SCIENCE AND TECHNOLOGY

The Department of Science and Technology is tasked with ensuring greater coordination and integration, as well as better management of all government-funded science and technology institutions, and to provide a holistic overview of public expenditure on science and technology.

The department funds basic research at universities and public entities, including science councils, so that they can train scientists, engineers and technologists and produce publications and patents.

Almost 60% of the department's R4,4-billion budget is spent on public entities. Of the overall research and development spend, the greatest portion is on the natural, medical and health sciences.

Donor funding

The department received official development assistance from Australia, Canada, the European Community, Finland, the United States Agency for International Development (USAID) and Japan.

Ten-Year Innovation Plan

The Ten-Year Innovation Plan helps to establish a knowledge-based economy for South Africa.

The Ten-Year Innovation Plan set long-term goals based on the grand challenges it identified. They included:

- becoming one of the top three emerging economies in the global pharmaceutical industry, based on innovative use of South Africa's indigenous knowledge and rich biodiversity
- deploying satellites that provide a range of scientific, security and specialised services for all spheres of government, the public and the private sector
- achieving a 25% share of the global hydrogen and fuel cell market with novel platinum group metal catalysts
- becoming a world leader in climate science and responding effectively to the multiple challenges associated with global and climate change
- meeting the 2014 millennium development goal to halve poverty.

Astronomy

The Southern African Large Telescope (Salt) was launched in November 2005, in Sutherland in the Northern Cape.

This is a multimillion-rand project involving Germany, Poland, the USA, New Zealand and the United Kingdom (UK). It is the largest single optical telescope in the southern hemisphere.

In 2012, the Square Kilometre Array (SKA) Organisation announced that South Africa and Australia would share the hosting of the most advanced scientific project in the world, thus firmly cementing South Africa's position as a major player on the world's science and technology stage.

According to the SKA Organisation, the two biggest components – about 70% of the facility – will be built in Africa, while one will be built in Australia. The SKA, which will be one of the biggest single global science projects the world has ever seen, will also contribute towards skills development, job creation, and economic growth.

The MeerKAT Array is currently taking shape in the Karoo and will be the largest and most sensitive radio telescope in the southern hemisphere, until the SKA is completed around 2024. The MeerKAT radio telescope array, which will start operations in 2016.

Nanotechnology

Nanotechnology, unlike other technologies, can find applications in virtually all areas of human life. In spite of it being in its beginning stages, some of the known issues related to nanotechnology suggest a wide spectrum of potential societal impact.

Two nanotechnology innovation centres were established at the Council for Scientific and Industrial Research (CSIR) and Mintek.

Indigenous Knowledge Systems (IKS)

The indigenous knowledge of many communities embodies a deeply spiritual and ancient relationship with the Earth's systems and cycles.

In April 2012, South Africa and Germany launched the German-South African Year of Science in Cape Town. There are roughly 600 German companies in South Africa, constituting ideal places for graduates to get good on-the-job training.

The National Recordal System is the largest fingerprint initiative of the region to document and record indigenous knowledge.

Indigenous knowledge research chairs were awarded the University of KwaZulu-Natal and Walter Sisulu University.

The Department of Science and Technology also established IKS centres of excellence at the universities. These centres will play a defining role in generating highly qualified human resources capacity in IKS.

Biotechnology

South Africa's research institutions and universities are conducting biotechnology research to increase production of crops suited to local conditions, enhance crop nutritional value and improve preservation and processing methods resulting in novel and improved food products.

Research is being conducted on understanding the nutritional components of food indigenous to South Africa, with the aim of making those with a high nutritional value available and accessible to the majority of people.

South Africa is classified as one of the 14 mega biotech countries in the world, and the only one in Africa. These countries have a special responsibility to ensure that the potential impacts of genetically modified organisms on human or animal health; on the environment; together with their probable socio-economic impact, are carefully measured, assessed and estimated before they are released.

Role players

Academy of Science of South Africa (ASSAf)

ASSAf is the official national Academy of Science of South Africa and represents the country in the international community of science academies.

Africa Institute for South Africa (Aisa)

Aisa's mandate is to produce knowledge aimed at informing sustainable political and socio-economic development in Africa. Its vision is to be an indispensable African voice on African Affairs, and its 2011 – 2015 research agenda is to seek solutions for Africa's developmental challenges.

Council for Scientific and Industrial Research (CSIR)

The CSIR is one of the leading science and technology research, development and implementation organisations in Africa. The CSIR's main site is in Pretoria, while it is represented in other provinces of South Africa through regional offices.

Human Sciences Research Council (HSRC)

The HSRC conducts large-scale, policy-relevant, social-scientific projects for public-sector users, non-governmental organisations and international development agencies.

National Advisory Council on Innovation (Naci)

Naci advises the Minister of Science and Technology on the role and contribution of innovation (including science and technology) in promoting and achieving national objectives.

National Research Foundation (NRF)

As an independent government agency, the NRF promotes and supports research in all fields of knowledge. It also

In December 2012, governments meeting at the United Nations Climate Change Conference (COP18) launched a new commitment period under the Kyoto Protocol and also agreed on a firm timetable to adopt a universal climate agreement by 2015.

The Kyoto Protocol, the only existing and binding agreement through which developed countries commit to cutting greenhouse gases, has been amended so that it continued as of 1 January 2013. The first commitment period ended on 31 December 2012. The length of the second commitment period will be eight years.

In March 2013, the South African National Space Agency and the Russian Federal Space Agency (Roscosmos) signed the RadioAstron Space Satellite Agreement. Coinciding with Russian President Vladimir Putin's visit to the country to attend the fifth BRICS Summit, the agreement paved the way for the two countries to work together on the development of science and space technologies.

The RadioAstron satellite was launched by Roscosmos in July 2011. It carries a radio telescope that will obtain images and coordinates of various radio-emitting objects.

conducts research and provides access to national research facilities. The NRF provides services to the research community, especially at higher education institutions and science councils, with a view to promote high-level human capital development. The NRF aims to uphold excellence in all its investments in knowledge, people and infrastructure.

South African National Space Agency (Sansa)

Sansa was created to promote the use of space and cooperation in space-related activities while fostering research in space science, advancing scientific engineering through developing of our human capital and provide support to industrial development in space technologies.

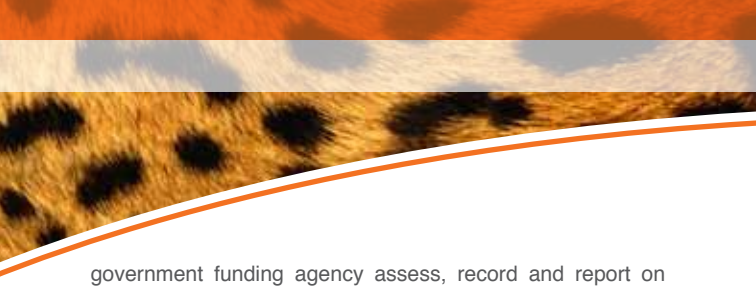
Technology Innovation Agency (TIA)

The TIA's core business objective is to support the development and commercialisation of competitive technology-based services and products. The agency primarily uses South Africa's science and technology base to develop new industries, create sustainable jobs and help diversify the economy.

It invests in the following technology sectors: advanced manufacturing, agriculture, industrial biotechnology, health, mining, energy, and information and communications technology.

National Intellectual Property Management Office (Nipmo)

Nipmo aims to ensure that recipients of funding from a



government funding agency assess, record and report on the benefit to society of intellectual property emanating from publicly financed research and development.

Recipients must protect intellectual property emanating from publicly financed research and development from appropriation and ensure that it is available to the people of South Africa. A recipient must identify commercialisation opportunities for intellectual property emanating from publicly financed research and development.

Agricultural Research Council (ARC)

The ARC is the principal agricultural research institution in South Africa. It conducts fundamental and applied research with partners to generate knowledge, develop human capital, and foster innovation in agriculture by developing technology and disseminating information. It also commercialises research results.

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.

Medical Research Council (MRC)

The MRC is an independent statutory body that coordinates health and medical research activities throughout South Africa.

Council for Geoscience (CGS)

The CGS' mandate is to be the custodians of geotechnical information; to act as a national advisory authority in respect of geohazards related to infrastructure and development; and to undertake exploration and prospecting research in the mineral and petroleum sectors.

South African Bureau of Standards (SABS)

The SABS is a statutory body that operates as the national

institution for the promotion and maintenance of standardisation and quality in connection with commodities and the rendering of services. It 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 research bodies and areas

Eskom

Eskom's Technology Services International group is a multidisciplinary industrial laboratory and consulting organisation. It undertakes testing, investigation studies, project management, engineering services and applied research for Eskom and other customers.

Sasol

Sasol's culture of innovation began in the 1950s when it developed its unique blend of coal gasification and Fischer-Tröpsch (FT) technology for its original coal-to-liquids operations at Sasolburg.

It has since evolved these operations into fully fledged research and development facilities that form the heart of the Sasol Technology R&D group.

Focused FT research and development in the 1980s and 1990s led to the development of the low temperature FT Sasol Slurry Phase process used at Sasolburg, and the high-temperature Sasol Advanced Synthol™ process used at Secunda.

ArcelorMittal

ArcelorMittal is a global steel-maker, with an industrial presence in 27 countries. It is the leader in all major global markets, including automotive, construction, household appliances and packaging.

The group is a leader in research and development and technology, holds sizeable captive supplies of raw material, and operates extensive distribution networks.

National Health Laboratory Service (NHLS)

The NHLS forms a national network of integrated pathology laboratories throughout the country that use common laboratory management systems and transport networks to facilitate the transport of specimens, referral of tests to reference laboratories, and delivery of results.

The NHLS has 265 laboratories and employs about 6 500 people. Their activities comprise diagnostic laboratory services; research, teaching and training; and producing sera for anti-snake venom, reagents and media. All laboratories provide laboratory diagnostic services to the Department of Health, provincial hospitals, local authorities and medical practitioners.

Bureau for Economic Research (BER)

The BER, located at the University of Stellenbosch, Western Cape, is an independent economic research organisation. It renders a service to organisations ranging from small one-person businesses to policy-makers at the highest level of government.

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.

Control methods are assessed and recommendations made to the appropriate authorities regarding equipment, insecticide usage and application. 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.

Institute for Economic Research on Innovation (Ieri)

Ieri was established as a public-good research organisation with a core competence in the analysis of systems of innovation. Its mandate is to provide research, capacity-building and community engagement in this field of study.

In April 2012, South Africa and Germany launched the year-long German-South African Year of Science 2012/2013 in Cape Town. The Year of Science celebrated the two countries' intense relations in science and research, and sought more innovative ways to strengthen the relations further.

South Africa's National Energy Development Institute (Sanedi)

Sanedi was established in 2012 through the merger of the South African National Energy Research Institute and National Energy Efficiency Agency.

The departments of science and technology, minerals and energy are joint custodians of Sanedi and assist in providing political and strategic focus for the company.

The institute is entrusted with the coordination and undertaking of public interest energy research, development and demonstration.

As such, it is responsible for enabling and implementing the energy technology roadmaps, which support long-term energy policies developed by the Department of Energy.

Mine-safety research

The activities of the Safety in Mines Research Advisory Committee are aimed at advancing the safety of workers employed in South African mines.

The committee is a statutory tripartite subcommittee of the Mine Health and Safety Council. It has a permanent research-management office managing the engineering ,rock engineering and mine occupational health fields of research.

National Agricultural Research Forum (Narf)

Narf coordinates agricultural research and development within the national agricultural research system.

Narf also provides a platform for stakeholder consultations on research and development matters. Biannual meetings are held to debate and agree on research needs, programmes and budgeting.

Water Research Commission

The main areas of research are surface hydrology, groundwater, hydrometeorology, agricultural water-use, water pollution, municipal effluents, industrial water and effluents, drinking water, membrane technology, water ecosystems, hydraulics, mine-water management, water policy, developing communities and the transfer of technology.

Institute for Water Research (IWR)

The IWR is a multidisciplinary research department of Rhodes University in Grahamstown. 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 through scientific research.

Coastal and marine research

The NRF supports marine and coastal research in partnership with the Department of Environmental Affairs and the South African Network for Coastal and Oceanic 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 by monitoring the marine environment.

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

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.

Human-capital development

The Department of Science and Technology's Human Capital and Science Platforms Subprogramme conceptualises, formulates and implements programmes aimed at developing and renewing science, engineering and technology human capital to promote knowledge generation, protection and exploitation.

By May 2012, there were 152 SARChI chairs. The NRF established an additional 25 postdoctoral fellowships, each worth R180 000 a year, for three years.

In May 2012, the then Minister of Science and Technology, Naledi Pandor, announced a one-year science and technology graduate internship programme in partnership with Da Vinci Institute and the TT100 companies, to give young graduates work experience and the opportunity to learn entrepreneurship skills from successful technology companies.

The initial intake comprised 50 interns. The department allocated R110 million in the 2012 to 2014 period to the programme, drawing on the R9,5 billion economic competitiveness package announced in the National Budget in February 2012. In 2012 and 2013, it allocated R15 million in each year, and R80 million in 2014/15.

In 2012, ASSAf made significant strides in increasing access to online journals and the visibility of South African research. The implementation of SciELO (Scientific Electronic Online), South Africa's open-access platform, provided free access to South African scholarly journals.

By May 2012, there were 22 journals on the platform, with plans to grow to 180 journals.

Statistics showed that the site was visited over 1 000 times a day, with over half the visits from outside Africa. Between May 2009 and May 2012, the South African Journal of Science had nearly 130 000 articles downloaded.