-effective physical infrastructure.

South African Bureau of Standards (SABS)

The SABS produces, maintains and disseminates standards. It promotes standardisation in business and government, and administers compulsory standards on behalf of the State. It also certifies international quality standards.

Other important research bodies and areas

The National Institute for Tropical Diseases in Tzaneen, Limpopo, continually assesses various malaria-control programmes.

The South African National Antarctic Programme manages three bases, one at Vesleskarvet, Antarctica; a second on Marion Island in the south Indian Ocean; and a third on Gough Island, a British territory in the South Atlantic Ocean.

In 2004/05, government allocated funds to the Pebble Bed Modular Reactor (PBMR) Project. Government wants to produce between 4 000 and 5 000 megawatt (MW) of power from pebble bed reactors in South Africa. This equates to between 20 and 30 PBMR reactors of 165 MW each. The project is factored into the country's future energy planning from about 2010 onwards. The PBMR will place the country at the forefront of energy technology.

- Science and Youth, emphasising educators, learners and careers in science and technology
- Science for Economic Growth, focusing on innovation, discovery and the capacity for science to stimulate economic growth
- Science for Sustainable Development, demonstrating how science can improve South Africans' quality of life and bring them prosperity.

South Africa is the only African country with a presence in Antarctica, and which is also conducting research there in physics, engineering, Earth sciences, and biological and oceanographic sciences.

The South African base, Sanae IV, is one of few country bases built on hard rock as opposed to the ice shelf, and is regarded as one of the more modern bases on Antarctica. The Department of Science and Technology has finalised the Antarctic Research Strategy for South Africa.

Mine-safety research

The Safety in Mines Research Advisory Committee aims to advance mineworkers' safety. It has a permanent research-management office overseeing research in rock engineering, engineering and occupational health.

Energy research

The Chief Directorate: Energy of the Department of Minerals and Energy manages a policy-directed research programme. This includes transport energy, renewable energy and energy for developing areas, coal, electricity, energy efficiency, energy economy and integrated energy-policy formulation.

Agricultural research

Agricultural research is conducted by the ARC, several universities and the private sector.

In September 2006, President Thabo Mbeki presented Selig Percy Amoils, Patricia Berjak and Lionel Opie with the Order of Mapunguwe, Silver class, for their contribution to the field of science.

Water research

Water research in South Africa is co-ordinated and funded by the Water Research Commission in Pretoria.

The organisations most active in water research are:

- universities and universities of technology (56,25% of the total number of contracts)
- professional consultants (16,6%)
- science councils (22,9%)
- water/waste utilities (2%)
- non-governmental organisations (2%).

Coastal and marine research

The Chief Directorate: Marine and Coastal Management advises on the use of marine living resources and the conservation of marine ecosystems, by conducting and supporting relevant multidisciplinary scientific research and monitoring the marine environment.

Environmental research

The Chief Directorate: Environmental Management of the Department of Environmental Affairs and Tourism annually finances several research and monitoring programmes.

The programmes focus on waste management and pollution, nature conservation, river management, the coastline and marine environment, and the atmosphere, among other things.