



## 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, research and innovation.

### 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.

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.





South Africa is bidding to host the ambitious Square Kilometre Array (SKA) radio telescope, a telescope that will have multiple receiving surfaces and will provide radio astronomers with one million m<sup>2</sup> of collecting area. The Northern Cape is an ideal location for the SKA's core array.

## Innovation centres

The Department of Science and Technology has created trusts as agencies for driving the development of the biotechnology sector in South Africa. These are the biotechnology regional innovation centres, the PlantBio Innovation Centre and the National Bioinformatics Network. These institutions – individually, collectively, and in partnership with the incubators, industry, and with the broader biotech role-players – must develop their leadership role to grow the South African biotechnology sector.

Backed by the European Union, the Godisa National Incubation Programme was launched in 2001. The programme aims to encourage technology transfer and to help small businesses compete in the global economy. By 2005, Godisa had supported 1 280 small, medium and micro enterprises (SMMEs).

## Supporting innovators

### Technology for Human Resources for Industry Programme (THRIP)

The programme aims to increase participation by SMMEs, Black Economic Empowerment entities, black and women



In 2005, Cabinet approved the Indigenous Knowledge Systems Policy. This followed recognition of the fact that indigenous knowledge has always been and continues to be the primary factor in the survival and welfare of the majority of South Africans. The policy seeks to recognise and protect the custodians and practitioners of this knowledge.

International alliances being forged with the European Union, within the New Partnership for Africa's Development structure and the India-Brazil-South Africa partnership are gaining momentum. Prior to 1994, foreign funding of South African research and development (R&D) was almost zero. By 2005, it had grown to at least 6% of total expenditure.

The Department of Science and Technology manages 36 signed international bilateral agreements, which have resulted in over 300 R&D projects.

researchers and students; as well as to increase the share of the THRIP budget allocation to historically disadvantaged individuals and universities of technology.

The Medium Term Expenditure Framework budget allocation for THRIP was R143 million in 2005/06.

### **Innovation Fund**

The Innovation Fund 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. The Innovation Fund's budget increased to R171 million in 2004/05.

### **Research capacity-development programmes**

These seek to boost historically black universities by supporting individual researchers and encouraging a postdoctoral research culture.

### **National research facilities**

South Africa's national research facilities are managed by the National Research Foundation (NRF). The NRF is responsible for promoting and supporting basic and applied research.

The following national research facilities are managed under the mandate of the NRF:

- South African Astronomical Observatory
- Hartebeesthoek Radio Astronomy Observatory

- Hermanus Magnetic Observatory
- South African Institute for Aquatic Biodiversity
- South African Environmental Observation Network, an emerging national research facility
- 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.

The organisation's staff complement is in the order of 2 500 with a core of technical and scientific specialists.

The CSIR's portfolio includes:

- research, development and implementation
- technology transfer and assessment
- scientific and technical education and training
- policy and strategic decision support
- global S&T links as well as perspectives
- specialised technical and information consulting
- prototyping and pilot-scale manufacturing
- commercialisation of intellectual property, including venture establishment.

### **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. Working closely 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 R278 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. Mintek has some 480 permanent staff members, over half of whom are scientists, engineers and other technical R&D personnel.

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

The HSRC is South Africa's statutory research agency dedicated to the applied social sciences. It has about 130 researchers, mainly specialists, 30 interns and 110 support staff. Its revenue is derived roughly equally from its parliamentary grant and from earnings through tenders, commissions, and local and international foundation grants.

According to a survey by the Centre for Science, Technology and Innovation Indicators, South Africa spent R10,1 billion or 0,81% of gross domestic product on research and development (R&D) in 2003/04.

This was an increase from R7,5 billion in 2001/02.

While South Africa's R&D expenditure is fairly high compared with that of other developing countries, the total number of researchers is low at 2,2 researchers per 1 000 employees.

Women researchers make up 38% of the total researchers, compared with 11,2% in Japan and 28,4% in Norway. In developing countries, Argentina leads the way with 50,5% women researchers.

The largest amount, 28%, of R&D is performed in the field of engineering sciences. This is followed at 21,9% in natural sciences and 13,5% in the medical and health sciences.

The major performer and financier of R&D is the business sector, which performs 55,5% of all R&D undertaken and finances 52% of the total spent in this field.

Government financed 28%, while 10% of R&D is financed from abroad.

Higher Education performs 20,5% of national R&D, and government 21,9%.

The HSRC conducts social-science research concerned with all aspects of development and poverty alleviation in South Africa, the region and in Africa.

### **Medical Research Council (MRC)**

Established in 1969, 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 recently established the African Biotechnology Information Centre in co-operation with various universities.

The MRC National HIV/AIDS Lead Programme co-ordinates the South African AIDS Vaccine Initiative (SAAVI).

This initiative 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.

By 2005, SAAVI had developed three candidate vaccines that had entered the regulatory process in preparation for trials. Human clinical trials with the DNA vaccine began in 2004. The development team completed the pre-investigational new drug application with the United States Food and Drug Administration (FDA) in 2003, which was the first-ever from a developing country to be lodged with the FDA.

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

The ARC is committed to the promotion of agriculture and



In 2004, South Africa was represented at the International Workshop on the Changing Role of Science Centres in Vietnam. The Vietnam Agreement resolved to strengthen the science centre network in developing countries. Nearly 600 000 people visit science centres in South Africa every year; about two thirds of whom are learners.

In June 2005, the South African Biodiversity Information Facility (SABIF) and its portal were launched at the Innovation Hub in Pretoria.

SABIF aims to contribute to South Africa's sustainable development by facilitating access to biodiversity and related information on the Internet. The SABIF Portal will serve as South Africa's national gateway to open and free scientific biodiversity information. In doing this, SABIF will contribute towards a co-ordinated international scientific effort to enable users throughout the world to discover and put to use vast quantities of biodiversity data.

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 such as ISO 9000 and ISO 14001.

### **Other important research bodies**

The National Institute for Tropical Diseases in Tzaneen, Limpopo, does ongoing assessment of various malaria-control programmes.

The South African National Antarctic Programme manages three bases, one at Vesleskarvet in Dronning Maud Land, 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.

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

### **Water research**

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

In 2004/05, government allocated funds to the Pebble Bed Modular Reactor (PBMR) project. The funding enables the PBMR to secure strategic contracts for the development of key components such as the turbine machinery being developed by Mitsubishi Heavy Industries from Japan and a helium test facility at Pelindaba. 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.

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. Sustainable use and the need to preserve future options in the use of marine ecosystems and their resources are guiding objectives in the research and advice provided by the chief directorate.

### **Environmental research**

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

The programmes comprise subjects such as waste management and pollution, nature conservation, river management, the coastline and marine environment, and the atmosphere.