SOUTH AFRICA

Yearbook

2021/22

Education, Science and Innovation

Education

The Constitution of the Republic of South Africa, 1996, declares basic education as an inalienable basic human right for all South Africans. In 2015, the United Nations Educational, Scientific and Cultural Organisation (UNESCO) adopted the global education agenda, Education 2030, which is part of the 17 UN Sustainable Development Goals (SDGs) that make up the Agenda 2030 for sustainable development. SDG 4 calls for an "inclusive, quality and equitable education and lifelong opportunities for all".

The National Development Plan (NDP) states that by 2030 South Africans should have access to education and training of the highest quality, leading to significantly improved learning outcomes. The education system will play a greater role in building an inclusive society, providing equal opportunities and helping all South Africans to realise their full potential.

Education is governed by two national departments, namely the Department of Basic Education (DBE), which is responsible for primary and secondary schools, and the Department of Higher Education and Training (DHET), which is responsible for tertiary education and vocational training.

Accessibility to education has improved significantly over the years, ensuring that South Africans are exposed to education at all levels to ensure that socio-economic challenges in the country are addressed.

The inclusive education system plays a major role in ensuring that there is access to quality basic education for leaners with special needs. This system contributes immensely towards the achievement of an inclusive economy and inclusive society.

The Early Childhood Development (ECD) Programme has ensured that the initiative is expanded to all socio-economic levels of society. This programme ensures that school readiness is a priority among South Africans and equal basic education is achieved by government.

Evaluation and research has been a serious deficiency in the country and the education sector, but over the years, with the introduction of monitoring, research and evaluation in the sector, performance has also improved. There is substantial research conducted within the sector which assists in identifying gaps and also creates a platform to monitor the sector through evidence-based evaluations.

Basic education

The DBE is mandated to monitor the standards of education provision, delivery and performance across South Africa, annually or at other specified intervals, to assess compliance with provisions of the Constitution and the National Education Policy.

- The functions of the DBE include:
- managing the development, evaluation and maintenance of policy, programmes and systems for ECD in the reception years;
- developing, evaluating and maintaining an accreditation system for providers and trainers;
- developing and maintaining policy concerning programmes, qualifications and assessment for ECD; and
- rendering support to qualifications and quality assurance authorities concerning ECD.

Schooling 2025, the overarching plan for the basic education sector, encapsulates the long-term vision of education priorities, targets and programmes articulated for the sector in the NDP.

The Policy on Screening, Identification, Assessment and Support (SIAS) was developed over a period of 10 years through a rigorous process of field testing and consultation. It aims to ensure that all children of school-going age who experience barriers to learning, including people with disabilities, will be able to access inclusive, quality, free, primary and secondary education on an equal basis with other young people in the communities in which they live.
The policy aims to standardise procedures to identify, assess and provide programmes for all learners who require additional support to enhance their participation and inclusion in school, making teachers and parents central to the support processes.
The successful implementation of the Policy on SIAS will be an important step towards meeting the obligations of government in respect of the UN Convention on the Rights of Persons with Disabilities as ratified by Cabinet in November 2007, in terms of ensuring an inclusive education system at all levels.

Over the medium term, the DBE will continue to focus on improving school infrastructure, providing high quality support materials for learners and teachers, developing skills for a changing world, facilitating the increase in supply of quality teachers, while preparing serving teachers to teach new subjects that will prepare learners for a changing world, taking over the early ECD function from the social development sector and providing nutritious meals for learners through the National School Nutrition Programme (NSNP).

School attendance

There were approximately 15 million learners at school in 2021. The largest percentage of these learners attended schools in KwaZulu-Natal (21,5%) and Gauteng (21,3%). Although only 5,6% of learners attended private schools, there were large variations between provinces. While 12,5% of learners in Gauteng attended private schools, only 2,4% of learners in North West and Eastern Cape attended such institutions.

The Coronavirus Disease 2019 (COVID-19) negatively affected school attendance in 2020 and 2021. According Statistics South Africa's (Stats SA) General Household Survey (GHS) of 2021, a much higher percentage of children aged five and six years old were not attending educational institutions in 2020 and 2021 than in 2019, before COVID-19 started.

Amongst five year olds the percentage of children who did not attend any education institutions increased from 10,9% in 2019 to 37,7% in 2020, before declining to 19,4% in 2021. It is clear that the young age groups were worst affected by the closure of nursery schools and pre school centres during this time.

A similar pattern was observed for children aged six (3,5% in 2019 increasing to 11,8% in 2020 before declining to 5,9% by 2021). Although participation (enrolment) in education was still relatively high, data shows that a slightly higher percentage of children in older age groups were not attending school compared to 2019.

The percentage of persons aged seven to 24 who attended educational institutions increased from 73,1% in 2002 to 76,3% in 2021. Attendance increased across most provinces between 2002 and 2021, with the highest increase observed in Northern Cape (+7,8 percentage points) and Free State (+7,3 percentage points).

Males and females in the age group 7–18 years provided various reasons for not attending any educational institutions. Learners most commonly reported illness and disability (22,7%), poor academic performance (21,2%) and a lack of money for fees (19,5%) as the main reason for not attending an educational institution.

Although 7,8% of individuals left their studies as a result of family commitments (i.e. getting married, minding children and pregnancy), it is noticeable that females were much more likely to offer these as reasons than males (13,4% compared to 0,5%).

Approximately 2,3% of individuals reported that education was useless. Males were more likely to share this sentiment than females in this instance. Although inadequate access to money to pay for fees remains a major hurdle for learners, attendance of no-fee schools has increased notably since 2002.

The percentage of learners aged five years and older who attended schools where no tuition fees were levied increased from 0,4% in 2002 to 65,9% in 2014, before increasing more slowly to 70,2% in 2021. Provincially, 92,8% of learners in Limpopo and 78,7% of learners in Eastern Cape attended no-fee schools, compared to 49,7% of learners in Western Cape and 56,4% in Gauteng.

The percentage of individuals aged 20 years and older who did not have any education decreased from 11,4% in 2002 to 3,2% in 2021, while those with at least a Grade 12 qualification increased from 30,5% to 50,5% over the same period. Inter-generational functional literacy has also decreased markedly.

While 35,8% of South Africans over the age of 60 years did not complete at least a Grade 7 qualification, this figure dropped to only 3,2% for those aged 20- 39 years of age. Almost one-third (31,5%) of individuals aged five years and older attended some kind of educational institution. Nationally, 87,6% of these individuals attended primary or secondary schools, while a further 5,6% attended tertiary institutions. Only 2,1% of individuals attended Technical and Vocational Education and Training (TVET) colleges.

The percentage of individuals aged five years and older and who attended school was the highest in Limpopo (92,7%) and Eastern Cape (92,4%), and lowest in Gauteng (80,2%). Attendance of higher education institutions was most common in Gauteng (9,5%), Free State (7,0%) and Western Cape (6,9%).

The percentage of individuals aged 5–24 years that attended educational institutions by single ages shows very high school attendance in the age group 7–14 years, after which the attendance of educational facilities drops sharply.

By the age of 24 years, approximately 10,0% of individuals were still attending an educational facility. The figure also shows a noticeable

representation of learners who were older than the ideal graduation age in primary and secondary schools.

Improving school infrastructure

The department is committed to improving the physical infrastructure and environment at every public school in the basic education sector. To this end, spending on the education infrastructure grant and the school infrastructure backlogs grant in the Planning, Information and Assessment programme accounts for an estimated 51.8% (R47.4 billion) of the department's total budget over the MTEF period.

The Education Infrastructure Grant is allocated R38.8 billion over this period, including an additional R470.5 million to repair school infrastructure damaged by storms in KwaZulu-Natal. Funds from this grant are transferred to provinces as a supplementary conditional grant to help accelerate the construction, maintenance, upgrading and rehabilitation of new and existing infrastructure in the basic education sector.

Funds from the School Infrastructure Backlogs Grant are intended to provide schools with water and sanitation, and to replace schools constructed with inappropriate materials such as mud. Over the medium term, R6.7 billion is allocated to the grant to build 30 new schools, provide water to 50 schools, and provide safe sanitation to 450 schools. These projects are set to be completed by the end of 2022/23, after which the School Infrastructure Backlogs Grant will be incorporated into the Education Infrastructure Grant.

Providing high quality support materials

The department ensures that all learners have access to quality support materials in languages, mathematics and life skills by printing and distributing to all public schools who request them; targeting 65 million workbooks for 9 million learners in grades R to 9 each year over the MTEF period. To this end, R3.7 billion is allocated over the period ahead in the Curriculum and Quality Enhancement Programme subprogramme in the Curriculum Policy, Support and Monitoring programme.

Developing skills for a changing world

To prepare learners for jobs in a changing and increasingly digitised world, the DBE plans to enhance the curriculum by introducing new technical subjects. These new subject choices include coding, robotics and data analytics at primary school level. Several public ordinary secondary schools will be transformed into focus schools over the MTEF period.

In addition to prioritising mathematics, science and aviation, new technology subjects and specialisations will be introduced at these focus schools. This initiative will be funded through the Maths, Science and Technology Grant, which will also provide resources for workshops and laboratories, information and communications technology (ICT) equipment and support to 1 000 schools, including 200 technical high schools and 300 primary or feeder schools over the same period. The grant has a total allocation of R1.3 billion over the medium term.

The Funza Lushaka bursary scheme addresses critical educator shortages in specified subject areas such as mathematics, science and technology in various school phases by providing bursaries to prospective teachers. Over the MTEF period, R4.1 billion is allocated to the scheme with the aim of providing more than 36 000 bursaries. Over the period ahead, the department plans to introduce new subjects such as coding, robotics and data analytics in primary schools. To this end, R78.5 million is reprioritised from the Funza Lushaka bursary scheme to train teachers in these subjects.

Implementing a curriculum with skills and competencies for a changing world

This includes implementing the Three Stream Model, Fourth Industrial Revolution, entrepreneurship and focus schools, among others. The department has developed the Coding and Robotics Curriculum for grades R – 9, which was repackaged to ensure proper sequencing and seamless progression from one phase to the next.

In partnership with the Department of Communications and Digital Technologies, the DBE has identified 152 sites in 76 education districts to be equipped with virtual classroom infrastructure. Through this initiative, the sector will fully embrace the digital revolution of remote learning. Districts will be able to benefit through curriculum specialists' streamed lessons on digital platforms.

The process of incrementally refocusing the teaching and learning of the previously marginalised African languages in South African schools has led to the introduction of Kiswahili as a second additional language (SAL) in grades 4 – 12 in 90 schools (10 per province). The Curriculum and Assessment Policy Statement (CAPS) for Kiswahili SAL for grades 4 – 9 has been versioned and the Kiswahili Toolkit has been developed for the respective grades.

Initially, 54 technical schools will be monitored for the implementation of the CAPS. Nationally, 540 schools will be monitored for implementing compulsory entrepreneurship education and 54 schools will be monitored for piloting and implementing the coding and robotics curriculum. Annual sector reports will be produced on the establishment of focus schools per provincial education department. A total of 81 schools will be monitored for utilisation of ICT resources and 307 special schools will be provided with access to electronic devices.

The DBE aims to provide occupationally oriented curricula for 21 subjects, to 74 schools of skill and 13 subjects to 103 ordinary schools, over the MTEF (to pilot in 2021 and 2022).

Taking over the ECD function

The NDP envisions quality ECD as a priority for South Africa to improve the overall quality of education and the long-term prospects of its future generations. From April 2022, the DBE took over the ECD function from the Department of Social Development. The department would also take over responsibility for the ECD Grant, which is allocated R3.7 billion over the MTEF period. In 2022/23, R1.1 billion is allocated for ECD subsidies to provide for and increase the number of children accessing subsidised ECD services; and R97.9 million is allocated for maintenance improvements to support ECD providers and to pilot the construction of new, low-cost ECD centres.

According to the GHS of 2021, nationally, almost two-thirds (64,6%) of children aged 0-4 stayed home with a parent or guardian, or with another adult. This figure was most pronounced in North West (79,4%), Northern Cape (74,1%) and KwaZulu-Natal (74,0%). Only 28,5% of children in this age group attended formal ECD facilities, nationally. Attendance of ECD facilities was most common in Western Cape (39,8%) and Free State (39,6%).

Providing support to improve matric completion rates

In response to the NDP's call to reduce the learner drop-out rate, the Second Chance Programme provides support to matric learners who do not meet the pass requirements of the National Senior Certificate (NSC) examinations.

Over the MTEF period, the programme's new policy priority will be to include learners with disabilities. Accordingly, the DBE will use the existing 23 special schools for the blind and 43 schools for the deaf as sites of support for learners with disabilities in the Second Chance Programme.

In addition, as a measure to support the performance of all learners, the DBE will develop a web-based system that will allow multiple users to upload subject support for learners to access. The programme will provide support in subjects such as mathematics, science, accounting and languages, facilitate the establishment of 80 face-to-face centres, and appoint more than 800 teachers and 80 centre managers to teach after school hours and over weekends.

Facilitating an increase in the number of quality teachers

Over the medium term, the DBE plans to continue facilitating an increase in the number of newly qualified teachers in mathematics, science and technology in various phases. This is expected to be achieved by providing 37 500 Funza Lushaka bursaries to prospective teachers.

The number of bursary awards is expected to be maintained at 12 500 per year over the MTEF period. This is on condition that general increases in university costs do not exceed average annual increases in allocations to the bursary scheme of approximately 5% over the same period.

While prospective Funza Lushaka bursary recipients may qualify for fee-free funding at universities, the DBE expects the demand for Funza Lushaka bursaries to remain unchanged as the guarantee of employment provided by the bursary's work-back provision remains a strong incentive.

Providing meals for learners

The NSNP is directly aligned with the NDP's priority of eliminating poverty and supporting food security. As part of the NSNP, a targeted nine million learners in each year over the medium term will be provided with a meal on school days. The programme is funded by the NSNP Grant, which was allocated R26.7 billion over the medium term

in the Educational Enrichment Services programme. Provinces are also required to ensure that meals are provided on school days when learners are not at school because of COVID-19 restrictions.

According to Stats SA's GHS of 2021, more than three-quarters (77,3%) of learners who attended public schools benefitted from school feeding schemes in 2021, compared to 63,1% in 2009. Learners in Limpopo (91,9%) and Mpumalanga (89,1%) most commonly benefitted from this programme, while only 55,2% of learners in Western Cape and 61,2% of learners in Gauteng benefitted from this type of programme.

Implementing standardised assessments

The DBE plans to improve quality and efficiency through the implementation of standardised assessments – to reduce failure, repetition and dropout rates, and introduce multiple qualifications such as the General Education Certificate (GEC) before the Grade 12 exit qualification. Preparations for the GEC has shown a significant progress since several schools have been randomly selected for the pilot study during the 2022 Academic Calendar. A refined policy framework will be submitted to Umalusi in 2022 for registration on the National Qualifications Framework (NQF).

The assessment model of the GEC was expected to be administered in almost 270 schools, randomly selected from across all nine provinces in 2022 – to provide lessons on how to strengthen the quality of assessment tools, their infusion into school-based assessment and how to generate a holistic GEC scorecard for learners.

Test exemplars and administration manuals on the end-of-year standardised tests and project-based assessments would be provided to participating schools and the training of teachers and subject advisors was scheduled for mid-2022. In 2023, the number of participating schools will be up-scaled to cover all education districts. The aim is to ensure that all public schools are empowered to administer the assessment model of the GEC at the Grade 9 level by 2024.

The department has drafted the National Assessment Framework (NAF) to coordinate all assessments conducted in the general and further education and training (FET) bands. A basket of purpose-driven assessments from school entry (Grade R) to Grade 9 has been designed for implementation. A significant intervention of the NAF is the roll-out of the Systemic Evaluation initiative, targeted at establishing key learner competencies in mathematics and languages at the end of grades 3, 6 and 9, and determining the enabling school and system support factors that contribute to the improvement of learning outcomes. The DBE will work towards implementing the first cycle of the Systemic Evaluation initiative, which is scheduled for 2022.

These assessment programmes and the country's participation in international benchmark assessments (such as the Trends in International Mathematics and Science Study (TIMSS) 2019, Progress in International Reading Literacy Study 2021 and Southern and Eastern Africa Consortium for Monitoring Educational Quality V), will be implemented accordingly, during the medium term. In addition, the assessments and public examination system in the FET band are also being reviewed so that they can be aligned with the NAF.

Through the Examinations and Assessments unit, the DBE will facilitate the quality assurance of school-based assessment (SBA) in the FET band and facilitate the high quality and standardised marking of the NSC, provision of the reliable instrument for the NSC and provision of reliable data and feedback on the NSC examinations.

The NAF replaces the Annual National Assessment as an indicator reflecting performance objectives. The programmes linked to the NAF will enable the generation of a national report on the monitoring of learning outcomes each year over the MTEF.

Promoting social cohesion, health and school safety

The DBE continues to implement enrichment and school safety programmes in collaboration with various partners and government departments. These programmes promote physical activity, literacy, arts and culture through education enrichment.

Over the MTEF, the department will use allocated resources to monitor and support the implementation of sport, social cohesion, arts and culture, and school safety programmes in districts. It also plans to host national enrichment programmes that support learners.

The department will monitor the implementation of the school safety, social cohesion and sports and enrichment programmes in 75 education districts. Due to the limited number of professionals such as social workers and psychologists in the sector, the department will continue to build the capacity of learner support agents through the implementation of the Guide for Learner Support Agents (LSAs) and schools on providing psychosocial support to learners. Additional skills will be provided to LSAs through a partnership to provide training on the Common Elements Treatment Approach.

The HIV and AIDS Life Skills Education Conditional Grant is utilised to support the implementation of the DBE's National Policy on HIV, Sexually Transmitted Infections and Tuberculosis for Learners, Educators and Support Staff in South African Public Schools.

Legislation

The DBE derives its mandate from the following legislation:

- the National Education Policy Act, 1996 (Act 27 of 1996), which inscribed into law the policies, legislative and monitoring responsibilities of the Minister of Basic Education, and the formal relations between national and provincial authorities;
- the South African Schools Act, 1996 (Act 84 of 1996), which promotes access to quality education and democratic governance in the schooling system, and makes schooling compulsory for children aged seven to 15, to ensure that all learners have access to quality education without discrimination; and
- the Employment of Educators Act, 1998 (Act 76 of 1998), which regulates the professional, moral and ethical responsibilities of educators, as well as the competency requirements for teachers.

Budget

For the 2021/22 financial year, the department was allocated R27.2 billion. Allocations to the department increase at an average annual rate of 3.3%, from R28.5 billion in 2021/22 to R31.4 billion in 2024/25. Transfers and subsidies account for an estimated 84% of the department's expenditure, increasing at an average annual rate of 4.2%, from R23.6 billion in 2021/22 to R26.6 billion in 2024/25.

Entities

South African Council for Educators (SACE)

The SACE aims to enhance the status of the teaching profession through registering educators appropriately, managing professional development and promoting a code of ethics for all educators. It was established in terms of the SACE Act, 2000 (Act 31 of 2000).

Before their employment, educators are required to register with the SACE, which has a register of about 500 000 educators. The council has strengthened entry requirements by checking applicants' professional standing. The SACE has a number of programmes that promote the development of educators and enhance the status and image of the teaching profession. These include:

- the Professional Development Portfolio Project, which aims to encourage educators to reflect on their practice and take responsibility for their own professional development;
- teacher education and development research activities;
- setting up the Continuing Professional Teacher Development (CPTD) System;
- celebrating World Teachers' Day to acknowledge the work of educators; and ensuring that educators adhere to the SACE Code of Professional Ethics, and
- the CPTD System, which recognises professional development undertaken by educators on their own initiative.

The council expects to generate 81.2% (R279.3 million) of its revenue over the MTEF period from membership fees, and the remainder through interest on investments and transfers from the department. Transfers from the department are set to decrease by R9 million over the period ahead as a result of the reprioritisation of funds for teacher training programmes that focus on coding and robotics.

Expenditure is expected to increase at an average annual rate of 0.1%, from R113.1 million in 2021/22 to R113.3 million in 2024/25.

Umalusi Council for Quality Assurance in General and FET

The Umalusi Council for Quality Assurance in General and FET derives its mandate from the NQF Act, 2008 (Act 67 of 2008) and the General and FET Quality Assurance Act, 2001 (Act 58 of 2001). As an external and independent quality assurance body, the council's mandate is to set and maintain standards in general and FET through the development and management of the General and FET Qualifications Sub-framework.

It is tasked with the certification of the following qualifications:

- Schools: the NSC.
- TVET colleges: the National Technical Certificate (Level N3) and the National Certificate Vocational.
- Adult learning centres: the General Education Training Certificate – Adults.

- To issue learners with certificates that are credible, the council:
- develops and evaluates qualifications and curricula to ensure that they are of the expected standard;
- moderates assessment to ensure that it is fair, valid and reliable;
- accredits providers of education and training, as well as assessment;
- conducts research to ensure educational quality; and
- verifies the authenticity of certificates.

To fulfil its obligations, the council's expenditure is expected to increase at an average annual rate of 0.2%, from R195 million in 2021/22 to R196 million in 2024/25. The council is set to derive 85.1% (R494.3 million) of its revenue through transfers from the department, increasing at an average annual rate of 2.5%, from R157.4 million in 2021/22 to R169.4 million in 2024/25.

Role players

Provincial departments of education

The role of the DBE is to translate government's education and training policies and the provisions of the Constitution into a national education policy and legislative framework.

The DBE works closely with provincial education departments to ensure that provincial budgets and strategies are in line with and support national policies. The national department shares a concurrent role with the provincial education departments for basic schooling and ECD, but it is the responsibility of each provincial education department to finance and manage its schools directly.

District offices are the provincial education departments' main interface with schools. Not only are they central to the process of gathering information and diagnosing problems in schools, but they also perform a vital support and intervention function.

This includes organising training for personnel, dealing with funding, resourcing bottlenecks and solving labour-relations disputes. District offices are key to ensuring that school principals remain accountable to provincial education departments and that accountability lines within the school, to the principal and school governing body, are maintained.

Equity in education expenditure between and within provinces is achieved through the equitable division of national revenue between provinces, making use of the Equitable Shares Formula, the National Norms and Standards for School Funding, and the national post-provisioning norms.

Council of Education Ministers

The council, comprising of the Ministers of Basic Education, and Higher Education and Training, as well as the nine provincial members of the executive councils for education, meets regularly to discuss the promotion of the national education policy, share information and views on all aspects of education in South Africa and coordinates action on matters of mutual interest.

Heads of Education Departments Committee

The committee comprises the Director-General (DG) of the DBE, deputy DGs of the national department and the heads of provincial departments of education. The purpose of the committee is to facilitate the development of a national education system, share information and views on national education, coordinate administrative action on matters of mutual interest and advise the DBE on a range of specified matters related to the proper functioning of the national education system.

National Education Evaluation and Development Unit (NEEDU)

The NEEDU ensures effective evaluation of all educators based on the extent to which learner performance improves. Its core responsibilities include:

- providing the Minister of Basic Education with an independent account of the state of schools, including the quality of teaching and learning at all schools;
- providing an independent account on the development needs of the school education system;
- accounting for the attainment of the standards by all schools through a monitoring and evaluation system;
- identifying, on a system-wide basis, the critical factors that inhibit or advance school improvement and making focused recommendations for redressing problem areas that undermine school improvement;
- proposing appropriate sanctions to ensure that schools offer effective education for all learners;
- strengthening internal evaluation capacity within schools in ways that inform and complement external evaluation;
- monitoring the different levels of school support and the extent action is considered on proposed interventions, whether in the form of developmental support or disciplined action;
- reviewing and assessing existing monitoring, evaluation and support structures and instruments regularly, to ensure clarity and coherence in the way schools and teachers are assessed and supported;
- providing schools with evidence-based advice on how to pursue school improvement in their particular context; and
- promoting school improvement through the dissemination of good practice.

The NEEDU completed its first five-year cycle of systemic evaluations by identifying, on a system-wide basis at school, district and provincial levels, the factors that inhibit or advance school improvement. The findings were in the following areas:

- Reading: Teachers in the 134 rural schools visited did not have a good method to teach foundational level learners how to read. Actions taken include a Reading Advisory Committee to advise on reading matters, prioritising reading support in the provinces, and piloting the Early Grade Reading Assessment.
- Curriculum delivery: Gaps such as the development and implementation of provincial literacy and numeracy were observed in curriculum delivery. Actions taken included asking for learners' books to monitor quality of writing and holding school management teams and principals accountable for curriculum delivery.
- Use of learning and teaching support materials: Most learners in primary schools did not have sufficient learning and teaching support materials, as well as textbooks for mathematics and languages due to an ineffective retrieval system from previous learners. Actions taken included developing policies that ensured that textbooks were retrieved from schools that did not have a good retrieval system.
- Time management: Many schools experienced time management issues such as tardiness and absenteeism by learners and teachers, while some teachers did not follow the time allocated to subjects on the timetable. Actions taken included monitoring of time management in schools by district and provincial officials. The DBE and the Minister of Basic Education engaged district and provincial officials in a discourse on time management.
- Assessment: Teachers in most schools were not able to construct/set assessment items of good quality. Learners perform well in SBAs but poorly in common and international assessments. Teachers assess what they have taught, not what they ought to have taught. Few schools had school improvement plans that were informed by assessments. Actions taken by the DBE included aligning provincial education department school improvement plans with DBE plans. Subject committees and SBA workshops were conducted in provinces to train advisors in setting up quality tasks.
- Special schools: The preliminary findings indicated that special schools did not have a systemic way of admitting learners and different curricula were used in each special school. Findings at school level were presented to districts and provincial education departments to take necessary actions.

During the second five-year cycle (2017-2021), the focus shifted to development to ensure the system-wide impact of the NEEDU's findings.

Education Labour Relations Council (ELRC)

The ELRC serves the public education sector nationally. It is a statutory council, initially established by the Education Labour Relations Act, 1993 (Act 146 of 1993), but draws authority from the Education Labour Relations Act, 1995 (Act 66 of 1995).

The main purpose of the council is to maintain labour peace within public education through processes of dispute prevention and resolution.

These include collective bargaining between the educator unions and the DBE as the employer. The ELRC also conducts various workshops to increase the level of awareness and understanding of sound labour-relations procedures.

Educator unions

Educators are organised into six educator unions:

- National Professional Teachers' Organisation of South Africa.
- National Teachers' Union.
- South African Teachers' Union.
- Professional Educators' Union.
- Cape Professional Teachers' Association.
- South African Democratic Teachers' Union.

There is an existing labour relations framework agreement between the DBE and unions. It encompasses both traditional areas of negotiation

and issues of professional concern, including pedagogy and quality-improvement strategies.

An agreement was reached on the Framework for the Establishment of an Occupation-specific Dispensation (OSD) for educators in public education. The OSD provides for dual career paths, where educators and specialists in classrooms can progress to levels where they earn salaries that are equal to, or higher than, those of managers without moving into management/supervisory posts.

It also provides for a new category of posts for teaching and learning specialists and senior learning and teaching specialists, as well as the creation of a cadre of education managers at school and office level.

The 2021 World Teachers' Day was celebrated under the theme; "Teachers at the heart of education recovery", focusing on the support teachers needed to fully contribute to the COVID-19 recovery process. Held annually on 5 October since 1994, World Teachers' Day commemorates the anniversary of the adoption of the 1966 International Labour Organisation recommendation concerning the status of teachers.

Matric 2021 results

The total number of candidates who registered for the 2021 NSC exams was 897 163, comprising 733 198 full-time candidates; as well as one 163 965 part-time candidates. The 2021 NSC overall pass rate, with the progressed learners included was at 76.4% – an improvement of 0.2% from the pass rate achieved by the Class of 2020. This represents a record of 537 687 candidates, who passed the 2021 NSC examinations – an improvement of 21.9% passes from 2020. Without the progressed learners, the overall pass rate stands at 79.8%.

The number of candidates qualifying for admission to Bachelor studies at universities was 256 031 – an improvement of 21.4% from 2020. This represents 36.4% of the total number of candidates, who wrote the 2021 NSC exams. The 2021 Bachelor passes in number was the highest attained in the history of the NSC examinations; but the second-highest to that attained in 2019, when expressed as a percentage. KwaZulu-Natal and Gauteng achieved the most Bachelor passes.

The number of candidates who passed with a Diploma was 177 572 – an improvement of 17.8% from 2020. This represents 25.2% of the total number of candidates who wrote the 2021 NSC examinations.

The number of candidates who passed with a NSC was 103, representing 0.01% of total number of candidates who wrote the 2021 NSC exams.

Curriculum Recovery Plan

To make up for lost time due to COVID-19, government has come up with a three-year curriculum recovery plan. As part of the plan, from 2021, the DBE will be implementing recovery annual teaching plans (ATPs) from Grade R to 12. The basis of the recovery ATPs is the trimmed curriculum, including the learning losses to be recovered in each grade, based on the learning losses in the previous grade. The start of the COVID-19 pandemic led to lost learning time as schools shutdown and ultimately reopened with several changes to the schooling environment, which included social distancing protocols, rotational attendance and the intermittent closure of schools due to increased localised infections.

To mitigate the impact of lost time, the recovery process will occur over a three-year period, straddling 2021 to 2023, to gradually recover the learning losses, while building on foundational content required for the next grade. The multi-year recovery plan also ensures that the impact of further learning losses are minimised.

The recovery ATPs focus mainly on core and fundamental content knowledge, skills, attitudes and values required in each grade and subject, to ensure deep learning and content mastery as opposed to superficial learning.

To assist in the recovery plan, the basic education sector will receive 300 000 young employees in schools. This is part of the Presidential Employment Stimulus Programme to create 200 000 employment opportunities for education assistants, and 100 000 for general school assistants. This will be accomplished through the Basic Education

The BEEI seeks to address COVID-19 academic disruption, as well as address some of the lingering systemic challenges. Education assistants will support teachers in the classroom and provide extra support to learners. General school assistants will help schools to comply with COVID-19 protocols, while ensuring that teaching and learning take place in a safe, secure and hygienic environment.

The 300 000 employment opportunities were targeted at young people, to strengthen capacity in schools, at least until the end of March 2021.

In planning its recovery plan, the DBE published a proposed staggered school calendar for 2022, in which coastal and inland provinces open schools on different dates.

Higher Education, Science and Innovation

The DHET and the Department of Science and Innovation (DSI) report to the Ministry of Higher Education, Science and Innovation but exist as separate votes.

Higher Education and Training

The NDP envisages that by 2030, South Africans should have greater access to post-school education and training (PSET) opportunities through a system that is responsive to their needs. The DHET's vision is to have an integrated, coordinated and articulated PSET system for improved economic participation and the social development of youth and adults. The *2014 White Paper for Post-School Education and Training* points out that the PSET system is an important institutional mechanism that must be responsive to the needs of society.

The system should be inclusive and cut across state boundaries, ethnic, gender, disability, class and socio-economic status, and national and religious identities, to achieve a united human race based on human dignity. This is supported by Priority 2 (education, skills and health) of government's 2019-2024 Medium Term Strategic Framework (MTSF).

Over the medium term, the department will continue to focus on expanding access to and enhancing performance at higher education institutions, and increasing their capacity.

According to Stats SA's GHS of 2021, the total number of students enrolled at higher education institutions increased by almost 57,8% between 2002 and 2021, growing to 968 109.

The percentage of black African students increased by 13,3 percentage points to 73,5% during this time, while the percentage of white students virtually halved to 14,8%. Even though most students are black African, the education participation rate of this population group remained proportionally low in comparison with the Indian/Asian and white population groups.

The percentage of persons aged 18 to 29 that were enrolled at an institution of higher education in the country increased from 4,3% in 2002 to 6,5% in 2021. Enrolment at a higher education institution was most common among whites (24,6%) and Indian/Asians (16,2%), while only 6,2% of the coloured and 5,3% of the black African population groups were enrolled.

The percentage of individuals aged 20 years and older who have attained at least Grade 12 has been increasing consistently since 2002, expanding from 30,5% in 2002 to 50,5% in 2021. Over this period, the percentage of individuals with some post-school education increased from 9,2% to 14,6%. The percentage of individuals without any schooling decreased from 11,4% in 2002 to 3,2% in 2021.

Expanding access to higher education and facilitating the transition to work

The department is in the process of updating the guidelines for the implementation of the bursary scheme for students from disadvantaged backgrounds. This is to strengthen funding criteria to ensure that only eligible students are funded, and thereby ensure that the scheme remains financially sustainable.

The department will continue to implement plans to develop capacity at universities, eliminate the certification backlog in TVET colleges, and conduct advocacy campaigns on the use of open-access learning and teaching support materials in Community Education and Training (CET) colleges.

In the department's efforts to expand access to higher education, transfers to the National Student Financial Aid Scheme for student loans and bursaries account for an estimated 37.8% (R143.3 billion) of total expenditure over the medium term, including an additional R32.6 billion to sustain the current levels of support to qualifying students. This funding is expected to benefit 1.3 million university and 1.1 million TVET college students from poor and working class backgrounds.

Additional allocations of R194.5 million in 2022/23 and R209.2 million in 2023/24 are to continue implementing initiatives that were started in the sector in 2021/22 as part of the presidential employment intervention. Of these amounts, the graduate employment programme implemented by universities receives R193.7 million to enhance the employability of a targeted 6 000 graduates through placements in universities to gain workplace experience; and the National Skills Fund (NSF) receives R210 million to provide demand-responsive training for jobs in priority growth areas such as the digital and ICT sectors, targeting 16 000 jobs.

Enhancing performance by upgrading infrastructure and increasing capacity at higher education institutions

The department plans to ensure that its institutions have appropriate infrastructure to accommodate students accessing higher education. To alleviate overcrowding and upgrade ailing infrastructure at universities, the university infrastructure and efficiency grant is allocated R6.7 billion over the medium term, increasing at an average annual rate of 31.6%, from R1 billion in 2021/22 to R2.3 billion in 2024/25; and the TVET infrastructure and efficiency grant is allocated R1.8 billion over the same period, increasing at an average annual rate of 38.2%, from R214.5 million in 2021/22 to R566.3 million in 2024/25.

These allocations will enable infrastructure repairs and maintenance in priority areas such as bulk services, sanitation, teaching and learning facilities, and student accommodation. The high growth rates in spending through these grants over the MTEF period is due to reprioritisations away from these grants to address the shortfall in funding for student bursaries in 2021/22.

Allocations of R600 million in 2022/23 and R300 million in 2023/24 will be used to deliver a target of 9 500 beds at four institutions as part of the student housing infrastructure programme. This funding will be supplemented by R540.3 million over the MTEF period from the university infrastructure and efficiency grant and R82.9 million from the TVET infrastructure and efficiency grant.

Of this funding, the Tshwane University of Technology is allocated R337.9 million, the University of KwaZulu-Natal R200.3 million, Gert Sibande TVET College R188 million, and Majuba TVET College R173.8 million.

The Historically Disadvantaged Institutions Development Programme

The programme is fully described in the draft HDI-DP Framework that has been fully consulted with historically disadvantaged institutions in the university sector.

The HDI-DP Framework seeks to address challenges that threaten the viability and sustainability of historically disadvantaged institutions and will draw on the Historically Disadvantaged Institutions Development Grant as a resource. It will also draw on a range of other institutional, department and partner resources.

The Framework sets the following strategic priority areas for development focus:

- strengthen institutional management and governance systems,
- improve institutional infrastructure and facilities,
- enhance effective staff recruitment, development and retention,
- strengthen the academic enterprise, and
- leverage locality and community.

The notion of universities as anchor institutions will be a key feature of the programme. Once it is presented and approved, the DHET plans to roll out its full implementation in the next five years.

Funding for the missing middle

Addressing the dearth of funding for the missing middle students was a priority for the 2020/21 financial year. In working towards a financial aid system that is inclusive of missing middle students, it would be necessary to explore the possibility of a loan scheme for the higher education sector, within the funding constraints, and working with private sector partners and other government departments, taking into account work already done.

Ensuring the sustainability and effective administration of the NSFAS would also be key to the success of the financial aid system.

Student accommodation

Plans are underway to develop and finalise a multi-faceted and comprehensive strategy for student housing. The strategy will include a range of possibilities for increasing the availability of student housing on and off university and TVET campuses.

This will include accelerating the Student Housing Infrastructure Programme, which is already underway, through which university- and college-owned housing will be developed, leveraging private sector investments and development potential, as well as developing a policy framework on the accreditation of private student accommodation. The norms and standards for student housing for the PSET system is also expected to be developed and implemented.

Establishing universities

Over the next five years, the system is expected to expand to provide additional spaces in higher education. In order to enhance the planned expansion in terms of the current enrolment plans of institutions, two new institutions will be established – a university for crime detection in Hammanskraal and a university for science and innovation in Ekurhuleni.

The Higher Education Act of 1997 allows for new institutions to be established as either higher education colleges or university colleges. This decision will be dependent on the outcome of a feasibility study, followed by a development plan for each new institution. Once funding is secured, the new institutions can be established as either a university college or a higher education college.

Over a period of time, a university college may be established as a fully-fledged university once it has met requirements to be established as such.

Expanding access to TVET colleges and improving their performance

Expanding access to skills programmes that address the labour market's need for intermediate skills that include practical components is one of the DHET's key mandates. Over the medium term, the department will work towards improving the quality of the PSET system by establishing more entrepreneurship hubs to enable TVET college students to realise their potential and become actively engaged in the economy, either through employment in the labour market or self-employment. While the enrolment projections in TVET colleges are held constant over the next five years in order to eliminate funding gaps, the DHET is committed to expanding provision in the TVET college system through the development of comprehensive proposals involving a diversity of stakeholders and modalities of delivery, and to grow the number of students who can access vocational education and training. However, growth in the TVET college core programmes must take cognisance of the number of opportunities available to students for work-integrated learning.

Among these proposals will be the provision of open learning opportunities, primarily in the form of e-learning, as a key strategy towards reaching out and expanding access to students in remote locations, as well as to those already in employment. Furthermore, it is becoming evident that highly responsive and quality short skills programmes will grow in demand as organisations seek to reskill and upskill employees to meet rapidly changing workplace practices and standards.

Colleges will, therefore, partner with a diversity of stakeholders to deliver fit-for-purpose training in order to meet these localised needs. Programme diversification will constitute the cornerstone of expansion of the TVET system. The DHET will work collaboratively with the DSI to leverage the innovation service points already in existence nationally, for the enhancement of skills development in TVET colleges.

Initial engagements will focus on augmenting and modernising current provision in TVET colleges through innovation and creativity to prepare students for the world of real work in a 21st Century context. To facilitate this, teaching and learning support plans will be implemented in TVET colleges.

Establishing and operationalising centres of specialisation

Establishment and operationalising centres of specialisation in TVET colleges is a critical project for which the DHET continues to engage employers to work with young people as apprentices. The project aims to provide fully qualified artisans for a range of sectors in the economy, including high-technology manufacturing, the creative industries, computer software and aerospace engineering.

Developing artisans

Over the medium term, the DHET aims to improve the public skills development system by managing the performance of service-level agreements with sector education and training authorities (SETAs) more effectively, and by providing funding to trade and quality assurance institutions for occupational qualifications. These institutions play a pivotal role in increasing the number of qualified artisans by rolling out skills programmes, learnerships, internships and apprenticeships, and by establishing partnerships with TVET colleges, universities and the labour market to provide opportunities for workplace experience.

Through the SETAs, over the medium term, 93 000 new artisans are expected to be registered for training and 75 000 artisan learners are expected to qualify. For this purpose, R347.8 million over the medium term is allocated. Through the Economic Reconstruction and Recovery Plan, the DHET has targeted 30 000 artisans per annum over the medium-term period to address shortage of artisanal skills in the country. Income generated through the skills development levy, which is collected from employers by the South African Revenue Service (SARS) and transferred to SETAs and the NSF as a direct charge

against the National Revenue Fund, contributes significantly to key performance areas of the public skills development system, including artisan development.

Strengthening governance of the CET sector

The DHET recognises that improving the CET sector is key for development as it has the potential to provide students with access to a comprehensive range of programmes that lead to part and full qualifications and employment opportunities, including entrepreneurial opportunities.

To ensure that the sector rises to its potential, the DHET will continue to prioritise the development and training of lecturers in CET colleges and learning centres by enabling them to upgrade their qualifications, with a particular focus on mathematics and science. The DHET has also strengthened its recruitment policies so that only qualified lecturers are employed in the sector.

Establishing the Imbali Education Precinct

The Imbali Education Precinct will be made up of an interconnected network of education and support institutions that will work together in a locality for the mutual benefit of all involved – to create seamless, enhanced, quality education pathways from early childhood education to higher education for the community it serves.

Some progress has been made in implementing the Imbali Education Precinct Development Plan, mostly on the Indumiso Campus of the Durban University of Technology (DUT) through the allocation of existing resources, including significant infrastructure developments, and the development of a range of new teacher education programmes for TVET and CET college lecturers. However, there has been slow progress for a range of reasons, including changed leadership at DUT and a lack of on-the-ground champions.

A project team and project office will be established to take the work forward over the next five years. The idea and model of the development of education precincts will be tested in terms of the Imbali Project. It is envisaged that, over the next 10-year period, at least three such precincts will be developed across the country. This approach will support the District Development Model.

South African Institute for Vocational and Continuing Education and Training

Colleges must evolve into institutions that are highly responsive to the mid-level skills demands in the labour market. This requires expert and accurate planning in identifying much-needed skills sets, identifying appropriate modalities of skills training and delivery, efficient turnaround times in the development and delivery of occupational curricula, and vastly expanding the opportunities for work-based experience and learning through stakeholder engagements and partnerships.

The DHET will, in partnership with the German government, seek to strengthen the TVET system through:

- sectorial coordination and cooperation to implement governance and policy through the facilitation of cooperation agreements between the public and private sectors that build on existing initiatives and take forward new initiatives.
- private-sector engagement by assisting partner organisations to increase the level of private sector representation in decision-making bodies and to promote systematic stakeholder dialogue.
- the implementation of reformed vocational and technical skills development to support the provision of demand- oriented skills development to youth by promoting on-the-job or work-based training approaches, the training of vocational teaching personnel, and strengthening the quality of artisan training in centres of specialisation.

Reviewing the NSF

The 2014 *White Paper for Post-School Education and Training* enunciates that the NSF will be responsible for skills development aligned to national development strategies and priorities, including building linkages within the skills system and providing funds for government strategies such as youth programmes, building small businesses and cooperatives, and rural development. It will also fund research and innovation that is not confined to a particular sector.

Coupled with the White Paper and other government strategic policy instruments, is the establishment of the new Ministry of Higher Education, Science and Innovation, which necessitates a review of policy and systems. On the other hand, the DSI has introduced the White Paper on Science, Technology and Innovation, which is critical in ensuring that science, technology and innovation enable inclusive and sustainable South African development in a changing world.

With the rising unemployment rate, especially among the youth, and sluggish economic growth, prioritisation and focused skills development interventions that support national policies need urgent attention and resourcing. To this end, the Minister of Higher Education, Science and Innovation intends to undertake a review of the NSF – to evaluate the general operations of the NSF, including, but not limited to its efficiency and relevance regarding the country's national priorities.

Legislation

Key policies and legislation relating to Higher education and training in South Africa include the:

- Continuing Education and Training Act, 2006 (Act 16 of 2006), which provides for the regulation of continuing education and training, the establishment of governance structures for, and the funding of, public TVET colleges and CET colleges, the registration of private colleges, and the promotion of quality in continuing education and training;
- Higher Education Act, 1997 (Act 101 of 1997), which provides for a unified national system of higher education;
- NQF Act, 2008 (Act 67 of 2008), which provides for the NQF, the SAQA and quality councils for the issuing and quality assurance of qualifications required by the sub-frameworks of the NQF;
- NSFAS Act, 1999 (Act 56 of 1999), which provides for the granting of loans and bursaries to eligible students attending public higher education and training institutions, and the subsequent administration of such loans and bursaries;
- Skills Development Amendment Act, 2008 (Act 37 of 2008), which enables the creation of the National Skills Authority, sector education and training authorities, the establishment of the Quality Council for Trades and Occupations, and the regulation of apprenticeships, learnerships and other matters relating to skills development; and
- Skills Development Levies Act, 1999 (Act 9 of 1999), which provides for the imposition of skills development levies.

Budget

For the 2021/22 financial year, the DHET was allocated R116.8 billion. Transfers and subsidies account for an estimated 91.3% (R374.1 billion) of the department's planned expenditure, with R212.5 billion earmarked for departmental agencies and accounts, R845.7 million for non-profit institutions and R160.7 billion for higher education institutions.

Total expenditure is set to increase at an average annual rate of 7.2%, from R116.8 billion in 2021/22 to R143.7 billion in 2024/25. These funds will contribute to building a high- quality, demographically representative higher education sector that provides students and staff with opportunities for access and success.

Expenditure on compensation of employees is expected to be R10.8 billion in 2022/23, R10.9 billion in 2023/24 and R11.5 billion in 2024/25. The bulk of this funding is for TVET college lecturers and support staff, and CET educators. Spending on compensation of employees constitutes an average 94.4% (R31.3 billion) of the budgets in the TVET and CET programmes.

National Skills Development Strategy

The key driving force of the NSDS 3 (2011-2020) was improving the effectiveness and efficiency of the skills development system. It promoted the linking of skills development to career paths, career development and promoting sustainable employment and in-work progression. The emphasis was particularly on people who did not have relevant technical skills or adequate reading, writing and numeracy skills to enable them to find employment.

The strategy promoted partnerships between employers, public education institutions, TVET colleges and universities and private training providers to ensure that cross-sectoral and intersectoral needs were addressed. The NSDS 3 was guided by, and measured against, several key developmental and transformation imperatives, such as race, class, gender, geographic considerations, age differences, disability, and HIV and AIDS. The NSDS 3 addressed the scope and mandate of the SETAs. The SETAs facilitated the delivery of sector-specific skills interventions that helped achieve the goals of the strategy, address employer demand and deliver results.

The strategy emphasised the relevance, quality and sustainability of skills training programmes focusing on eight goals, namely:

- establishing a credible institutional mechanism for skills planning, and ensuring that the national need in relation to skills development is researched, documented and communicated to enable effective planning across all economic sectors;
- increasing access to occupation-specific programmes targeting

intermediate and higher-level professional qualifications;
- promoting the growth of a public TVET college system that is responsive to sector, local, regional and national skills needs and priorities;
- addressing the low level of youth and adult language and numeracy skills to enable additional training;
- encouraging better use of workplace-based skills development;
- encouraging and supporting cooperatives, small enterprises, worker-initiated non-governmental organisation and community-training initiatives;
- increasing public-sector capacity for improved service delivery and supporting the building of a developmental state; and
- building career and vocational guidance.

Entities

Council on Higher Education

The CHE is a statutory body established in terms of the Higher Education Act of 1997, as amended. The council is mandated to advise the Minister responsible for higher education on all matters pertaining to higher education; develop and manage the higher education qualifications sub-framework; and develop and implement a suite of policies and criteria to facilitate the implementation of the framework and sub-framework, and protect their integrity.

Over the medium term, the council will continue to focus on becoming a recognised centre for information and policy analysis on higher education, and on advising the Minister by researching and monitoring the higher education sector.

The council's spending on compensation of employees accounts for an estimated 46.8% (R112.2 million) of its total budget of R252.3 million over the medium term as the core functions of providing research, quality assurance, knowledge and advisory services, and monitoring and evaluation are labour intensive. The number of personnel is expected to remain constant at 50 over the medium term. If capacity challenges arise, it will appoint external academics as consultants.

Transfers from the department account for an estimated 91.1% (R244.5 million) of total revenue over the period ahead. These are expected to increase at an average annual rate of 7.5%, from R70 million in 2021/22 to R86.9 million in 2024/25, as a result of the council's baseline increase of R60 million to implement its approved quality assurance framework. The remainder of the council's revenue is set to be generated through interest on investments and fees charged for accreditation services provided to private higher education institutions.

National Skills Fund

The NSF was established in 1999 in terms of Section 27 of the Skills Development Act, 1998 (Act 97 of 1998). The fund focuses on national priority projects identified in the NSDS, projects related to the achievement of the purposes of the Act, as determined by the DG of Higher Education and Training, and any activity undertaken by the Minister of Higher Education, Science and Innovation to achieve a national standard of good practice in skills development.

Over the medium term, the fund aims to contribute to the development of skills for 4 900 small, medium and micro enterprises and cooperatives; facilitate the acquisition of various skills for 34 500 learners through community-based skills development initiatives; fund education and training for occupations in high demand for 117 000 learners; fund education and training programmes for 107 400 learners from rural areas; pursue priority projects such as the development of infrastructure at TVET and CET colleges; and conduct research and innovation aimed at expanding, integrating and improving the effectiveness of the post-school education and training system. An estimated 93.1% (R10.6 billion) of its expenditure over the medium term is set to go towards these skills development and infrastructure initiatives.

The fund receives R210 million over the first two years of the MTEF period as part of the presidential employment intervention to continue the pay-for-performance model to provide demand-responsive training for jobs in priority growth areas such as the digital and ICT sectors. A total of 16 000 jobs are expected to be created through the model.

The fund derives its revenue through the skills development levy, which is collected from employers by the SARS and transferred to the fund as a direct charge against the National Revenue Fund; and interest earned on investments at the Public Investment Corporation.

Over the MTEF period, revenue from the levy is estimated at 87.9% (R13.6 billion), increasing at an average annual rate of 7.4%, from R3.9 billion in 2021/22 t R4.8 billion in 2024/25. The remaining 12.2% of revenue from interest is estimated at R1.9 billion.

National Student Financial Aid Scheme

The NSFAS was established in terms of the NSFAS Act of 1999, as amended. The scheme is responsible for providing loans and bursaries; developing criteria and conditions for the granting of loans and bursaries to eligible students in consultation with the Minister of Higher Education, Science and Innovation; raising funds; recovering past loans; maintaining and analysing a database of funded students; undertaking research for the better use of financial resources; advising the Minister on matters relating to student financial aid; and undertaking other functions assigned to it by the Act or the Minister.

The scheme aims to provide bursaries to more than 1.3 million undergraduate university students and an estimated 1.1 million TVET college students over the MTEF period at a projected cost of R147.9 billion, and plans to enter into sector stakeholder partnerships and undertake research to determine ways to increase funding so that more students can obtain bursaries. It also aims to enhance the bursary application process so that funding confirmation is immediate and that any issues that arise with the disbursement of tuition and student allowance fees are dealt with promptly. Transfers from the department constitute an estimated 94.2% (R144.3 billion) of the scheme's total revenue over the MTEF period, increasing at an average annual rate of 10.4%, from R38.6 billion in 2021/22 to R51.9 billion in 2024/25 as a result of an additional allocation of R32.6 billion over the MTEF period to fund the increased number of students qualifying for financial support.

The remainder (R4.7 billion) is derived mainly through transfers from the DBE for the Funza Lushaka teacher bursary programme, the NSF SETAs and other government departments. Total revenue is expected to increase by 9.2% over the MTEF period, from R42 billion in 2021/22 to R54.7 billion in 2024/25.

Quality Council for Trades and Occupations

The Quality Council for Trades and Occupations was established through the Skills Development Act of 1998. It is mandated to oversee the development and maintenance of the occupational qualifications sub-framework in the NQF, and advise the Minister of Higher Education, Science and Innovation on all policy matters concerning occupational standards and qualifications.

The council's quality assurance role and its management of the occupational qualifications sub-framework contribute to the post-school sector's broader imperative of providing access to education and training of the highest quality that leads to significantly improved learning outcomes.

Over the medium term, the council will focus on overseeing the conversion of national accredited technical education diploma qualifications into occupational qualifications that have greater industry relevance, and developing and submitting new occupational qualifications to the SAQA for registration. These activities will be funded at a projected cost of R231.3 million over the medium term, comprising an estimated 61.4% of total expenditure.

The council will also intensify its quality assurance functions for occupational qualifications by evaluating, assessing and verifying the qualifications provided by registered providers at an estimated cost of R36.9 million over the MTEF period.

The council expects to derive 75% (R303.1 million) of its revenue over the MTEF period from SETAs for the provision of quality assurance for skills and training programmes, and 21.4% (R86.3 million) through transfers from the department. Revenue is expected to increase at an average annual rate of 13.8%, from R95.4 million in 2021/22 to R140.7 million in 2024/25, driven mainly by an expected increase in revenue from SETAs.

Sector education and training authorities

The Skills Development Act of 1998 mandates SETAs to implement national, sector and workplace strategies to develop and improve skills in the South African workforce, provide learnerships that lead to recognised occupational qualifications, and fund skills development. The authorities derive their objectives directly from the NSDS, which aims to increase access to occupationally directed programmes, promote the growth of public TVET colleges, address low levels of youth and adult literacy and numeracy skills, and encourage the better use of workplace-based skills development.

Over the medium term, the authorities will focus on strengthening and delivering relevant priority skills to South Africa's labour market, with particular emphasis on partnerships with TVET colleges, universities

and the market; monitoring and evaluation; improved institutional research capacity; artisan development; apprenticeships, learnerships, internships and bursaries; and the development of small, medium and micro enterprises to provide opportunities for work experience.

Carrying out these activities is expected to cost R62.9 billion over the medium term, increasing at an average annual rate of 6.6%, from R18.6 billion in 2021/22 to R22.6 billion in 2024/25. The authorities will continue to support artisan development through skills development centres, with the specific aim of addressing skills shortages identified by occupational teams working on strategic infrastructure projects. The sector plans to train 68 000 artisans over the medium term through this initiative at a projected cost of R4.7 billion.

The authorities derive the bulk of their revenue through the skills development levy, which is collected from employers by the SARS and transferred as a direct charge against the National Revenue Fund. Revenue from the levy comprises an estimated 90.1% (R55.6 billion) of total revenue over the medium term, increasing at an average annual rate of 8.2%, from R15.8 billion in 2021/22 to R20 billion in 2024/25, in line with the expectation that the economy will begin to recover. The remainder (R5.3 billion) is set to be derived through interest on investments.

South African Qualifications Authority

The institution is a statutory body established in terms of the SAQA Act, 1995 (Act 58 of 1995) and exists under the NQF Act of 2008, as amended. Its mandate and goals are to advance the objectives of the NQF, coordinate the higher education qualifications and occupational qualifications sub-frameworks, and oversee the further development and implementation of the NQF.

Over the medium term, the authority will focus on implementing framework policies effectively; registering quality qualifications; promoting, recording and analysing learning initiatives; lobbying to strengthen and align relevant legislation so that the authority's mandate is clearly reflected in amendments to the NQF Act (2008); recognising professional bodies; registering professional designations; verifying national and foreign qualifications; locating foreign qualifications within the NQF; and reporting on misrepresented qualifications.

As this work is labour intensive, spending on compensation of employees accounts for an estimated 67.1% (R243.8 million) of the authority's total projected expenditure over the period ahead, increasing at an average annual rate of 2.6%, from R78.1 million in 2021/22 to R84.3 million in 2024/25.

The authority is set to receive 70.3% (R261.9 million) of its revenue over the medium term through transfers from the department, increasing at an average annual rate of 3.8%, from R82.8 million in 2021/22 to R92.6 million in 2024/25. The remainder is set to be derived through the evaluation of foreign qualifications, income from professional bodies and the verification of national qualifications. Total revenue is expected to increase at an average annual rate of 2.7%, from R120.2 million in 2021/22 to R130.3 million in 2024/25.

Universities

South Africa's higher education landscape comprises the following institutions:

- Cape Peninsula University of Technology
- Central University of Technology, Free State
- Durban Institute of Technology
- Mangosuthu University of Technology
- National Institute for Higher Education, Northern Cape
- National Institute for Higher Education, Mpumalanga
- Nelson Mandela University (NMU)
- North-West University
- Rhodes University
- Sefako Makgatho Health Sciences University
- Sol Plaatje University, Northern Cape
- Tshwane University of Technology
- University of Cape Town (UCT)
- University of Fort Hare
- University of the Free State
- University of Johannesburg
- University of KwaZulu-Natal
- University of Limpopo
- University of Mpumalanga
- University of Pretoria
- University of South Africa
- University of Stellenbosch
- University of Venda
- University of the Western Cape
- University of the Witwatersrand
- University of Zululand
- Vaal University of Technology
- Walter Sisulu University, Eastern Cape.

Science and Innovation

In 2020/21, the DSI started working under a new five-year strategic plan, which saw the department begin to implement a new policy that has replaced the *1996 White Paper on Science and Technology*. The revised mandate of the DSI is articulated in the *2019 White Paper on Science, Technology and Innovation*.

The White Paper increased the scope for science, technology and innovation in support of South Africa's inclusive development. This revision in policy has attempted to firm up policy efforts in areas where the DSI has encountered challenges in implementation. The new strategic plan has adopted six outcomes, which the department will pursue between 2020/21 and 2024/25.

These are:

- a transformed, inclusive, responsive and coherent National System of Innovation;
- increased knowledge generation and innovation outputs;
- knowledge utilisatiion for economic development in revitalising traditional industries and stimulating research and development (R&D)-led industrial development;
- knowledge utilisation for inclusive development; and
- innovation in support of a capable and developmental state.

The NDP identifies science, technology and innovation as a primary driver of economic growth, job creation and socio-economic reform. Central to this identification is the emphasis of the *2019 White Paper on Science, Technology and Innovation* on the themes of inclusivity, transformation and partnerships.

The White Paper is aimed at improving policy coherence, developing human capabilities, expanding knowledge, improving innovation performance and increasing investment. The work of the DSI is pivotal in realising these goals, particularly the initiatives it champions for innovation in the challenging fields of energy, food security, poverty alleviation and healthcare.

The implementation of the Strategic Plan on Transformed, Inclusive, Responsive Coherent National System of Innovation will be strengthened through the finalisation of the Decadal Plan 2020-2030, that will define specific missions which will be pursued collectively by the National System of Innovation in support of national priorities.

The DSI will introduce the Sovereign Innovation Fund, during the 2020/21 financial year, to support knowledge utilisation for economic development in revitalising traditional industries and stimulating R&D-led industrial development.

Once fully operational, the Sovereign Innovation Fund will serve as a new financing instrument between the public and private sectors. Its overall objective will be to harvest and commercialise South African technology innovations for deployment in national and international markets.

Over the medium term, the department will focus on developing human capital, ensuring the effective use of publicly funded intellectual property, implementing the National Space Strategy, and implementing the National Integrated Cyberinfrastructure System.

Developing human capital

Human capital is key to the development of a national system of innovation that is globally competitive and responsive to South Africa's developmental needs. For this purpose, the DSI has allocated R8.5 billion over the MTEF period in the Human Capital and Science Promotions subprogramme to provide postgraduate bursaries and scholarships; internships; and support for emerging and established researchers, including strategic instruments such as the South African research chairs initiative, and the centres of excellence.

To date, the department has awarded 252 research chairs and will continue to support the 14 established centres of excellence that serve as hubs that draw together a range of universities and science councils to tackle challenges in health, food security, human development, energy and biodiversity, among other things.

Effective use of publicly funded intellectual property

The DSI will continue to work towards identifying, protecting, using and commercialising intellectual property and technology. Over the MTEF

period, this includes generating a targeted 365 knowledge products (including peer-reviewed scientific articles and applications for or the registration/granting of intellectual property rights); developing and approving 12 science, technology and innovation strategic policy directives; and developing and/or maintaining nine interventions to improve the delivery of government services or functions. These activities are expected to contribute to spending of R5.5 billion in the Technology Innovation programme over the medium term.

National Space Strategy

The national space strategy is intended to ensure, through activities such as Earth observation, navigation and meteorological monitoring, that South Africa captures a reasonable share of the global space market. To this end, R642.2 million is allocated over the medium term to the Space Science subprogramme in the Technology Innovation programme.

In addition, as the department seeks to contribute to a reduction in greenhouse gas emissions and air pollution through more diverse and sustainable energy solutions, R598 million in the Hydrogen and Energy subprogramme, in the same programme, will be invested in the development of technologies such as hydrogen fuel cells, renewable energy and carbon capture.

National Integrated Cyberinfrastructure System

The National Integrated Cyberinfrastructure System is expected to enable the successful and sustainable implementation of national projects such as MeerKAT and the Square Kilometre Array (SKA). To this end, R3.7 billion is allocated over the medium term to the Basic Science and Infrastructure subprogramme in the Research, Development and Support programme for the Council for Scientific and Industrial Research to implement the system. The MeerKAT telescope, for example, is expected to add 20 antennae to its current array of 64 at a projected cost of R800 million over the period ahead.

Legislation

Legislation governing the DSI include the:

- Intellectual Property (IP) Rights from Publicly Financed Research and Development Act, 2008 (Act 51 of 2008), provides for the more effective use of IP emanating from publicly financed R&D, through the establishment of the National Intellectual Property Management Office (NIPMO), the IP Fund, and offices of technology transfer at institutions;
- Technology Innovation Act, 2008 (Act 26 of 2008), intends to promote the development and exploitation in the public interest of discoveries, inventions, innovations and improvements, and for that purpose establishes the Technology Innovation Agency;
- South African National Space Agency (SANSA) Act, 2008 (Act 36 of 2008), establishes the SANSA to promote space science research, cooperation in space-related activities and the creation of an environment conducive for the development of space technologies by industry;
- Natural Scientific Professions Act, 2003 (Act 27 of 2003), establishes the South African Council for Natural Scientific Professions, and legislates the registration of professional natural scientists, natural scientists-in-training, natural science technologists and natural science technologists-in-training;
- NRF Act, 1998 (Act 23 of 1998), establishes the NRF to promote basic and applied research, as well as the extension and transfer of knowledge in the various fields of science and technology;
- National Advisory Council on Innovation (NACI) Act, 1997 (Act 55 of 1997), establishes the NACI to advise the Minister responsible for science and innovation on the role and contribution of science, mathematics, innovation and technology in promoting and achieving national objectives;
- Africa Institute of South Africa (AISA) Act, 2001 (Act 68 of 2001), establishes the AISA to promote knowledge and understanding of African affairs by encouraging leading social scientists;
- Human Sciences Research Council (HSRC) Act, 2008 (Act 17 of 2008), provides for the HSRC, which carries out research that generates critical and independent knowledge relative to all aspects of human and social development;
- Scientific Research Council Act, 1988 (Act 46 of 1988), refers to the activities of the Council for Scientific and Industrial Research (CSIR), one of the leading scientific and technological research, development and implementation organisations in Africa, which undertakes directed R&D for socio-economic growth in areas including the built environment, defence, the environmental sciences, as well as biological, chemical and laser technologies;
- Astronomy Geographic Advantage Act, 2007 (Act 21 of 2007), provides for the preservation and protection of areas in South Africa that are uniquely suited to optical and radio astronomy, and for intergovernmental cooperation and public consultation on matters concerning nationally significant astronomy advantage areas;
- Geoscience Amendment Act, 2010 (Act 12 of 2010), amends the Geoscience Act, 1993 (Act 100 of 1993), to mandate the Council for Geoscience to be the custodian 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 National Research Network (SANReN), which is responsible for the roll-out of a high-speed broadband network to all academic and research institutions in the country, was awarded a private electronic communications network licence exemption under the Electronic Communications Act, 2005 (Act 36 of 2005); and
- Science and Technology Laws, Amendment Act, 2014 (Act 7 of 2014), seeks to, among other things, streamline the process for the nomination and appointment of members of the boards or councils of such entities as well as the filling of vacancies on the boards.

Budget

For the 2021/22 financial year, the DSI was allocated R2.6 billion. Expenditure is expected to increase at an average annual rate of 2.4%, from R9 billion in 2021/22 to R9.7 billion in 2024/25. Transfers to entities account for an estimated 93.7% (R26.3 billion) of the department's expenditure over the MTEF period. The second-largest cost driver is compensation of employees, spending on which is set to increase at an average annual rate of 1%, from R363.3 million in 2021/22 to R374.5 million in 2024/25.

Entities

Academy of Science of South Africa (ASSAf)

The academy was established in terms of the ASSAf Act, 2001 (Act 67 of 2001), as amended, to promote outstanding achievements in all fields of scientific inquiry, recognize excellence, and provide evidence-based scientific advice to government and other stakeholders.

Over the medium term, the academy aims to achieve enhanced national capacity to produce and publish research, provide evidence-based policy advice to government, and increase the quality and visibility of South African research publications. This will entail undertaking various studies in the areas of health, education, climate change, energy, the science-policy nexus, biosafety and biosecurity, poverty reduction, gender-responsive issues; and, where possible, young people and people living with disabilities.

Expenditure is expected to decrease at an average annual rate of 4.7%, from R43 million in 2021/22 to R37.2 million in 2024/25. This is mainly a result of the academy using digital platforms, which are more cost effective than physical venues, for most of its activities since the onset of the COVID-19 pandemic. Transfers from the department account for an estimated 95.6% (R103.3 million) of the academy's total revenue over the period ahead, also decreasing at an average annual rate of 4.9%, from R41.3 million in 2021/22 to R35.5 million in 2024/25.

Council for Scientific and Industrial Research

The CSIR was established in 1945 and is governed in terms of the Scientific Research Council Act of 1988. The council fosters industrial and scientific development in the national interest, through multidisciplinary research and technological innovation to improve the ability of the State to efficiently deliver basic services, in fields such as health, education, social security, energy and shelter, to all South Africans, and in so doing, reduce inequality.

Over the medium term, the council will focus on conducting high-quality and relevant research, pursuing technological innovation to foster industrial and scientific development, and furthering industrial development opportunities in fields such as pharmaceutical innovation and agro-processing.

The council's ability to generate its own revenue is directly related to its ability to attract and retain the requisite expertise and skills to deliver favourable research outcomes. As such, spending on compensation of employees accounts for an estimated 54.1% (R5.9 billion) of the council's total expenditure, increasing at an average annual rate of 7%, from R1.7 billion in 2021/22 to R2 billion in 2024/25. To retain a high calibre of staff and strengthen its value proposition, the council also offers non-monetary employee benefits such as training and exchange programmes.

The council generates revenue mainly through the services it renders, such as contract research and development, income from intellectual property, proceeds from technology transfer, and royalties.

Transfers from the department account for an estimated 21.6% (R2.3 billion) of its projected total revenue of R10.9 billion over the MTEF period.

The council expects to post a net profit of R2 million in 2022/23, which it anticipates increasing to R3 million by the end of the MTEF period. These profits will be invested in resources and capabilities such as property, plant and equipment.

In January 2021, the CSIR was recognised as a top employer in South Africa by the Top Employers Institute Programme, which certifies organisations based on the participation and results of their Human Resource Best Practices Survey. The survey covers six human resource domains consisting of 20 topics such as people strategy, work environment, talent acquisition, learning, well-being, and diversity and inclusion, among others.

Human Sciences Research Council

The HSRC was established in 1968 to undertake, promote and coordinate research in human and social sciences. The council is mandated to initiate, undertake and foster strategic, basic and applied research in human sciences; and address developmental challenges by gathering, analysing and publishing relevant data, especially through projects linked to collaborative programmes oriented towards the Public Sector.

The council's research outputs are widely disseminated to support policy development at all levels of government. As such, over the medium term, the council will continue to focus on producing research that serves the public; contributing to good governance and public service delivery; helping to address the challenges of poverty, inequality and inclusive development; and building the capacity of scholars and researchers.

As a research institute, human capital plays a central role in the council's work. As such, spending on compensation of employees accounts for an estimated 49.6% (R893.5 million) of the council's budget, increasing at an average annual rate of 4.4%, from R273.4 million in 2021/22 to R311 million in 2024/25. The council is set to receive 56.6% (R980.2 million) of its revenue over the period ahead through transfers from the department, decreasing at an average annual rate of 1.5%, from R352.4 million in 2021/22 to R336.8 million in 2024/25. The remaining revenue is generated by research contracts and grants from national and international agencies, government departments and private sector foundations.

National Research Foundation

The NRF is mandated to fund research, develop human resources, promote indigenous knowledge, and provide research facilities to enable knowledge creation, innovation and development in all fields of science and technology.

Over the MTEF period, the foundation will focus on implementing its 10-year strategy: Vision 2030. This entails interventions to catalyse transformation in the science and technology system through measures such as creating grant funding instruments that focus on women and black researchers, and fast-tracking black women doctoral graduates towards obtaining their foundation rating.

To procure specialised equipment at iThemba Labs, the SKA and the extension of the MeerKAT telescope, capital expenditure of R5 billion over the MTEF period is allocated in the National Research Infrastructure Platforms programme.

The foundation receives funding primarily through a parliamentary grant, which accounts for an estimated 89% (R12.4 billion) of its projected revenue over the MTEF period. Other revenue is derived through transfers from the department, contract funding for specific projects and programmes from other government departments and entities, and income generated by sales and interest earned. Transfers from the department are expected to decrease at an average annual rate of 3.6%, from R4.5 billion in 2021/22 to R4.1 billion in 2024/25, due to the completion of Phase 1 of the SKA.

South African National Space Agency

The agency was established in terms of the SANSA Act of 2008, as amended, to promote the peaceful use of space, foster international cooperation in space-related activities, and facilitate the creation of an environment conducive to space technology and industrial development. Over the medium term, the agency will focus on broadening the suite of products and services available in the space sector, and contributing to promoting socio-economic development across Africa. This will be achieved by building adequate space capacity; improving geospatial information; developing key infrastructure in support of the sector; and providing technical skills interventions, research capacity, and knowledge-management tools.

As the agency relies on highly skilled professionals to fulfil its mandate, compensation of employees accounts for an estimated 52.8% (R475 million) of its planned spending, increasing at an average annual rate of 0.8%, from R163.7 million in 2021/22 to R167.4 million in 2024/25. Expenditure is expected to decrease at an average annual rate of 8.5%, from R363.8 million in 2021/22 to R278.8 in 2024/25, particularly in administration-related activities, as a result of an anticipated decrease in revenue, mainly from the parliamentary grant.

Transfers from the department account for an estimated 72.6% (R611 million) of the agency's revenue over the MTEF period. Additional revenue is generated by services rendered to government institutions and other organisations, mainly international clients in the space sector.

Technology Innovation Agency

The Technology Innovation Agency Act of 2008, as amended, mandates the agency to serve as a key institutional intervention to bridge the innovation gap between R&D outcomes from higher education institutions, science councils, public entities and private companies. This with the purpose of intensifying the effect of technological innovation in the economy.

Over the medium term, the agency will continue to focus on: bridging the innovation gap between research and development; supporting technologies within the national system of innovation; scaling up all strategic programmes by increasing the pace at which applications and internal processes take place; and creating a conducive environment for engaging with innovators, stakeholders and suppliers.

Accordingly, the agency plans to license 41 new technologies, provide technology development funding and support in strategic high-impact areas to 83 innovators, and ensure that at least 470 patents, publication outputs and knowledge-based products are produced.

To fund these initiatives, expenditure is expected to increase at an average annual rate of 2.1%, from R572.2 million in 2021/22 to R608.3 million in 2024/25. Compensation of employees accounts for an estimated 19.7% (R348.1 million) of expenditure over the period ahead. The agency derives the bulk of its revenue through transfers from the department. These are set to increase at an average annual rate of 2.4%, from R447.7 million in 2021/22 to R480.8 million in 2024/25 as the agency aims to increase the number of technologies it licenses and commercialises.

In 2021, South Africa was elected as an International Civil Aviation Organization (ICAO) designated Regional Space Weather Centre. The announcement came after the country received excellent audit results from ICAO.
South Africa, through the South African National Space Agency, has been designated to provide space weather information that is now an adopted standard by ICAO for all aviation requirements.
The country has been given three years to upgrade its current limited capacity to meet ICAO's requirements. The requirements include 24-hours/seven-day operations with an established team of trained forecasters and specialist space researchers. It has also been granted permission to collaborate with the Pan-European Consortium for Aviation Space Weather User Service.
The designation affords South Africa an opportunity to grow its science and engineering technology and innovation sector, and puts the country on the map as a global player in space science.

Role player

South African Council for Natural Scientific Professions (SACNASP)

The SACNASP's mandate is to provide a credible professional registration and regulatory body that allows natural scientists to establish, direct, sustain and ensure a high level of professionalism and ethical conscience in the natural scientific professions sector. Their conduct should be internationally acceptable and in the broad interest of the community as outlined in the SACNASP Code of Conduct.

Policy mandate and programmes

Technology Innovation

The programme aims to enable R&D in space science and technology, energy security and the bioeconomy, and in the emerging and converging areas of nanotechnology, robotics, photonics and indigenous knowledge systems (IKS), to promote the realisation of commercial products, processes and services.

It also promotes the protection and utilisation of IP, technology transfer and technology commercialisation through the implementation of enabling policies and interventions along the entire innovation value chain. Its subprogrammes include the:

- Space Science, which supports the creation of an environment conducive to the implementation of the national space strategy and South African earth observation strategy, and that addresses the development of innovative applications and human capital to respond to national priorities and support socio-economic development.
- Hydrogen and Energy, which provides policy leadership in research, development and innovation initiatives in the energy sector. This subprogramme plays a key role in developing a sustainable and globally competitive South African energy knowledge base and industry.
- Bio-innovation, which leads the implementation of the national bio-economy strategy.
- Innovation Priorities and Instruments, which supports and strengthens the innovation policy package aimed at creating and sustaining an enabling environment for innovation, technology and development, and the commercialisation of publicly funded R&D initiatives.
- NIPMO – the implementing agency established to provide for the more effective use of IP emanating from publicly financed R&D.

International Cooperation and Resources

The programme strategically develops, promotes and manages international partnerships that strengthen the National System of Innovation. It enables an exchange of knowledge, capacity and resources between South Africa and its international partners, with a focus on building capacity to support science, technology and innovation in Africa. It also supports South African foreign policy through science diplomacy. Its subprogrammes include:

- Multilateral Cooperation and Africa, which advances and facilitates South Africa's participation in bilateral science, technology and innovation cooperation initiatives with other African partners; in African multilateral programmes, especially those of the Southern African Development Community and African Union; and in broader multilateral science, technology and innovation and innovation partnerships, with a strategic focus on South-South cooperation.
- International Resources, which works to increase the flow of international funding into South African science, technology and innovation initiatives, as well as African regional and continental programmes, through concerted efforts to promote foreign investment and the fostering of strategic relations with partners such as the EU, as well as foundations and philanthropic organisations and the multinational private sector.
- Overseas Bilateral Cooperation, which promotes and facilitates South Africa's cooperation in bilateral science, technology and innovation agreements with partners in Europe, the Americas, Asia and Australasia, especially for human capital development and collaborative research and innovation; and secures support for joint cooperation with other African partners.

South Africa is regarded by many countries and private sector partners as a preferred and privileged partner for international cooperation. On average, approximately 15% of annual R&D funding in South Africa comes from international investors.

Research, Development and Support

The programme provides an enabling environment for research and knowledge production that promotes the strategic development of basic sciences and priority science areas through the promotion of science human capital development, and the provision of research infrastructure and relevant research support, in pursuit of South Africa's transition to a knowledge economy. Its subprogrammes include:

Human Capital and Science Promotions, which formulates and implements policies and strategies that address the availability of human capital for science, technology and innovation; provide fundamental support for research activities; and contribute to the development of a society that is knowledgeable about science, critically engaged and scientifically literate.

Science Missions, which promotes the development of research, the production of scientific knowledge, and the development of human capital in fields of science in which South Africa enjoys a geographic advantage.

Basic Science and Infrastructure, which facilitates the strategic implementation of research and innovation equipment and facilities to promote knowledge production in areas of national priority, and sustain innovation led by research and development. Astronomy, which supports the development of astronomical sciences around a new multiwavelength astronomy strategy, and provides strategic guidance and support to relevant astronomy institutions in the implementation of strategic astronomy programmes.

Socio-economic Innovation Partnerships

The programme enhances government's growth and development priority areas through targeted science and technology-based innovation interventions, and the development of strategic partnerships with other government departments, industry, research institutions and communities. Its subprogrammes include:

- Sector Innovation and Green Economy, which provides policy, strategy and direction for research and the development-led growth of strategic sectors of the economy; and supports the transition to a green economy.
- Innovation for Inclusive Development, which supports the development of science and technology-based innovations for tackling poverty, including the creation of sustainable jobs and human settlements, and the enhanced delivery of basic services.
- Science and Technology Investment, which leads and supports the development of indicators and instruments for monitoring investments in science and technology, the performance of the National System of Innovation, and ways of strengthening policy.
- Technology Localisation, Beneficiation and Advanced Manufacturing, which funds technology and innovation development programmes to advance strategic, sustainable economic growth for the medium and long term; sector development priorities; and service delivery.

National research facilities

The national research facilities managed by the NRF are clustered on the basis of their areas of specialisation aligned to the science missions of the National Research and Development Strategy.

South African Astronomical Observatory (SAAO)

The SAAO is the national centre for optical and infrared astronomy in South Africa. Its prime function is to conduct fundamental research in astronomy and astrophysics by providing a world-class facility and by promoting astronomy and astrophysics in southern Africa.

The SAAO contributes to South Africa's future development by creating and disseminating scientific knowledge, providing research infrastructure and providing an interface between science and society. It is also responsible for managing the operations of the South African Large Telescope.

Hartebeesthoek Radio Astronomy Observatory (HartRAO)

The HartRAO is a national facility of the NRF. Its radio astronomy research focuses on stellar evolution, pulsars and masers; and its space geodesy research uses space-based techniques to study the earth. The facility is also used by university students for carrying out research. It also undertakes science awareness programmes for schools and the general public.

South African Institute for Aquatic Biodiversity (SAIAB)

A national facility of the NRF, the SAIAB is famous for its association with the discovery of the enigmatic coelacanth and is internationally recognised for ichthyological research, dynamic research staff and active postgraduate school. The SAIAB provides unique skills and infrastructure support in marine, estuarine and freshwater ecosystems research, molecular research, collections and bioinformatics.

South African Environmental Observation Network (SAEON)

The SAEON is a business unit of the NRF and serves as a national platform for detecting, translating and predicting environmental change through scientifically designed observation systems and research. The SAEON also captures and makes long-term datasets freely accessible, and runs an education outreach programme. The SAEON has six nodes dispersed geographically across the country.

National Zoological Gardens (NZG)

The NZG is a rapidly transforming facility reporting to the NRF. It owns an impressive animal collection, conservation centres, the Centre for Conservation Science and the NZG Academy.

The NZG is well placed as an education and awareness platform for visitors comprising educators, learners, students, special interest groups and the general public.

iThemba LABS

iThemba LABS is the continent's largest facility for particle and nuclear research as well as one of only a handful of facilities in the world producing radionuclides for commercial, research and medical applications. In addition, its facilities include a full radiotherapy clinic for the treatment of certain cancers using both proton and neutron therapy.

The facility has secured government support to finance its strategic flagship project, the South Africa Isotope Facility (SAIF) – an initiative that seeks to secure future sustainability of the facility by procuring a dedicated 70 Mega electron-volt cyclotron accelerator to boost the production rate of a range of accelerator-based radioisotopes.

The strategic vision of the facility is to configure its radioisotope production division and establish the SAIF in a flagship project geared to triple the current radioisotope income. The move is set to establish the facility as a formidable international entity with a secure market niche in the accelerator-based radiopharmaceutical sector.

An annual average of more than 155 000 patients worldwide benefit from cancer diagnostic radioisotopes produced using the separated sector cyclotron particle at iThemba LABS.

Infrastructure projects

Square Kilometre Array

The multibillion-rand SKA, to be hosted in South Africa and Australia, will eventually extend into eight African countries and will be the world's biggest telescope. It is also one of the biggest-ever scientific projects and multinational collaborations in the name of science. The SKA organisation is progressing well, and South Africa continues to play an active role in the project. It was one of seven countries (with Australia, China, Italy, the Netherlands, Portugal and the United Kingdom (UK)) that signed a treaty establishing the SKA Observatory in March 2019.

South Africa is also working on getting the SKA Observatory treaty ratified by Parliament. The SKA Observatory is an intergovernmental organisation tasked with the construction and operations of the SKA radio telescope. The quality of astronomy infrastructure will allow world-class research.

With thousands of linked radio wave receptors in Australia and in southern Africa, the SKA radio telescope will constantly scan space and feed the data to astronomers around the world.

The amounts of data being collected and transmitted by the SKA in a single day would take nearly two million years to play back on an iPod. This means the project requires supercomputing power and Big Data management and analytics capabilities on an unprecedented scale. The SKA is working with the world's most significant ICT powerhouses on the project.

One aspect of the project will see the Netherlands Institute for Radio Astronomy and the International Business Machines Corporation collaborating to research extremely fast, but low-power exascale computer systems, data transport and storage processes, and streaming analytics that will be required to read, store and analyse all the raw data that will be collected daily.

The SKA project will also have unprecedented data-connectivity needs. Meeting the advanced technological and engineering needs of this project will result in significant local skills development, revolutionise science and technology research and enable innovative new businesses and employment in the science, technology and engineering fields.

Aside from the benefits to African science, Big Data Management and Analytics capabilities could be the biggest spin-off from the SKA project. The innovations, skills development and commercial potential emerging as a result of the project are huge. The potential is not just academic – the taxpayer-funded IP is developed to a point where it is ready to become commercialised and benefit the economy.

Human capital development is already taking place as a result of the SKA project, with bursaries and scholarships being granted to allow students to learn the necessary cutting-edge science, technology, mathematics and engineering skills to support the project. Because the SKA is a long-term project, over decades its effect will increase.

The Centre for High Performance Computing is a member of the international SKA Science Data Processing Consortium. With funding from the DSI, it is also supporting eight African SKA partner countries through an initiative where they have installed its new supercomputer to provide 1 000 teraflops (one petaflop) of computing power to researchers.

The facility was upgraded to meet the growing demand for use by university and industrial researchers. The SKA remains a major platform for cutting-edge innovation in domains such as supercomputing the high-speed transmission and processing of massive data sets. Going forward, there will be a strong drive to leverage the SKA as a spearhead for other programmes – including next generation high performance computing challenges and Big Data challenges.

Two engineering consortia have been hard at work at their sites in Murchison, Western Australia, and the Northern Cape, South Africa, respectively, designing all the essential infrastructure required for the construction of this complex global project to get under way. This includes access roads, power, water and sanitation, buildings, antenna foundations, and the communication, security and site monitoring equipment required to support the SKA telescope.

The South African consortium, Infrastructure South Africa, was led by the South African Radio Astronomy Observatory, which designed, built and operates the 64-dish SKA precursor telescope, the MeerKAT.

Following the successful review of the key infrastructure components of the SKA – considered a major engineering victory – the project will now move on to the bridging phase.

National Integrated Cyberinfrastructure System

The NICIS promotes scientific and industrial development through the provision of high-performance computing capability, high-speed network capacity and a national research data infrastructure integrated hierarchically into globally connected systems and into local system systems, providing seamless access for the research and education communities of South Africa. It is a national initiative of the DSI and is implemented by the CSIR.

The Centre for High Performance Computing is one of three pillars of the NICIS. It provides massive parallel processing capabilities and services to researchers in industry and academia. The other main pillars are the South African National Research Network, which provides high-speed connectivity and advanced networking services, and the Data Intensive Research Initiative of South Africa, which implements services that enable sound data management practices and support efficient data-driven scientific and engineering discoveries.

The NICIS is the national or Tier 1 platform to provide e-infrastructure, tools and services to enable sustainable e-research, human capital and research capacity and skills development; and effective delivery of e-learning.

The implementation of the following projects of the NICIS continued during the 2020/21 financial year:

- A multi-institutional national e-science postgraduate teaching and training programme – to be expanded in terms of the disciplines covered and institutions being added;
- Increasing the number of awards of the e-research support programme;
- Additional regional Tier 2 data nodes being established; and
- The big data strategy being implemented.

The DSI, in cooperation with the CSIR, has commissioned the set-up of a core situational awareness platform. The centre, led by the DoH, provides near real-time analytics and dashboards on the COVID-19 outbreak per province, district, local municipality and ward.
The centre is housed in a secure facility at the CSIR in Pretoria and provides a central situational awareness, giving a single view of the reality of the spread of COVID-19 across the country.
The centre is one of several projects that the DSI is working on in support of government's response to the pandemic. Among the centre's capabilities is the Command and Control Collaborator (Cmore) app – a mobile visualisation platform used by community health workers to record screening data and symptoms in the field and transmit the information to the centre.
The Cmore app enables a near-live display of the results of the work being conducted by government's Household Screening and Testing Programme. The data and insights generated by the centre provide significant input for decision making by the National Coronavirus Command Council.

South African Research Infrastructure Roadmap (SARIR)

Through a joint agreement between South Africa and the EU, the SARIR Framework was developed as the basis for prioritising the development of national research infrastructure needs. The SARIR is

a high-level strategic and systemic intervention to provide research infrastructure across the entire public research system, building on existing capabilities and strengths, and drawing on future needs.

This roadmap will provide guidance to the DSI on the strategic development, acquisition and deployment of research infrastructure as a necessary enabler for research, development and innovation.

The SARIR is intended to provide a strategic, rational, medium- to long-term framework for planning, implementing, monitoring and evaluating the provision of research infrastructure necessary for a competitive and sustainable national system of innovation. It also provides a basis for discussion concerning financing future infrastructure for research in South Africa, and for participating in joint international research infrastructure.

The roadmap was developed through a bottom-up process driven from within the national research community, moderated at a technical level by an expert steering committee and aligned with national research priorities through strategic moderation by the DSI. The implementation of the SARIR will continue over the MTSF period, with all 13 research infrastructures approved in the first phase of the roadmap being implemented.

Information and communications technology

The DSI is leading the implementation of the national ICT Research, Development and Innovation Strategy. The strategy's main purpose is to create an enabling environment for innovation and manufacturing facilities and resources in South Africa.

The Centre for High-Performance Computing (CHPC), SANReN and the Very Large Databases are the three pillars of cyberinfrastructure that the DSI supports. Hosted by the UCT and managed by the CSIR's Meraka Institute, the CHPC was the first of its kind in South Africa and is making scientific supercomputing a reality for the country.

A major project for SANReN is the national backbone network, which aimed to connect all major metros in the country with a 10 gigabyte per second link. SANReN, linking 215 research sites, consists of 1 500 kilometres (km) of dark fibre and 5 000 km of managed bandwidth.

This network is complimented by significant international broadband capacity on the West Africa Cable System and the east coast SEACOM system, ensuring that the DSI's projects support competitive research and innovation as it prepares the national innovation system for the future.

SANReN connects more than 200 sites from Thohoyandou to Cape Town, including all the main campuses of all South African universities and most public research institutions, as well as global projects such as the SKA and the MeerKAT.

Indigenous knowledge systems

The IKS Policy serves as a guide for the recognition, understanding, integration and promotion of South Africa's wealth of indigenous knowledge resources. One of the areas of action identified by the policy is the protection of indigenous knowledge and the holders of such knowledge against exploitation. This includes ensuring that communities receive fair and sustained recognition and, where appropriate, financial remuneration for the use of this knowledge.

The indigenous knowledge of many communities embodies a deeply spiritualised and ancient relationship with the Earth's systems and cycles. Traditional songs and languages, clothing, architecture, foods, motifs, daily rituals and mythological epics contain local survival information. Moreover, the diversity of indigenous cultures provides unique insights into how to live harmoniously within nature.

By sharing indigenous stories of vulnerability and adaptation, people learn how communities share ideas on how ancestral wisdom is being incorporated into climatic adaptation strategies.

By cherishing the value of indigenous knowledge, people can discover how best to adapt to a changing climate.

The DSI has three IKS priorities:

- The development of a regulatory environment for the protection of IKS.
- The development of the National Recordal System for the collection, recording, documenting, storage and management and dissemination of IKS in communities in the nine provinces of the country. Until orally transmitted and rapidly disappearing indigenous knowledge is recorded, it will be difficult to protect. The National Recordal System is the largest fingerprint initiative of the region to document and record indigenous knowledge.
- Applied research, specifically bio-prospecting activities. An example would be the Moritela Tshwene Tea Project near Zeerust in the North West.

A major achievement was to put in place an information infrastructure that would hold IKS in oral format.

In addition, two UK-South Africa bilateral research chairs have been awarded for research into food security – one co-hosted by the universities of the Western Cape and Pretoria, and the other based at the NMU. The DSI has also established indigenous knowledge studies centres of excellence at some of the country's universities.

The centres will play a defining role in generating highly qualified HR capacity in IKS.

Natural resource development

To reinvigorate the South African mining sector and to harness the vast amounts of existing and potential opportunities for industrial and manufacturing growth, it is crucial for the country to create the technologies and mining methods to push mining deeper in a commercially viable manner. South Africa needs a competitive mining industry.

This will only be possible if science and innovation play the quintessential role of changing the cost and exploitation horizons of the sector. None of the existing mining stakeholders (publicly funded research institutions, private sector companies, universities, unions or government) have the scale to impact the situation alone in the long run.

To achieve this, a critical mass of science and knowledge to push the frontiers of mining will require a national effort consisting of deep partnerships and collaborations across institutions and industries.

Women in Science Awards

Every year since 2003, the DSI has held the SAWiSA to recognise the achievements of prominent women scientists and encourage the participation of women in research. The awards are held in August as part of National Women's Month celebrations, which take place to honour the women who marched to the Union Buildings in 1956 to protest the apartheid system's pass laws.