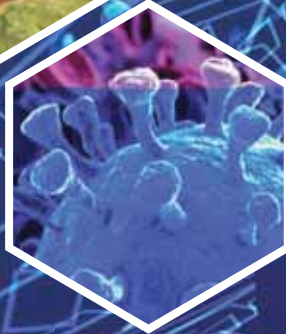


Annual Performance Plan

2020/2021



Making sure it's possible



science & innovation

Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA



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Executive Authority Statement



The 2020/21 financial year is the first under the Department's new five-year Strategic Plan and will see us begin to implement the new policy that has replaced the 1996 White Paper on Science and Technology.

The 2019 White Paper on Science, Technology and Innovation (STI), which emphasises inclusivity, transformation and partnerships, commits South Africa to furthering the role of the national system of innovation (NSI) in the country's socio-economic development.

With the budget for 2020/21 estimated at R8,6 billion (it was R8,2 billion in 2019/20), this Annual Performance Plan identifies new policy initiatives in line with the new White Paper.

The National Advisory Council on Innovation reviews of the 2002 National Research and Development Strategy and the 2008-2018 Ten-Year Innovation Plan, and its foresight exercise identifying a range of STI domains for focus over the next 10 years, will inform the development of a decadal plan for STI in South Africa. The plan, which will follow a sector-based approach, will be finalised in 2020/21.

The DSI has consulted across government about a proposal to introduce a budget coordination instrument to enhance the quality, responsiveness and impact of public funding for research and development (R&D) activities. This is intended to underpin a government-wide medium-term R&D investment framework aligned to the economic and social priorities identified by the government in the National Development Plan.

Over the years, the Department has sharpened its focus on the ways in which its work and that of the NSI can contribute to the reduction of inequality, poverty and unemployment. We are paying particular attention to inclusivity, transformation and linkages in the NSI; enhancing the innovation culture in society and government; improving policy coherence and budget coordination across government; supporting social and grassroots innovation; expanding the research system; and accelerating the implementation of the pan-African STI agenda.

On the macro-economic front, initiatives to develop new R&D-led industries will help improve South Africa's exports, reduce the country's current deficit, and improve the prospects of economic growth.

The DSI continues to invest in building a South African titanium industry (manufacturing titanium powder and developing the next-generation additive manufacturing Aeroswift machine), the Fluorochemicals Expansion Initiative, and the hydrogen fuel cell technologies research, development and innovation programme, among others.

The Department also actively supports the implementation of the Industrial Policy Action Plan, working to harmonise instruments to attract private-sector investment in R&D in South Africa.

Coordinating efforts to grow South Africa's gross expenditure on research and development (GERD) to 1,5% of gross domestic product remains a constant focus of the Department in the medium term. The figures from the 2016/17 national survey on research and experimental development show that GERD during that period was 0,82%, and in 2017/18 moved up only one basis point to 0,83%.

The Department also offers technological support to a range of large and small firms through its Technology Localisation Programme and Technology Stations Programme. This is aimed at increasing competitiveness and turnover, and hence employment. The increased turnover enabled through technology support should also make it easier for small and medium enterprises to secure better contracts for larger projects in both the public and private sectors. The Technology Localisation Programme is one of the more effective interventions for leveraging public procurement activities to increase the level of local production, while also creating opportunities for export via foreign original equipment manufacturers.

In pursuit of a more inclusive NSI, the Grassroots Innovation Programme is being accelerated.

In line with the National Development Plan objective of integrating innovation in the delivery of basic services, the Department is providing decision-support tools to improve service delivery decision making and practice. This includes providing geospatial information through Earth observation initiatives for use in local planning.

The recent merger of the Ministries of Higher Education and Training and Science and Technology introduces new opportunities. A systemic review will identify synergies and complementarities in the mandates, functions and operations of the two departments, allowing optimal alignment.

The change in name from the Department of Science and Technology to DSI places greater emphasis on the Department's ability to drive the innovation agenda.

Over the past few years, the Department has made good progress in all of the strategic outcome-orientated goals set in the previous Strategic Plan. The high vacancy rate has seen DSI staff assuming additional responsibilities to ensure delivery while the Department finds new ways to ensure that the NSI contributes to reducing unemployment, inequality and poverty.



Dr BE Nzimande, MP

Minister of Higher Education, Science and Technology

March 2020

ISANDULELA SIKANGQONGQOSHE (UHLELO LOKUSEBENZA KONYAKA)

Unyaka ka 2020/2021 wezezimali unyaka wokuqala ngaphansi kohlelo lomnyango lweminyaka emihlanu oluzosisiza ukuqalisa inqubomgomo entsha engene esikhundleni seWhite Paper on Science and Technology yonyaka ka1996.

iWhite Paper on Science, Technology and Innovation (STI) yonyaka ka 2019 egcizelela ukumbandakanyeka, ukuguquka Kanye nokubambasana, izinikele kuMzansi Afrikha ukuqhubekisa indima yeNational system of innovation (NSI) yokuthuthukisa umnotho wezenhlalo wezwe.

Ngesabelomali sonyaka ka 2020/2021 esilinganiselwe ku 8,6 billion wamarandi (kwakungu 8.2 billion wamarandi onyakeni ka 2019/20), loluhlelo lokusebenza lonyaka luveza imizamo emisha yenqubomgomo ehambisana neWhite Paper entsha.

INational Advisory Council on Innovation reviews yonyaka ka 2002 yeNational Research ne Development Strategy kanye Ten-Year Innovation Plan yonyaka ka 2008 kuya kunyaka ka 2018, Kanye nokuvivinywa kubonelo phambili lwayo oluveza uhla lwezizinda zeSTI olubheke eminyakeni elingana neshumi, izokwazisa ukuthuthuka kwexebo leminyaka elishumi le STI eNingizimu Afrikha. Icebo, elilandela indlela esekwe emkhakheni, lizoqedelwa ngonyaka ka 2020\2021.

Eminyakeni endlule, umnyango ulole ukugxila kwayo endleleni osebenza ngayo nangendlela INSI engaxhasa ngayo ekunciphiseni ukungalingani, ububha Kanye nokungasebenzi. Ssibhekelele kubandakanyo, ushintsho kanye nokuxhumeka kwiNSI. Ukulula usiko loshintsho emiphakathini nakuhulumeni; ukweseka ezokuphila kanye nemvelaphi; ukukhulisa uhlelo lwezocwanningo; Kanye nokubungaza ukusungulwa kohlelo lwePan-African STI.

Ngokwesobonelo lezomnotho, amagxathu okuthuthukisa izimboni zeR&D-led entsha zizosiza ukuthuthukisa ukuthekelisa eNingizimu Afrikha, yehlise ukusilela kwezwe okwenzakalayo, ithuthukise amathuba okukhula komnotho.

IDSI iyaqhubeka nokuzinikela ekwakheni izimboni zaseNingizimu Afrikha zethitheniyamu (ukukhanda impuphu yethitheniyamu Kanye nokuthuthukisa ukwakhiwa okongeziwe komshini weAeroswift wesizukulwane esizayo), i Fluorochemicals Expansion Initiative kanye ne hydrogen fuel cell technologies research, ne development and innovation programme pakathi kwezinye.

Umnyango weseka ngenkuthalo ukusungulwa kwe Industrial Policy Action Plan, ukusebenzela ukuvumela kwamathuluzi ukuheha abemikhakha yangasese ukunikela kuR&D eNingizimu Afrikha.

Imizamo yokubambisana ukukhulisa igross expenditure on research and development (GERD) yaseNingizimu Afrikha ukuya kumaphesenti angu 1,5 yemikhiqizo yasekhaya ehlala igxile emnyangweni esigabeni esiphakathi. Lezizombolo zonyaka ka2016/17 zocwanningo lwezwe; ukuthuthukiswa kokuhlola kuveza ukuthi IGREG kulesosikhathi ibingamaphesenti angu 0.82 kanti ngonyaka ka2017/18 yankhuphuka yaze yafika ephuzini lamaphesenti angu 0.83.

Umnyango uphinde unikezele ukweseka kwezobuchwepheshe ezinkampanini ezinkulu nezincane kwiTechnology Localisation Programme kanye neTechnology Stations Programme, lokhu kubhekiswe ekwandiseni imincintiswano nenzuzo, Kanye nemisebenzi. Inzuzo eyongezekile yasiza ukweseka kwezobuchwepheshe kanti kumele kubelula ukuthi amabhizinisi amakhulu namancane akwazi ukuthola izinkontileka ezincono zezinhlelo ezinkulu emikhakheni yangasese neyomphakathi. i Technology Localisation Programme kanye neTechnology Stations Programme enye yezindlela zokungenelela ezinomphumela zokusiza umphakathi ukuthola imisebenzi yokukhulisa izinga lemikhiqizo yasekhaya, ngenkathi kuvulwa amathuba okuthekelisa ngaphandle kusetshenziswa amathuluzi emikhiqizo yangempela.

Ekuphikeleni kubandakanyo olukhulu lweNSI, iGrassroots Innovation Programme is being iyasheshiswa.

Ngokuhambisana nenhloso yeNational Development Plan ye-integrating innovation yokulethwa kwemisebenzi eyisisekelo, umnyango uletha ukweseka kwamathuluzi okuthatha isinqumo sokuthuthukiswa ukulethwa kwemisebenzi. Lokhu kufaka phakathi ulwazi lokuhlinzeka kwendawo ngamagxathu okuhlolwa komhlaba ukusebenzisa ukuhlela kwasekhaya.

Ukuhlanganiswa okwenzekaya kwezinkonzo zeHigher Education and Training and Science and Technology kwethula amathuba amasha. Ukubuyekwezwa okuhlelekile kuzoveza ukusebenza okuhambisanayo ezigunyazweni, imisebenzi, ukwenza kweminyango emibili, okuvumela ukuqondisa okulungile.

Ushintsho egameni lomnyango wezesayensi nobuchwepheshe ezindaweni zeDSI lugcizelela kabanzi ekhonweni lokuqhuba uhlelo loshintsho lomnyango.

Eminyakeni embalwa endlulile, umnyango wenze inqubekela phambili enhle kuyoyonke imiphumelo yezinhlelo ezibheke ezinjongweni zohlelo olwendlule. Lelizinga lesikhala elikhulu kangaka selibone abasebenzi beDSI becabanga ukongeza izibopho ukuqinisekisa ukwethulwa ngenkathi umnyango uthola izindlela ezintsha zokuqinisekisa ukuthi iNSI iyanikela ekunciphiseni ukungasebenzi, ukungalingani kanye nobubha.



uDokotela BE Nzimande, MP

Ungqongqoshe wezinga eliphakeme lezefundo, isayenzi kanye nezobuchwepheshe.

MATSENO A TONA (MORERO WA MOŠOMO WA NGWAGA LE NGWAGA)

Ngwaga wa ditšhelete wa 2020/21 ke wa mathomo ka fase ga morero o mofsa wa Lefapha wa Leano la mengwaga e mehlano gomme re tlo thoma go tsenya tirišong molao wo mofsa wo o tšeešego wa 1996 wa White Paper go Saense le Theknolotši legato.

White Paper go Saense, Technolotši le Bothomi ya 2019 (STI), yeo e gatelelago go tsenyeletša, phetogo le ditirišano, e tshepiša go tšwetša pele mošomo wa peakanyo ya setšhaba ya bothomi {national system of innovation} (NSI) ka gare ga ikononi ya setšhaba mono nageng.

Ka tekanyetšo ya 2020/21 go balelwa go tšhelete ya Di-billion tše R8,6 (e be ele Di-billion tše R8,2 ka 2019/20), morero wo wa mošomo wa ngwaga le ngwaga o tšweletša maikemišetšo a boithomedi ao a sepedišanago le a White paper e mpsha.

Lekgotla la Dikeletšo tša Setšhaba go ditlahlobo tša Bothomi la 2002 go Dinyakišišo le Tšwetšo-pele ya Maano a Setšhaba le Mengwaga e Lesome ya Morero wa Bothomi wa 2008-2018, le ponelopele ya go šupa mehuta ya di-domains tša STI mo e ka bago ka mengwaga e fetago e 10, le tla tsebiša Tšwetšo-pele ya morero bakeng sa STI mono Afrika Borwa. Morero, wo o tlo latelago lekala leo le lebeletšwego, o tla feleletšwa ka 2020/21.

DSI e ikgokagantše le mmušo mabapi le go tsebiša ka sedirišwa sa tshepedišo ya tekanyetšo e le go godiša boleng, dikarabo le tšhušumetšo ya tšhelete ya setšhaba bakeng sa mošomo wa dinyakišišo le tšwetšo-pele. Se se dirilwe ka maikemišetšo a go thekga go naba ga mmušo go beeng tšhelete go mošomo wo o sepedišanago le dinyakwa tša moruo le tša setšhaba tšeo di šupilwego ke mmušo ka go Tšwetšo-pele ya Morero wa Setšhaba.

Go theoša le mengwaga, Lefapha le kaonafaditše tlhokomelo go ditsela tša yona gore mošomo wa lona le wa NSI o ka tsenya letsogo go fokotšeng go se lekane, go hloka le tlhokego ya mošomo. Re lebišitše tlhokomelo go go tsenyeletša, phetogo le dikgokaganyo ka gare go NSI; go kaonefatša bothomi bja setšo go setšhaba le go mmušo, go tšwetša pele bothomi bja setšo setšhabeng

le go mmušo; go kaonefatša molao le tekanyetšo ya tshepedišo go mmušo; go thekga setšhaba ka bothomi bja bjang; go oketša tshepedišo ya dinyakišišo; le go iša godimo dikakanyo tša merero ya pan-African STI.

Kudukudu go ikononi yeo e golago, ka maikemišetšo a go dira dilo tše mpsha tša indasteri ya R&D-led go tla thuša go kaonefatša go romela dilo di ageng tše dingwe go tloga mono Afrika Borwa, go tla fokotša le tšhelete yeo e hlaelago ya naga, le go kaonefatša ditsela tša go godiša ikononi.

DSI e tšwela pele go tsenya tšhelete go ageng indasteri ya go tšweletša titanium mono Afrika Borwa (go tšweletša lerole la titanium le tšwetšo-pele ya moloko o latelago wa tlatšeletšo go tšweletšeng motšhene wa Aeroswift), kgodišo ya kgato ya Fluorochemicals, le nyakišišo ya theknolotši ya disele tša hydrogen fuel, tšwetšo-pele ya lenaneo la bothomi, go tše dingwe.

Lefapha ka mafolofolo le thekga go tsenyeng letsogo go Indasteri ya Leano la Ditiro le Morero, le šoma go kopana didirišwa go tanyeng šedi ya go tsenya tšhelete go makala a praevete a R&D mono Afrika Borwa.

Go okameleng maikemišetšo a go godiša bontši bja go dirišwa go dinyakišišo le tšwetšo-pele (GERD) go 1,5% ya di tšweletša-bontši tša gae e dula e le taba ya bohlokwa ya Lefapha ka nakwana. Dipalo-palo go tloga ka 2016/17 tša tlhahlobo ya setšhaba ya dinyakišišo le tšwetšo-pele ya diteko di bontšha GERD nakong yeo e be ele 0,82%, le ka 2017/18 e ile godimo gatee feela go 0,83%.

Lefapha gape le fana ka thekgo ya theknolotši go mehuta ye megolo le e menyenyane ya difeme go dirišwa Lenaneo la Theknolotši ya Selegae le Lenaneo la Diteišene tša Theknolotši. Se se dirilwe ka maikemišetšo a phadišano le phetišo, le mešomo. Phetišo yeo e hlatlogilego ka thekgo ya theknolotši e swanetše go dira dilo gore di be bonolo bakeng sa dikgwebo tše dinyenyane le tše itekanetšego go boloka dikotraka tše kaone bakeng sa diprotšeke tše dikgolo go makala a setšhaba le a praevete. Lenaneo la Theknolotši ya Selegae ke le lengwe la mananeo ao a

šomago tseleletšeng thekišo setšhabeng e le go oketša boemo bja ditšweletšwa tša selegae, ka lehlakoreng le lengwe le bula dikgoba tša go romela dilo go dirišwa didirišwa tša batšweletši ba dinaga tša ka ntle.

Tsenyeletšo yeo e kitimišwago ya NSI, Lenaneo la Bothomi bja Bjang le išitšwe godimo.

Ka go sepedišana le Morero wa Tšwetšo-pele ya Setšhaba ka maikemišetšo a go kopanya Bothomi go ditirelo tša motheo, Lefapha le fana ka dithulusi tša go thekga diphetho e le go kaonefatša ditirelo tšeo di tlišwago ke diphetho tšeo di dirwago le go di tsenya tirišong. Seo se akaretša go fana ka tshedimošo ya lefelong leo go dirišwa kgato ya go lekola Lefase bakeng sa merero ya selegae.

Go kopanywa ga Tirelo ya Thuto e Phagamego le Tlwaetšo le Saense le Theknolotši e tšweletša dikgoba tse mpsha. Tshepedišo e tla šupa go dirišana le go tlatšana ga ditirišano, mešomo le go dirišana ga mafapha a mabedi, ao a dumelelanago gabotse.

Go fetolwa ga Lefapha la Saense le Theknolotši go DSI go gatiša bokgoni bja Lefapha go sepedišeng Morero wa bothomi.

Go theoša le mengwaga e mmalwa, Lefapha le dirile tšwelo-pele e kgahlišago go maano ao a lebeletšwego go dipakane tšeo di ilego tša bewa go Maano a Morero. Go beng le dikgoba tše dintši go dirile gore bašomi ba DSI ba thome go nagana gore ba tlo hwetša maikarabelo a oketšegilego ge Lefapha le sa nyakana le ditsela tše difsa tša go netefatša gore NSI e tsenya letsogo go fokotšeng tlhokego ya mešomo, go se lekane le ho hlaka ga batho.



Ngaka BE Nzimande, MP

Tona ya Thuto e Phagamego, ya Saense le Theknolotši

Deputy Minister's Foreword

The 2020/21 financial year is the first under the Department's new five-year Strategic Plan, which will take us further in our efforts to improve lives, enhance productivity and grow the country's economy.

Internationally, the Department enjoys respect among its peers in the science arena, with a reputation for supporting world-class research outputs. It will continue to participate in global research partnerships with organisations like CERN, the European organisation for nuclear research, one of the world's largest and most respected centres in its field, and a facilitator of the STI agenda across Africa.

The White Paper on Science, Technology and Innovation (STI), and the signing into law of the Protection, Promotion, Development and Management of Indigenous Knowledge (IK) Act are two of the Department's achievements in the previous Strategic Plan period. Implementing them will be priorities in the 2020/21 financial year.

In 2018, government undertook a 25-year self-assessment of its performance since the dawn of democracy, evaluating to what extent it had succeeded in delivering on the promise of a better life for all South Africans. The review focused on, among other things, building the economy,

developing human capital, infrastructure, spatial planning, rural development and land reform, and climate change. Importantly, the review found that science, technology and innovation had contributed in various ways to all six of the focus areas, highlighting the value of a strong and effective STI system for a transformed, competitive and sustainable economy in South Africa.

With this acknowledged, the Department will continue its work with the aim of enabling the state and citizens to advance the 6th administration's priorities and deal with the triple challenge of poverty, inequality and unemployment that faces our country.



Deputy Minister of Higher Education, Science and Technology

March 2020

Accounting Officer Statement



After the 2019 general elections, the sixth administration changed the name of the Department from Science and Technology to Science and Innovation, and the Department has begun to prepare itself for a broader strategic role across government, placing more emphasis on innovation. The intention is to explore mechanisms to balance the traditional science (research and development) with the now more pronounced innovation agenda over the strategic plan term.

The revised mandate of the Department is articulated in the new White Paper on Science, Technology and Innovation, which Cabinet approved in March 2019. The White Paper increased the scope for science, technology and innovation (STI) 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 2020/21 annual performance plan will mark the first year of implementation of the Department's new strategic plan. The strategic plan has adopted 6 outcomes which the department will pursue between 2020/21 and 2024/45. These are:

- Outcome 1: A transformed, inclusive, responsive and coherent NSI;
- Outcome 2: Human capabilities and skills for the economy and for development;
- Outcome 3: Increased knowledge generation and innovation outputs;
- Outcome 4: Knowledge utilisation for economic development (a) in revitalising traditional industries and (b) stimulating R & D led industrial development;
- Outcome 5: Knowledge utilisation for inclusive development; and
- Outcome 6: Innovation in support of a capable and developmental State.

In recognition of innovation as a strategic enabler in improved service delivery and access to government services, the Department has introduced a new performance outcome aimed at expanding the use of innovation in building a more responsive and capable developmental state.

The implementation of the strategic plan outcome one of a "transformed, inclusive, responsive coherent National System of Innovation (NSI) will be strengthened through the finalisation of the Decadal Plan 2020- 2030. The decadal plan will define specific missions which will be pursued collectively by the NSI in support of national priorities.

One of the main policy achievements under the 2015-2020 Strategic Plan was the introduction of The Protection, Promotion, Development and Management of Indigenous Knowledge Act 6 of 2019. This Act intends to provide for the protection, promotion, development and management of indigenous knowledge, by among others, establishing a National Indigenous Knowledge Systems Office (NIKSO), the management of rights of indigenous knowledge communities, an Advisory Panel on indigenous knowledge and to provide for access and conditions of access to knowledge of indigenous communities. Building on this achievement and in pursuing outcome 3 of the SP 2020-25, which focuses on

increasing knowledge generation and innovation output, the regulations to the Act will be developed from 2020/21.

Outcome 4 of the strategic plan is focused on knowledge utilisation for economic development in (a) revitalising existing industries and (b) stimulating R&D led industrial development. For 2020/21, a key output towards this outcome will be the introduction of the Sovereign Innovation Fund (SolF). Once fully operational, the SolF will serve as a new financing instrument in partnership 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.

The 2019-2024 Medium Term Strategic Framework (MTSF) introduces the District Development Model (DDM) as a lever in driving coordinated planning and implementation across the three spheres of government. The DSI has embraced the DDM as part of strengthening service delivery in support of innovation enabling a capable state and introducing STI activities to spaces where such has not been prevalent. The DSI will seek to expand on its portfolio of decision support mechanisms and case use in determining service delivery choices to other government departments.

The DSI will continue with its focus on investing in the building of infrastructure that is a necessary means for world class science. Towards this end, we have prioritised three infrastructure projects over the MTEF commencing in 2020/21. These are the National Integrated Cyberinfrastructure System (NICIS), the Square Kilometre Array (SKA) and the South African Research Infrastructure Roadmap (SARIR).

On the international front, we will prioritise support for the African Union's Agenda 2063, Science, Technology and Innovation Strategy for Africa 2024 (STISA) and target support to historically disadvantaged higher education institutions to access international opportunities. The Africa STI Strategy will also be finalised and presented for Ministerial approval. The Department is committed to delivering on the South African government's commitment of "A better Africa and a better world" and usher in a more equal and human society.

Finally, the White Paper and the Decadal Plan currently under development also provide ground for an organisational review to ensure alignment in structure and delivery programmes with the revised mandate. Our employees remain our most valuable asset. The Department will also undertake a budget restructuring exercise within the MTEF allocated funds to ensure realignment with new priorities for the five-year planning cycle and to drive cohesion in targeted NSI areas in support of national priorities.



Dr Phil Mjwara

Accounting Officer of the Department of Science and Innovation

March 2020

Official Sign-Off

Ms Buhle Khumalo-Bokaba

Acting DDG: Institutional Planning and Support



Ms Nombuyiselo Mokoena

DDG: Corporate Services



Mr Mmboneni Muofhe

DDG: Technology Innovation



Mr Daan Du Toit

DDG: International Cooperation Resources



Dr Daniel Adams

Acting-DDG: Research Development and Support



Mr Imraan Patel

DDG: Socio-Economic Innovation Partnerships



Ms Pretty Makukule

Chief Financial Officer



Dr Phil Mjwara

Accounting Officer





M Making sure *it's possible*



PART A: OUR MANDATE

1. Legislative and Other Mandates

1.1 Legislative mandate

Academy of Science of South Africa Act, 2001

Establishes the Academy of Science of South Africa (ASSAf) to promote common ground in scientific thinking across all disciplines, including the physical, mathematical and life sciences, as well as human, social and economic sciences; to encourage and promote innovative and independent scientific thinking; to promote the optimum intellectual development of all people; to advise and facilitate appropriate action in relation to the country's needs, opportunities and challenges; and to link South Africa with high-level scientific communities within the Southern African Development Community, the rest of Africa and internationally.

Astronomy Geographic Advantage Act, 2007

Provides for the preservation and protection of areas in South Africa uniquely suited to optical and radio astronomy, and for intergovernmental cooperation and public consultation on matters concerning such areas.

Human Sciences Research Council Act, 2008

Provides for the continued existence of the Human Sciences Research Council (HSRC), which carries out research that generate critical and independent knowledge relative to all aspects of human and social development.

Income Tax Act, 1962

Section 11D of the Income Tax Act gives the Minister of Science and Technology authority to approve scientific and/or technological research and development (R&D) undertaken or funded in South Africa by the private sector for a 150% tax deduction on qualifying R&D expenditure.

Intellectual Property Rights from Publicly Financed Research and Development Act, 2008

Provides for the more effective use of intellectual property emanating from publicly financed R&D through the establishment of the National Intellectual Property Management Office (NIPMO), the Intellectual Property Fund, and offices of technology transfer at higher education institutions and science councils.

National Advisory Council on Innovation Act, 1997

Establishes the National Advisory Council on Innovation to advise the minister responsible for science and technology and, through the minister, the Cabinet, on the role and contribution of science, mathematics, innovation and technology in achieving national objectives.

National Research Foundation Act, 1998

Establishes the National Research Foundation (NRF) to promote basic and applied research, as well as the extension and transfer of knowledge in the various fields of science and technology.

Natural Scientific Professions Act, 2003

Establishes the South African Council for Natural Scientific Professions (SACNASP) and legislates the registration of professional natural scientists, scientists-in-training, technologists and technologists-in-training.

Protection, Promotion and Protection, Promotion, Development and Management of Indigenous Knowledge Act, 2019

Provides for the protection, promotion, development and management of indigenous knowledge; the establishment and functions of the National Indigenous Knowledge Systems Office; the registration of indigenous knowledge and the management of rights of indigenous knowledge communities; the recognition of prior learning; and the facilitation and coordination of indigenous knowledge-based innovation.

Scientific Research Council Act, 1988

Refers to the activities of the Council for Scientific and Industrial Research (CSIR), which undertakes R&D for socio-economic growth.

Science and Technology Laws Amendment Act, 2014

Amends the Scientific Research Council Act, 1988, the National Research Foundation Act, 1998, the Academy of Science of South Africa Act, 2001, the Natural Scientific Professions Act, 2003, the Human Sciences Research Council Act, 2008, the Technology Innovation

Agency Act, 2008, and the South African National Space Agency Act, 2008, so as to harmonise the processes for the appointment of the chairpersons of the boards of the entities reporting to the Minister; to streamline the processes for the appointment of members of the boards and of the chief executive officers of the entities; to provide for the filling of vacancies on the boards; to provide for the qualification requirements for membership of the boards and the disqualification of members of the boards; to provide for the extension of the term of office of members of the boards; to provide for the dissolution and reconstitution of the boards; and to provide for matters connected therewith.

South African National Space Agency Act, 2008

Establishes the South African National Space Agency (SANSA) to promote space science research, cooperation in space-related activities, and the creation of an environment conducive to industry's development of space technologies.

Technology Innovation Act, 2008

Establishes the Technology Innovation Agency (TIA) to promote the development and exploitation of discoveries, inventions, innovations and improvements in the public interest.

1.2 Policy mandate

The Department of Science and Innovation (DSI) derives its mandate from the 2019 White Paper on Science, Technology and Innovation, which emphasises the core themes of inclusivity, transformation, and partnerships

to address policy coherence, the development of human capabilities, knowledge expansion, innovation performance and increased investment that will result to economic, socio-political and intellectual benefits of science, technology and innovation (STI) to be enjoyed by all South Africans.

The 2019 White Paper on Science, Technology and Innovation, is drawing from what has worked in the past and introduces a number of policy shifts, namely:

- Increasing the focus on inclusivity, transformation and linkages in the NSI.
- Enhancing the innovation culture in society and government.
- Improving policy coherence and budget coordination across government.
- Developing a more enabling environment for innovation.
- Developing local innovation systems.
- Supporting social and grassroots innovation.
- Expanding the research system.
- Developing human capabilities.
- Accelerating the implementation of the pan-African STI agenda.
- Increasing investment in the NSI.

1.3 Relevant court rulings

None.



M Making \langle sure $\left(\begin{array}{c} \text{it's} \\ \text{possible} \end{array} \right) \rangle$



PART B:

OUR STRATEGIC FOCUS

RESPONDING TO THE COVID 19 PANDEMIC

July 2020

After the tabling of the Department of Science and Innovation's 2020/21 Annual Performance Plan in March 2020, the President of the Republic of South Africa declared a national state of disaster in response to the global spread of COVID-19, which the World Health Organisation categorised as a pandemic. The country went into lockdown with South Africa's borders closed and restrictions on movement for all citizens. The lock down had both social and economic repercussions. A risk-based approach saw the initial lockdown adjusted from level 5 in March 2020 to level 3 from June 2020.

The President announced a R500 billion stimulus package to reignite the economy after the first two levels of lockdown. The social and economic relief package is intended to support various initiatives across the country, and a Special Adjustment Budget to actualise it was tabled by the Minister of Finance in June 2020. Parts of the package are to be derived from the implementation of budget cuts across government and public entities. The Department's allocation for 2020/21 has therefore been revised downwards from R8 797 393 to R7 362 088. An amount of R324 175 has also been redirected to COVID-19-related responses.

The COVID-19 pandemic has been an opportune time for the South African science and innovation system to demonstrate its relevance and support of national priorities and South Africa's socio-economic imperatives. Entities such as the Council for Scientific and Industrial Research and the Human Sciences Research Council, as well as other initiatives and projects established or supported by the Department, have responded to the situation in a variety of ways, including the development of continuous positive airway pressure solutions under the guidance of the National Ventilator Project, the deployment of DSI-funded infrastructure to expand testing facilities, and the manufacturing of molecular biology enzymes, reagents and testing kits.

In managing the budget cuts, the Department attempted to absorb them internally as far as possible, in areas least likely to affect delivery on its mandate. The cuts were focused on the compensation of employees, because of the general delay in filling vacant posts under the lockdown, and on spending categories related to activities restricted under the lockdown, such as foreign travel, venues and catering. This created savings that could be used for COVID-19 interventions.

The budget cuts have impacted the Department's plans in the following broad areas:

- Infrastructure (the Square Kilometre Array, the National Integrated Cyberinfrastructure System and the South

African Research Infrastructure Roadmap).

- Human capital in designated areas of advanced manufacturing, aerospace, chemicals, mining, advanced manufacturing, ICTs and the Industry Innovation Programme, including the Sector Innovation Fund and the green economy.
- Science awareness initiatives.
- Knowledge and innovation products generated.

Under the leadership of the Presidency, an initiative termed the Presidential Youth Employment Initiative (PYEI) is underway to introduce an employment stimulus based on the announcement by the President in April 2020 of an allocation of R100 billion for job creation and retention as part of the R500 billion economic stimulus. The youth employment Project Management Office within the Presidency is leading the effort. The Special Adjustment Budget recommitted to the R100 billion stimulus over the coming period, with R19.6 billion made available in the 2020/21 financial year.

The following interventions across the National System of Innovation have been scoped as part of the PYEI:

- Community Science Journalist Programme (300 beneficiaries to be implemented by the National Research Foundation (NRF));
- Health Promotion agents (1,000 beneficiaries to be implemented by the Human Sciences Research Council (HSRC));
- Envirochamps (300 beneficiaries to be implemented by the Duzi Umngeni Conservation Trust (DUCT));
- Water Graduate Employment Programme (300 beneficiaries to be implemented by the Water Research Commission (WRC));
- District Development data workers (200) beneficiaries to be implemented by the mLab); and
- Experiential Learning Programme (300 beneficiaries to be implemented by the Council for Scientific and Industrial Research (CSIR)).

As a requirement under the PYEI, the Department has introduced a new indicator under Programme 5. The funds to implement this indicator titled "**Number of Presidential Youth Employment Initiative (PYEI) beneficiaries**" are separate to the Department's allocation. An amount of R67,811,773 has been tentatively secured from the Presidency for the 2020/21 financial year towards this indicator linked to the PYEI.

2. Situational Analysis

The notion of a national system of innovation was introduced in the 1996 White Paper on Science and Technology. In 1994, the democratic state inherited an ailing science and technology system, with challenges that included the financial consequences of the termination of apartheid technology missions (such as military dominance in the subcontinent and energy self-sufficiency) by the apartheid government between 1990 and 1994, as well as the strategic risks faced by the SADC region from a human, economic and security perspective.

The 1996 White Paper's intention was to improve the lives of all the country's people through science, technology and innovation. This would be achieved "through progressively increasing economic growth and enhanced participation in the economy" and "through the innovative and pervasive personal and social development of the nation's people". The White Paper was augmented in 2002 by the National Research and Development Strategy. The adoption of these new policy instruments for STI post-1994 was informed by the need to develop an STI system that responded to the needs of all South Africans under the democratic dispensation.

The period 2005 to 2018 was marked by the introduction of a range of sectoral policies. These included the Bio-economy Strategy, the Advanced Manufacturing Technology Strategy, the Hydrogen and Fuel Cell Technologies Research, Development and Innovation Strategy, the Intellectual Property Rights from Publicly Financed Research and Development Act and the establishment of new institutional players such as the Technology Innovation Agency, the National Advisory Council on Innovation (NACI) and the Department of Science and Technology (now the Department of Science

and Innovation), which had previously been a chief directorate in the Department of Arts, Culture, Science and Technology. These sectoral policies leveraged off the strengths of the national system of innovation, but also sought to create competitiveness and development in line with global technological advancements. At a macro-level, the Department obtained Cabinet approval for the Ten-Year Innovation Plan (TYIP) in 2008. The TYIP presented five grand challenges that the country sought to address in the period 2008-2018, namely Farmer to Pharma (now the bio-economy), Space Science and Technology, Energy Security, Global Change (including climate change) and Human and Social Sciences.

The continued evolution in STI policy recently saw the adoption of a new White Paper in 2019. The implementation plan for the White Paper on STI, the Decadal Plan for STI, is currently under development. The new era of STI policy is targeted at increasing the responsiveness of the NSI and its contribution to socio-economic imperatives and national priorities. It places greater emphasis on technology and innovation deployment and the use of innovation in support of a capable state and service delivery improvement.

A review of the 1996 White Paper was conducted by NACI in 2017. The review assessed performance against the vision, high-level goals and various specific initiatives set out at the time, such as policy formulation and resource allocation; regulatory policy; financing at performance level; human resource development and capacity building; and science and technology infrastructure. The review found that much improvement had been made but more needed to be done in certain areas. Key achievements and ongoing weaknesses between 1996 and 2016 are summarised below.

Key achievements	Prevailing weaknesses
<ul style="list-style-type: none"> • New national department responsible for science established • New actors: NACI, NRF, TIA, SANSA and research facilities • Regulatory Policy: IPR Act • Incentives introduced: R&D tax incentive, Technology and Human Resource for Industry Programme, Support Programme for Industrial Innovation • Infrastructure: Square Kilometre Array, national facilities established/expanded 	<ul style="list-style-type: none"> • Interdepartmental coordination leading to greater policy cohesion and the achievement of culture of innovation in government • Human resource development • Promotion of an information society • Use of government incentives for innovation

Figure 1: Key achievements and prevailing weakness at policy level determined by a review of the 1996 White Paper

The white paper review also presented an analysis of the performance of the system measured through certain scientific outputs.

Metric	1996	2016	Direction
Business expenditure on R&D: GERD (%)	41,5	47,1	↗
Basic Research (%)	19,6	24,5	→
Expenditure R&D on Engineering & Tech (%)	41,7	25,8	↘
Expenditure on R&D on Health (%)	6,9	17,2	↗
Expenditure R&D Soc Sci & Humanities (%)	7,7	14,8	↗
HEI STEM enrolment (%) (1996; 2014)	23,7	29,6	→
Degrees awarded to Black students (1996; 2014)	38 383	145 831	↗
PhD graduates	630	1 576	↗
Foreign university students (%)	<1	8	↗
Foreign PhD graduates (%)	n.a.	20	↗
FTE Researchers (excl PhD & Post Doc)	12 102	11 644	→
Female Researchers (%)	n.a.	42,3	↗
GERD (2010 Rand)/FTE researcher (000s)	844	1 848	↗
HEI Researcher/PhD enrolment	1.4	1.0	↘
Black Researchers, Government sector (%)	<3	± 55	↗
TVET enrolment.	n.a.	154 960	→
Articles (Web of Science Core) 1995; 2015	3 233	12 251	↗
Articles, books, conference proceedings, fractional	2351	9 679	↗
International co-authorship (%)	30	49	↗
Top 1% most highly cited 2003-2013	n.a.	3	
ZA h index, Web of Science (1996-2000; 2006-2010)	162	192	→
World share of publications (fractional); rank	0,38 (31)	0,44 (35)	↗
US Patent awards	105	144	→
Patent Cooperation Treaty applications	n.a.	442	
Trademark applications (ZA resident)	7 051	19 522	↗
Trademark applications (ZA abroad)	11	5 694	↗
Plant cultivars in force, world share %; rank	n.a.	2710;2,6;8	↘
High technology exports % of total exports	5	6	→
Global Competitiveness Index; Basic requirements; Innovation	n.a.	56; 89; 37	↘
Global Innovation Index	n.a.	60	↘

Table 1: Findings of the NACI 1996 White Paper Review of performance of the NSI against scientific output indicators

The review did not include a detailed analysis of the strengths and weaknesses of the NSI or the efficacy of the existing policy mix. It is anticipated that these aspects will emerge as part of the review of the National Research and Development Strategy and the Ten-Year Innovation Plan, which is expected to be completed in April 2020. The TYIP review will also provide details on performance against

each of the grand challenges identified in 2008.

In 2016 the National Research Foundation commissioned the Centre for Research, on Evaluation, Science and Technology (CREST) to undertake a comprehensive assessment of the state of the South African research enterprise. The CREST study published in 2019, revealed the insights summarised below.

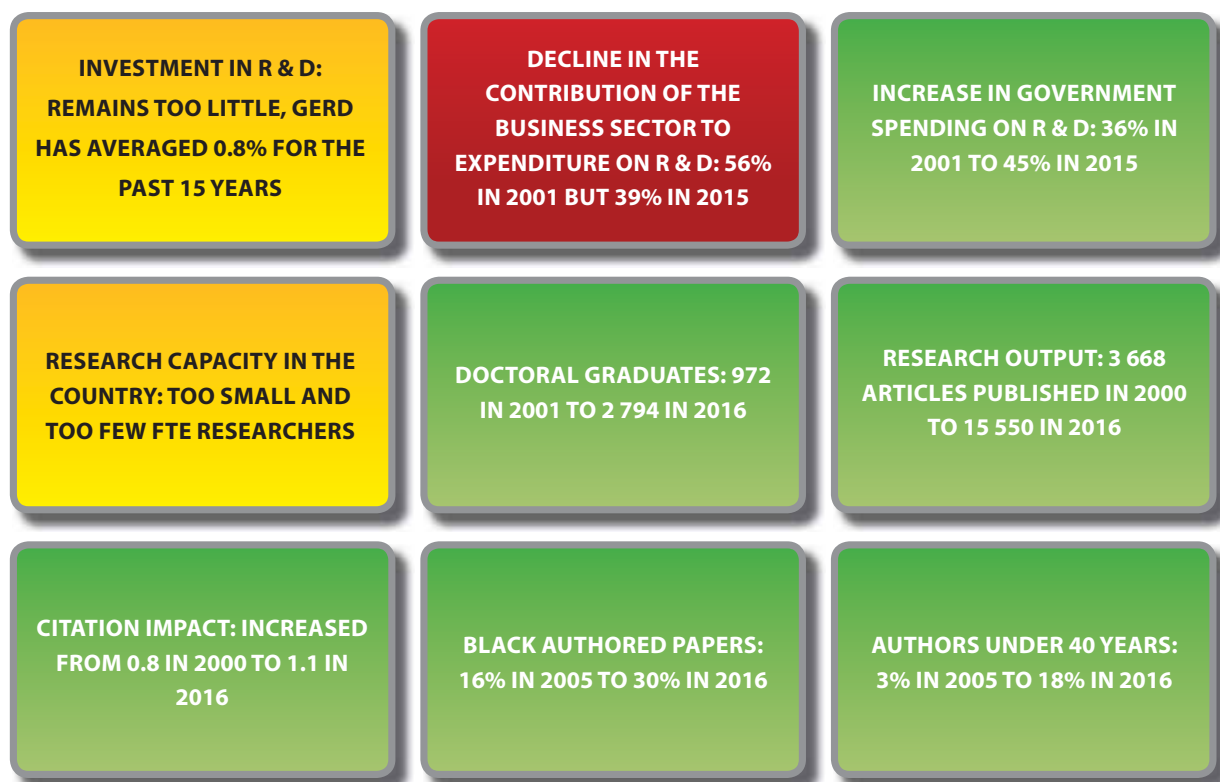


Figure 2: Summary of CREST study findings on the state of the South African research enterprise

Whilst significant strides were made between 1996 and 2016, the 1996 White Paper review and 2019 CREST publication both indicate that the national system of innovation is yet to realise its full potential. The NSI needs to be better coordinated to respond to national imperatives and increase its contribution to socio-economic transformation.

In 2012, South Africa adopted a National Development Plan (NDP) setting out a vision for the country in 2030. In responding to the ambition of Vision 2030, the DSI approached phase 1 of the NDP (which overlaps with the 2015-2020 Strategic Plan) by implementing initiatives intended to –

- expand research capacity by developing human capital and building institutions;
- commercialise research ideas;
- mature approaches for advancing R&D-led industrial development opportunities;
- integrate innovation within the local economic development strategic framework; and
- continue support to existing economic sectors

such as agriculture, forestry and agroprocessing, manufacturing and energy.

Some of these initiatives of how DSI responded to Phase 1 were contained in the 2014-2019 MTSF. Over the previous (2014-2019) Medium Term Strategic Framework (MTSF) period, the Department drove and reported on initiatives aligned to the following outcomes:

- **Outcome 4:** Decent employment through inclusive economic growth;
- **Outcome 5:** A skilled and capable workforce to support an inclusive growth path;
- **Outcome 6:** An efficient, competitive and responsive economic infrastructure network;
- **Outcome 7:** Vibrant, equitable, sustainable rural communities contributing towards food security for all; and
- **Outcome 10:** Protect and enhance our environmental assets and natural resources. The performance of the Department against its 2014-2019 MTSF indicators is reflected in Table 1 below.

Table 1: MTSF 2014-2019 commitments and performance by 31 March 2019

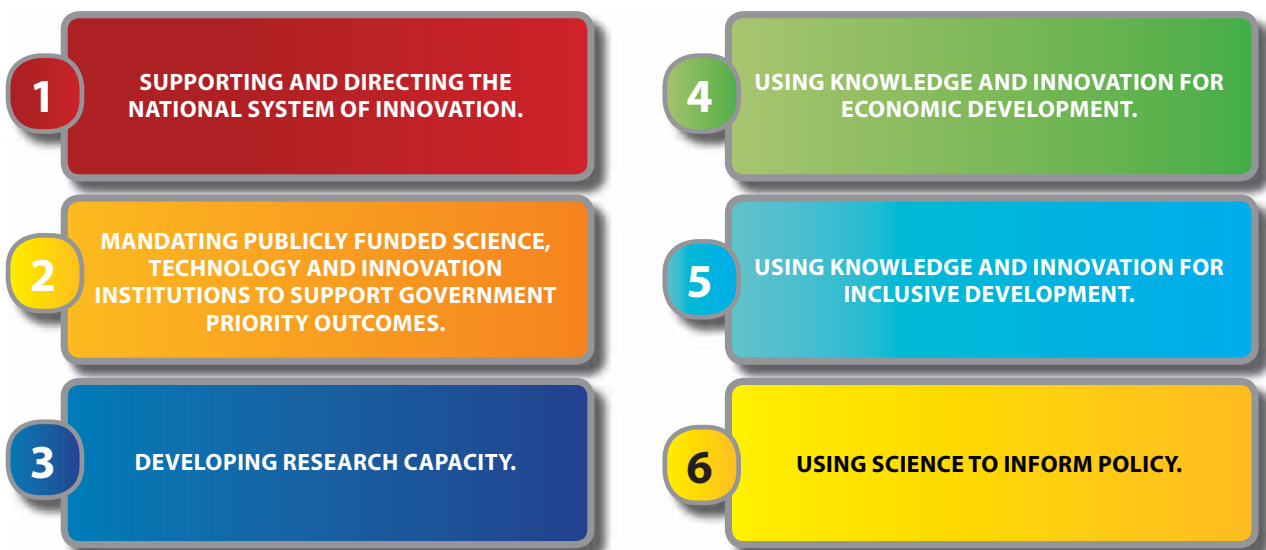
Outcomes	Indicator	MTSF target	Performance	Comments
Outcome 4: Decent employment through inclusive economic growth	% increase in the rand value of investment by government and the private sector in research and development partnerships	50% increase in the rand value of investment when compared to 2013	Not achieved	The actual extent of the impact of the partnerships over the MTSF has not been determined.
	% of all procurement of those products capable of being manufactured locally on a commercially feasible basis	75% procurement of those products capable of being manufactured locally on a commercially feasible basis by 31 March 2019	No data available	No data available
	Improved efficiencies achieved through reduction turnaround time providing final decision on applications for the R&D tax incentive	Final decision of R&D tax incentive application provided within 90 days	Not achieved	Capacity constraints and initial backlog impacted on overall performance
	Emerging/new industry sector and cross-cutting interventions towards growth, employment creation and higher income for the poor households under way	All emerging/new industry sector and cross-cutting interventions being implemented	Identification and evaluation of at least five candidate initiatives (Aeroswift, titanium beneficiation, Fluorochemicals Expansion Initiative, Hydrogen SA, battery precursor materials and mining RDI)	None
	Institutional mechanism for the strategic management of public funding for research, development and innovation.	Improved institutional arrangements in place	Introduction of a budget coordination mechanism was approved by Cabinet in 2017.	None
	Proportion of gross expenditure on R&D (GERD) to GDP (high-level impact (or outcome) indicator)	1,5% by 2019	Introduction of a budget coordination mechanism to improve institutional arrangement was approved by Cabinet in 2017. Efforts to improve institutional arrangements are ongoing	The 2017/18 national survey on research and experimental development measured GERD at 0,87% of GDP.

Outcomes	Indicator	MTSF target	Performance	Comments
Outcome 5: Skilled and capable workforce to support an inclusive growth part	Total broadband capacity provided by South African National Research Network (SANReN) per annum.	3 500 Gbps total available broadband capacity provided by SANReN by 31 March 2019	Achieved	The indicators committed to under Outcome 5 were exactly the same as those in the 2015-2020 Strategic Plan. The targets related purely to activities funded directly by the Department, with little (if any) external influence.
	Number of postgraduate students and postdoctoral fellows funded through the Department	27 411 master's students 15 209 doctoral students 3 682 postdoctoral fellows	Achieved Achieved Achieved	
	Number of infrastructure grants awarded	330 research infrastructure grants awarded to higher education institutions, science councils, national facilities and NRF museums by March 2019	Achieved	
	Number of ISI-accredited research articles published by NRF-funded researchers as reflected in the NRF project reports	33 700 ISI-accredited research articles published by NRF-funded researchers by 31 March 2019	Achieved	
	Total number of researchers awarded research grants through NRF-managed programmes as reflected in the NRF projects report	22 032 researchers awarded research grants through NRF-managed programmes as reflected in the NRF-project reports by 31 March 2019	Achieved	
	Number of MeerKAT antennae installed	64 MeerKAT antennae installed by 31 March 2018	Achieved	
Outcome 6: An efficient and competitive economic infrastructure network				
Outcome 10: South Africa's environmental assets and natural resources protected and enhanced	Functional climate change research network formalised through memorandum of understanding	Research report and memorandum of understanding developed	Achieved	n/a
	Biennial reports to Cabinet on state of climate change science and technology	Two biennial reports approved by Cabinet by March 2019	Not achieved	The first report was approved in 2016. The second report was finalised in 2019 but not approved by Cabinet as the change in administration affected the Cabinet agenda.
	Rand value of public and private sector investment in research and development to support a green economy	300% increase in the rand value of investment in R&D made in 2011	Not achieved	The target was set with no baseline data and was unattainable owing to the scale of investment already directed to the green economy.

The Nine-Point Plan¹ adopted in 2015 prioritised the implementation of the 2014-2019 Medium Term Strategic Framework. It had three main objectives:



The elements of the plan were divided into job drivers, enablers and cross-cutters. The Department had a cross-cutting mandate, and contributed to the Nine-Point Plan as follows:



The support for the Nine-Point Plan was aligned to the aims of the Department's 2015-2020 Strategic Plan, which identified five strategic outcome-orientated goals. The goals and performance related to addressing poverty, inequality and unemployment are summarised below.

¹ Government's Nine-Point Plan announced in the State of the Nation Address, 2015

Table 2: A summary of the Department's contribution to the reduction of poverty, inequality and unemployment between 2015-2020

DIRECT CONTRIBUTION		
Poverty	Inequality	Unemployment
<p>Innovation-enabled local economic development</p> <p>Pilot three community-based agroprocessing plants that have the potential to catalyse systematic local development (e.g. traditional medicines, cosmeceuticals, nutraceuticals) by 2017</p> <p><i>Performance comment</i> – The Moringa agroprocessing plants in Tooseng (Limpopo) and Hammanskraal (Gauteng) have been completed. The Department, in partnership with the Agricultural Research Council, the University of Venda and the Limpopo Department of Agriculture, funded the development of a community-based agroprocessing facility for indigenous crops and Moringa at Makonde village, outside Thohoyandou. Products (capsules, soup, yoghurt, teas and vitamin water) are being processed and commercialised.</p> <p>Ensure that STI poverty-alleviation initiatives are demand-driven and informed by local economic development priorities and local comparative advantages</p> <p><i>Performance comment</i> – Five honeybush co-operatives and agroprocessing facilities were assisted by the Department during the period under review. The co-operatives have 42 beneficiaries, more than 50% of whom are women.</p> <p>The Department also actively engaged the Departments of Cooperative Governance and Traditional Affairs to ensure that innovation is recognised and embedded in the revised National Framework for Local Economic Development. In support of this framework, the Department continued in its efforts to strengthen the local systems of innovation, with the intention of enhancing participation and support to marginalised NSI actors.</p>	<p>Transformation of the scientific workforce in terms of race and gender</p> <p>Details are available on page 50 as findings of the 2017/18 South African National Survey of Research and Experimental Development</p> <p>Innovations to enhance standards of living</p> <p>In partnership with the Department of Basic Education, leverage innovative technologies to improve access to and the quality of basic education for children with special needs, prioritising the visually or hearing impaired</p> <p><i>Performance comment</i> – Through the Technology for Rural Education and Development (TECH4RED) projects, the Department was able to contribute to the national implementation plan for deploying ICTs in education (Operation Phakisa ICT in Education).</p> <p>The Department funded the development and piloting of an ICT maturity assessment tool to guide provincial education departments in assessing readiness and prioritising schools for the deployment of ICTs.</p> <p>The initiative focused on children with special needs by providing an e-health solution that enables rapid and timely screening for disability and learning challenges. The Eastern Cape Department of Health adopted this solution to enhance the efficiency of its operations.</p> <p>In partnership with the Eastern Cape Department of Education, the Department of Water and Sanitation, and the Bill & Melinda Gates Foundation, provide innovative and appropriate off-grid sanitation technologies for rural and peri-urban areas</p> <p><i>Performance comment</i> – Through the TECH4RED projects in the Eastern Cape and North West, the Department was able to demonstrate innovative technology solutions that enabled access to basic services (mainly sanitation and energy) for rural schools.</p>	<p>Internships</p> <p><i>Performance comment</i> – The Youth in Science Journalism project provided internship opportunities to unemployed graduates across the country. This project was unique as it promoted communicating science, technology and innovation in local indigenous languages, which is key for democratising STI. Some of the interns were able to secure employment in media based on experience gained through this project.</p> <p>To date, a total of 4 148 graduates and students have been placed in DST-funded work preparation programmes in science, engineering, technology and innovation institutions.</p> <p>Researchers</p> <p>A total of 18 194 researchers were awarded research grants through NRF-managed programmes.</p> <p>Postdoctoral support</p> <p>To date, a total of 3 343 postdoctoral fellowships have been awarded.</p> <p>Economic growth</p> <ul style="list-style-type: none"> • Help grow companies' turnover • Support small, medium and micro-enterprises (SMMEs) through technology localisation initiatives and the Technology Stations Programme • Help increase technological competitiveness through R&D partnerships at sector and firm-level • Grow new local industries through the Emerging Industries Action Plan

DIRECT CONTRIBUTION		
Poverty	Inequality	Unemployment
<p>Mainstream applied indigenous knowledge-based R&D (traditional medicines, cosmeceuticals and nutraceuticals), including innovation and local manufacturing, to support commercialisation models for sustainable livelihoods</p> <p><i>Performance comment</i> – The CSIR is the coordinating hub for the IK-based Nutraceuticals Platform. The Maggi Morogo Noodles product was developed in a partnership between the CSIR, the Agricultural Research Council, the Universities of Fort Hare and Venda, local communities and Nestlé. The products are now being sold in a number of South African retail stores.</p> <p>Clinical studies on an anti-wrinkle oil extract from an indigenous plant were completed, with the candidate product proving safe and effective in reducing human skin wrinkles after just two weeks.</p>	<p>Low-pour flushes sanitation technology-enabled access to decent sanitation services in selected schools of the Nciba circuit in the Eastern Cape, 800 low pour flush units were piloted in KwaZulu-Natal, the Eastern Cape, Mpumalanga and the Northern Cape. Evidence generated from the pilot projects was used in influencing the sanitation policy whose revised version is open, supportive of and is aligned to innovation. The low pour flush solution received a SAB Foundation social innovation award.</p> <p>Through the Bill & Melinda Gates Foundation partnership, the Caltech innovative sanitation unit is being piloted in eThekweni as a communal off-grid solution, key to providing decent sanitation services in informal settlements.</p>	<p><i>Performance comment</i> – Through the South African Sanitation Evaluation Technology Programme (SASTEP), the Department enabled the recognition of innovative sanitation technologies as an emerging industry, which has been incorporated into the Industrial Policy Action Plan (IPAP). This emerging industry has enabled at least two technology/localisation opportunities.</p> <p>The lessons learnt from SASTEP were incorporated into South Africa's input on the new global standards on sanitation. The Department's investment in SASTEP also supported the new standard for non-sewerage (off-grid) sanitation, SABS 30500. This is an important development for the Presidential Sanitation Appropriate for Education (SAFE) initiative and the sanitation sector as a whole in South Africa.</p> <p>Initiatives to improve the technology-based competitiveness of the established primary economic sectors</p> <p>New R&D-led industry development initiatives, such as Hydrogen South Africa, the Fluorochemicals Expansion Initiative, the Titanium Beneficiation Initiative and the Advanced Manufacturing Technology Strategy</p> <p><i>Performance comment</i> – The Department has provided funding and other support to five technology stations located at universities of technology. The technology stations provide support in the areas of electronics, chemicals, and advanced tooling at the Tshwane University of Technology) and, in metal casting, processing energy and the environment at the University of Johannesburg. The stations have supported more than 1 766 SMMIEs to date.</p>

INDIRECT CONTRIBUTION		
Poverty	Inequality	Unemployment
<p>Postgraduate bursaries</p> <p><i>Performance comment</i> – By March 2019, 13 859 PhD students have been awarded bursaries through NRF and DST-managed programmes. A total of 54 405 pipeline postgraduate students were awarded bursaries through NRF and DST initiatives.</p> <p>South African Research Chairs Initiative</p> <p><i>Performance comment</i> – To date, 238 research chairs have been awarded. In addition, five new communities of practice were established, in agriculture, health, biodiversity, marine research and economics. The communities of practice provide a platform for research chairs to stretch their focus beyond fundamental research, towards contributing to the formulation of evidence-based policy and translational research.</p> <p>Centres of excellence</p> <p><i>Performance comment</i> – The centres of excellence continued to make an impact in health, social development, biodiversity and manufacturing. The Centre of Excellence in HIV Prevention, established at the University of KwaZulu-Natal, has contributed significantly to the generation of new knowledge in this critical health area and contributed to relevant international and national policies.</p> <p>Providing and packaging information to enhance policy decision-making</p> <p>Through its various technology demonstration projects, the Department was able to contribute to key developments, including in water and sanitation policy, sustainable human settlements, small-scale hydropower in support of off-grid rural electrification and ICT for education.</p>	<p>Targeted postgraduate bursaries (for black people and women) and funding to support young and emerging researchers</p> <p><i>Performance comment</i> – The demographic targets for black (80%) and women (55%) students supported were exceeded at honours and master's level, but at a doctoral level more needs to be done to achieve equity in the distribution of bursaries, scholarships and fellowships.</p> <p>The Thuthuka Research Grant was established to provide support for emerging researchers in full-time, permanent or fixed-term contract appointments at public universities and research institutions. A total of 562 grant-holders were funded, 471 (84%) of which were black, 91 (16%) white and 359 (64%) women.</p> <p>Using technology to identify and test the use of technology to improve service delivery and demonstrate better standards of living, such as the use of wireless mesh networks to bridge the digital divide</p> <p><i>Performance comment</i> – The Innovation Partnership for Rural Development Programme demonstrated innovative water, sanitation and energy solutions that were able to provide access to these basic services for previously unserved rural communities.</p> <p>A new cooperative-based connectivity model has been developed and profiled internationally. The model positions cooperatives as connectivity providers and does not require complex infrastructure to execute. The model has the potential to positively disrupt the connectivity space in a manner that enables more actors and accelerates access for unserved communities.</p> <p>The Department is working with the contracted implementing agent and other partners to ensure that the model is financially viable and sustainable.</p> <p>A differentiated pricing structure (funded by the Department) is used by the Technology Stations Programme to help enable SMMEs and potential entrepreneurs to access the services of the technology stations, which will aid in maturing their innovative ideas or technologies.</p>	<p>R&D infrastructure</p> <p>Manufacture (including assembly, integration and testing) and launch Earth observation satellite (EO-Sat1), in addition to the ZACube-2 satellite</p> <p>Manufacture and launch South Africa's first indigenous CubeSat constellation to provide automatic identification system services to Operation Phakisa (Oceans Economy) and Africa</p> <p><i>Performance comment</i> – As part of spacecraft development efforts, ZACube-2 was launched into space on 27 December 2018. The primary objective of the project, is to demonstrate maritime domain awareness applications, specifically vessel tracking services in the South African Exclusive Economic Zone in support of Operation Phakisa (Oceans Economy).</p> <p>MeerKAT/Square Kilometre Array radio astronomy telescope</p> <p><i>Performance comment</i> – The 64-antennae MeerKAT radio telescope was completed and commissioned for science operations. At the launch, a panorama obtained with the new telescope was unveiled. This revealed extraordinary detail in the region surrounding the supermassive black hole at the centre of the Milky Way, proving the MeerKAT to be one of the best scientific instruments in the world.</p>

In addition to being a cross-cutter in support of the job drivers and enablers, the DSI was also assigned the following five strategic initiatives to lead on behalf of government as part of the Nine-Point Plan:

- To provide leadership and coordinate efforts to increase GERD to 1,5% of GDP. The percentage remains at suboptimal levels, with the 2017/18 national survey on research and experimental development measuring GERD at 0,87% of GDP;
- To develop a framework to optimise the use of available funding for R&D – Cabinet approved the introduction of a budget coordination mechanism in 2017, but since then progress on implementation of the decision has stalled;
- To establish a sovereign innovation fund (SoIF)– The first allocation of R1.2 billion has been granted commencing in the 2020/21 MTEF. The SoIF will be operationalised from 2020/21 to enhance the department’s commercialisation of RDI outputs; A number of implementing partners have been identified and a project pipeline for funding compiled
- To develop a strategy for the deployment of South African-developed technologies – A comprehensive and overarching strategy is yet to be finalised. Despite the absence of such a strategy, a number of interventions were introduced over the last few years, including the piloting of a technology acquisition and deployment fund, advancing the use of locally developed technologies in areas such as sanitation, energy and health; and
- To develop a plan for the management of intellectual property leakages in South Africa – NIPMO’s Guideline 6.1 of 2019: The Intellectual Property Enforcement Fund was finalised. The guideline provides for implementation modalities and government’s role in providing appropriate support in cases of intellectual property right infringements.

2.1 External environmental analysis

In 2018, led by the Department of Planning, Monitoring and Evaluation², the South African government undertook a 25-year self-assessment of its performance since the dawn of democracy.

The assessment sought to evaluate the extent to which government had succeeded in delivering on the promise of a better life for all South Africans, in implementing the priorities set out in the NDP 2030, specific constraints and obstacles that had impeded progress towards the set objectives and targets, and whether any effective strategies had been developed to address identified constraints and obstacles. The 25-year review focused on the following:

- Building the economy;
- Developing human resources and human capital;
- Building our infrastructure;
- Spatial planning;
- Rural development and land reform; and
- Climate change.

Science, technology and innovation have contributed, to varying degrees and means, to all six of the focus areas of the 25-year review.

Broadly, the review found that government had significantly improved access to essential services and provided social protection, but had not been successful in improving the quality and efficiency of service delivery, in building a truly capable and coherent state, in realising its developmental objectives and reducing inequalities in both per capita income and expenditure, improving the human capital base of the economy and in modernising its public service. Too many government priorities were accorded equal weight and status, which resulted in slow/poor implementation of the NDP. Resources are thinly spread given the current economic environment and there are inadequate information systems in government to track progress towards the NDP vision and objectives.

The World Bank, in its Systematic Country Diagnostic³ Report of April 2018, asserts that since 1994 South Africa has made significant progress, but its economic transition from a system of exclusion under segregation remains incomplete. In the period 1994-2018, poverty has significantly declined, but the extent of inequality remains extremely high.

² Towards a 25 Year Review: 1994- 2019

³ South Africa - Systematic country diagnostic: an incomplete transition - overcoming the legacy of exclusion in South Africa, 2018

Using different measures, South Africa consistently emerges as one of the most unequal countries in the world. In fact, in the period 1994 to 2006, inequality increased. This is evidenced by findings of widening wealth inequality; the labour market being split into two extreme job types of a small number of people in highly paid jobs mainly in the formal sector versus a majority that gets by through often informal and far lower paying jobs. Income polarisation is distinguishable through the high concentration of low-income earners and very few high-income earners and small number of middle-income earners. Inequality of opportunity is also high and can be measured by the influence of race, parental education and occupation, gender and place of birth. It is arguable that certain policies introduced by the democratic government have exacerbated the extent of inequality. The World Bank further states that, in its view, insufficient skills form the key constraints to reducing poverty and inequality in South Africa.

South Africa's high unemployment rate remains its key challenge and the country's economy struggles to create sufficient employment opportunities. The unemployment rate increased by 1,6 percentage points from 27,6% in the first quarter of 2019 to 29,2% in the third quarter of the year. Among the youth, unemployment figures increased from 55,2% to 56,4% in the same period.

In being part of the United Nations, South Africa is committed to the 2030 Agenda for Sustainable Development which sets out 17 development goals agreed to by all members of the United Nations in 2015. The 2030 Agenda recognises the role and contribution STI is playing in supporting the implementation of all 17 SDGs with dedicated programmes of support emerging from the STI community. The support of the STI community includes research to strengthen evidence-informed decision making and providing innovative solutions that ensure no one is left behind (equitable access to basic services such as water, energy, education and health services). In support of domesticating the 2030 Agenda, the Department has supported various engagements including how municipalities may localise the SDGs.

South Africa responded to the SDG agenda through the establishment of a National Working Group to develop

an integrated and harmonised national approach to the implementation and monitoring of the SDGs. The working group, led by Statistics South Africa, published a self-assessment report, *South Africa's Voluntary National Review* in 2019. The report evaluated what has been done and determined the remaining obstacles to ridding South Africa of extreme poverty. The Department has supported the working group by coordinating the NSI to achieve maximum impact from efforts to achieve the SDGs, by identifying strategic partnerships and mobilising resources, assisting in the development of indicators at a regional and national level, and crystallising the role of STI in implementation of the SDGs.

The Department achieved significant success in the development of STI partnerships with a pan-African focus as part of its 2015-2020 Strategic Plan. This included numerous bilateral STI cooperation initiatives co-funded with African partner governments. At a multilateral level, the five-year Science Granting Councils Initiative, led in South Africa by the NRF, strengthened the capacities of science granting councils in sub-Saharan Africa in order to support research and evidence-based policies that will contribute to economic and social development. A three-year pilot of the African Open Science Platform was completed in 2019. Engagements undertaken at multilateral level, in both the AU and SADC, proved to be especially successful, for example, the creation of a post dedicated to the role of STI in advancing regional integration by the SADC Secretariat on its personnel establishment (for which the Department provided seed funding over many years). The Department also continued to actively champion a focus on STI in various bi-regional partnership initiatives of the AU, most notably related to China, the EU and Japan.

The Department enjoys respect among its peers in the science diplomacy arena, with South Africa known for producing world-class research outputs (with quality in many disciplines above the world averages), participation in large/global research institutions and projects like CERN (the European Organization for Nuclear Research), the European Synchrotron Radiation Facility, the Square Kilometre Array, the Southern African Large Telescope, Group on Earth Observations, the International Centre for Genetic Engineering and Biotechnology and as a facilitator of STI agenda across Africa.

2.2 Internal environmental analysis

The Department is associated with excellence and high levels of performance, with the Department attaining over 80% of its predetermined objectives and spending 99% of its budget in the past four years. In October 2019, the Department obtained an award from the Auditor-General of South Africa for obtaining a clean audit for the 2017/18 financial year.

The mandate of the Department is articulated in the 2019 White Paper on Science, Technology and Innovation. In the execution of its mandate as a national department with no concurrent functions in other spheres of government, the Executive and Accounting authorities are able to drive implementation centrally, with limited potential dilution of messaging and intent at provincial and local government levels. Science, technology and innovation are transversal issues that influence and define success in a broad range of sectors. Over the 2015-2020 Strategic Plan period, the DSI implemented projects, programmes and initiatives that contributed to a variety of economic sectors such as agriculture, mining and minerals beneficiation, manufacturing, water and sanitation, energy, ICTs and health.

The Department has a well-educated staff complement, with an average age of 43 years. Of the total staff establishment of 385, 79 staff members have a master's degree and 21 a PhD. The Department has excelled in exercising compliance oversight of the entities that fall under its Ministry, which are all credible, stable and well-reputed. The Department has also been diligent in appointing boards and councils to exercise fiduciary responsibility and governance over its entities.

While not having a concurrent function is identified as a strength, it also poses weaknesses in the execution of the Department's mandate. The lack of a provincial and local government footprint means the department relies on staff at national level to identify and build the relations necessary to integrate STI into provincial and local government agendas.

The mandate of the Department is not derived from any legislation. This sometimes hinders its ability to enforce cooperation in initiatives that would enable the

adoption of STI to achieve national priorities. The name of the Department was changed from the Department of Science and Technology to the Department of Science and Innovation in June 2019. The name change indicates a leadership role for the Department in advancing overall government policy on innovation (as articulated in the 2019 White Paper on STI). A systematic and institutionalised mechanism is needed to manage the transition, and to implement the White Paper. There are reflections on the implications of the name change linked to the process of developing the Decadal Plan for STI, which will be finalised in 2020.

As part of its expanded mandate, the DSI has been appointed to champion several strategic initiatives on behalf of government, such as the South African Affiliate Centre of the World Economic Forum for the Fourth Industrial Revolution, whose focus is on understanding and dealing with technology governance challenges that prevent innovation and the effective deployment of technologies.

The 2019 White Paper is an attempt to strengthen policy intent in areas where the DSI has encountered challenges in implementation. It gives the DSI a greater opportunity for using STI in support of South Africa's inclusive development. The White Paper and the Decadal Plan (currently under development) also provide the impetus for an organisational restructuring towards a leaner, more agile organisation with concentrated capability in critical areas.

The recent merger of the Higher Education and Training and Science and Technology Ministries introduces new opportunities, but also has the potential to divert attention from STI to the plethora of contentious issues plaguing the higher education sector. While the merger is at this point only at the level of the Ministries (the departments remain separate), the two departments under the leadership of the Minister have introduced measures that will enable a systematic review of the synergies and complementarity in the mandates of the two departments, as well as commonalities in functions and operations that could be aligned.

Communication is a challenge in terms of both kind and frequency. The Department has been successful in

communication centred around events and its political principals. STI seldom makes into mainstream media unless reporting is associated with a particular event.

As at 28 February 2020, the DSI had a vacancy rate of 23,13%, with 24% at Senior Management Service level. This is far above the target of a maximum of 6% over the 2015-2020 Strategic Plan period. Some posts have been vacant for more than three years. As a result, the Department relies on

its staff to assume additional responsibilities to maintain delivery, resulting in some overworked and highly stressed employees. An organisational culture survey undertaken in 2018 identified some critical human resource-related challenges that will require focused change management strategies. In addition, the compensation of employee's allocation for the DSI continues to be revised downwards by the National Treasury, which has further compounded the human resources challenge.

3. The Medium-Term Strategic Framework and STI

The NDP, as the overarching government framework for the socio-economic transformation of South Africa, has been divided into five-year implementation plans, the second of which has been the 2019-2024 Medium Term Strategic Framework (MTSF). The 2019-2024 MTSF is premised on three pillars with seven associated priorities. Over the MTSF period, the DSI will contribute to and report on the following sixth administration priorities:



Table 3: 2019-2024 MTSF commitments led by the DSI

National Development Plan	MTSF priorities	Outcome	Intervention	Action/commitment
<p>Chapter 3: Economy and employment</p>	<p>Priority 2: Economic transformation and job creation</p>	<p>Improve competitiveness through ICT</p>	<p>Increase investment in gross expenditure on research and development</p> <p>Strengthen the national system of innovation</p>	<p>Increase investment gross expenditure on research and development to 1,1% of gross domestic product by 2024</p> <p>35 000 research articles published by NRF-funded researchers and cited in the Web of Science Citation Database by 31 March 2024</p>
<p>Chapter 9: Improving education, training and Innovation</p>	<p>Priority 3: Education, skills and health</p>	<p>Expand access to post-school education and training opportunities</p> <p>Improved quality of post-school education and training provisioning</p> <p>A responsive post-school education and training system</p>	<p>Increased number of black lecturers supported through the New Generation of Academics Programme (nGAP).</p> <p>Implement the nGAP</p> <p>Proportion of university lecturers who hold doctoral degrees</p> <p>Conduct intellectual property awareness sessions (IP Wise) at technical and vocational education and training (TVET) colleges.</p> <p>Users from the education and research sector supported through SANReN</p>	<p>12 200 PhD students awarded bursaries as reflected in the reports from the NRF and other relevant entities by 31 March 2024</p> <p>24 400 pipeline postgraduate students awarded bursaries through NRF and DSI-managed programmes as reflected in the NRF and DSI project reports by 31 March 2024</p> <p>3 000 of emerging researcher grants to improve percentage of PhD-qualified staff (gender, race, disability and age).</p> <p>20 IP awareness sessions in TVET colleges</p> <p>SANReN will support 1,3 million users (from the university sector and post-school sector, national research facilities, science councils, and all public research performing institutions) by 2024.</p>

4. Overview of 2019/20 budget and MTEF estimates and expenditure trends

R'000	Audited outcome			Adjusted appropriation	MTEF estimates		
	2016/17	2017/18	2018/19		2020/21	2021/22	2022/23
Programme				2019/20	2020/21	2021/22	2022/23
Administration	311 815	318 844	320 045	372 313	313 965	378 120	394 998
Technology Innovation	1 019 783	1 120 555	1 148 962	1 280 292	1 390 335	1 878 255	1 899 883
International Cooperation and Resources	125 838	136 679	146 755	149 131	116 775	163 273	169 332
Research Development and Support	4 157 536	4 296 468	4 520 446	4 583 676	3 842 984	5 125 320	5 316 502
Socio-economic Innovation Partnerships	1 768 623	1 617 000	1 755 718	1 786 892	1 698 029	1 832 858	1 900 802
Total	7 383 595	7 489 546	7 891 926	8 172 304	7 362 088	9 377 826	9 681 517
Compensation of employees	319 037	323 806	330 750	389 105	381 993	449 383	468 936
Goods and services	188 876	190 347	215 402	222 883	139 981	217 064	225 079
Transfers and subsidies	6 860 078	6 954 524	7 336 589	7 551 282	6 836 710	8 708 526	8 984 487
Payments for capital assets*	15 478	20 649	9,042	8 900	3 404	2 853	3 015
Payments for financial assets**	-	-	-	-	-	-	-
Total	7 383 595	7 489 546	7 891 926	8 172 304	7 362 088	9 377 826	9 681 517

The expenditure trends of the DSI are given below (reproduction of Table 30.2 of the Estimates of National Expenditure)

Table 30.2 Vote expenditure trends by Programme and economic classification

Programmes		2016/17		2017/18		2018/19		2019/20		2016/17-2019/20	2016/17-2019/20			
Programme	Annual budget	Adjusted appropriation	Audited outcome	Annual budget	Adjusted appropriation	Audited outcome	Annual budget	Adjusted appropriation	Audited outcome	Annual budget	Adjusted appropriation	Revised estimate	Outcome/Annual budget (%)	Outcome/Adjusted appropriation average (%)
1. Administration	303,9	345,1	311,8	383,7	375,9	318,8	383,8	379,5	320,0	380,3	365,2	365,2	90,6%	89,8%
2. Technology Innovation	1 007,2	1 005,4	1 019,8	1 073,6	1 075,1	1 120,5	1 131,7	1 131,7	1 148,9	1 224,3	1 224,3	1 224,3	101,7%	101,7%
3. International Cooperation and Resources	124,4	124,4	125,8	128,7	132,4	136,7	136,4	137,9	146,7	149,0	149,0	149,0	103,7%	102,7%
4. Research Development and Support	4 200,6	4 170,9	4 157,5	4 348,8	4 350,1	4 296,5	4 360,3	4 530,9	4 520,4	4 572,9	4 572,9	4 572,9	100,4%	99,6%
5. Socio-economic Innovation Partnerships	1 792,8	1 782,9	1 768,6	1 622,3	1 623,6	1 617,0	1 778,2	1 778,2	1 755,7	1 824,4	1 834,7	1 834,7	99,4%	99,4%
Total	7 428,9	7 428,9	7 383,5	7 557,2	7 557,2	7 489,5	7 790,4	7 958,3	7 891,9	8 150,9	8 146,1	8 146,1	99,9%	99,4%
Change to 2019 Budget estimate														
Economic classification														
Current payments	509,7	494,5	402,6	496,4	494,1	445,9	508,2	508,9	497,8	509,7	532,3	523,3	93,9%	92,5%
Compensation of employees	309,1	313,7	319,0	315,5	326,8	352,8	352,8	330,7	380,4	375,6	375,6	375,6	99,4%	98,5%
Goods and services of which:	200,5	218,5	188,8	260,2	243,9	190,3	250,4	249,7	215,4	254,8	244,5	244,5	86,9%	87,7%
<i>Advertising</i>	17,7	17,7	12,6	20,3	9,0	9,2	10,3	11,5	24,9	11,2	11,2	11,2	97,4%	117,3%
<i>Consultants: Business and advisory services</i>	13,2	16,5	20,8	20,6	19,0	5,4	21,5	27,3	16,3	21,4	21,4	21,4	83,6%	76,0%
<i>Agency and support/outsourced services</i>	16,2	16,2	13,7	16,7	16,7	7,3	17,6	11,8	12,0	16,1	16,1	16,1	73,7%	80,7%
<i>Travel and subsistence</i>	47,3	47,6	67,1	54,2	56,5	60,3	58,1	58,8	56,9	53,9	53,9	53,9	111,6%	109,8%
<i>Venues and facilities</i>	25,6	25,6	5,6	32,9	33,2	18,2	25,4	24,3	14,8	12,7	12,7	12,7	53,2%	53,2%
Interest and rent on land	-	-	-	-	-	-	-	-	-	-	-	-	0,0%	0,0%

Programme	Annual budget	Adjusted appropriation	Audited outcome	Annual budget	Adjusted appropriation	Audited outcome	Annual budget	Adjusted appropriation	Audited outcome	Annual budget	Adjusted appropriation	Audited outcome	Annual budget	Adjusted appropriation	Audited outcome	Revised estimate	Outcome/Annual budget average (%)	Outcome/Adjusted appropriation average (%)
Transfers and subsidies	6 916,9	6 872,1	6 860,0	6 960,4	6 964,4	6 954,5	7 174,9	7 343,5	7 336,5	7 513,0	7 523,3	7 523,3	7 523,3	7 523,3	7 523,3	7 523,3	100,4%	99,9%
Departmental agencies and accounts	5 344,6	5 311,4	4 696,5	5 204,2	5 204,2	4 768,2	5 312,2	5 496,4	5 003,5	5 572,9	5 583,2	5 583,2	5 583,2	5 583,2	5 583,2	5 583,2	93,5%	92,9%
Higher education institutions, foreign governments and international organisations	-	-	187,0	-	-	-	-	-	-	-	-	-	-	-	-	-	0,0%	0,0%
Public corporations and private enterprises	1 307,3	1 299,3	1 817,2	1 420,1	1 447,1	1 722,5	1 519,8	1 504,7	1 850,3	1 563,9	1 563,9	1 563,9	1 563,9	1 563,9	1 563,9	1 563,9	119,7%	119,6%
Non-profit institutions	264,9	261,4	157,7	336,0	313,0	462,5	342,8	341,6	481,3	376,1	376,1	376,1	376,1	376,1	376,1	376,1	112,0%	114,4%
Households	-	-	1,4	-	-	1,2	-	0,7	1,3	-	-	-	-	-	-	-	0,0%	612,3%
Payments for capital assets	2,3	24,5	15,5	20,9	22,0	20,6	12,2	12,2	9,0	2,7	2,7	2,7	2,7	2,7	2,7	2,7	125,4%	78,0%
Machinery and equipment	2,3	24,5	15,5	20,9	22,0	20,6	12,2	12,2	9,0	2,7	2,7	2,7	2,7	2,7	2,7	2,7	125,7%	78,0%
Payments for financial assets	-	-	1	-	-	2	-	-	1	-	-	-	-	-	-	-	0,0%	0,0%
Total	7 428,9	7 428,9	7 383,5	7 557,2	7 557,2	7 489,5	7 790,4	7 958,4	7 891,9	8 150,9	8 146,2	8 146,2	8 146,2	8 146,2	8 146,2	8 146,2	99,9%	99,4%



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PART C: MEASURING PERFORMANCE

Institutional Programme Performance Information

Internally, the Department is organised into five budget Programmes to deliver on the six strategic outcomes. The five Programmes are:

- **Programme 1:** Administration.
- **Programme 2:** Technology Innovation.
- **Programme 3:** International Cooperation and Resources.
- **Programme 4:** Research Development and Support.
- **Programme 5:** Socio-economic Innovation Partnerships.

The DSI is supported in the execution of its mandate by the following agencies/science councils and entities:

- The National Research Foundation (NRF).
- The Technology Innovation Agency (TIA).
- The South African National Space Agency (SANSA).
- The Council for Scientific and Industrial Research (CSIR).
- The Human Sciences Research Council (HSRC).
- The National Advisory Council on Innovation (NACI).
- The Academy of Science of South Africa (ASSAf).
- The South African Council for Natural Scientific Professions (SACNASP).

The Strategic Management Model adopted in 2002 outlines how the DSI interacts with and to some extent coordinates the work of science councils that fall under other line departments, such as the Agricultural Research Council (Department of Agriculture, Land Reform and Rural Development), the Medical Research Council (Department of Health) and the Water Research Commission (Department of Water and Sanitation).

The DSI over the next medium term will continue to fund and support and facilitate science technology and innovation-enabling ecosystem and set performance indicators and targets around the following six outcomes in the strategic medium term horizon:

Outcome 1: A transformed, inclusive, responsive and coherent NSI

- 1.1. Percentage increase in the number of formalised partnerships between different category actors of the NSI that advance Decadal Plan priorities;
- 1.2. Number of STI missions introduced and adopted by Cabinet that crowd in resources and capabilities across the NSI;
- 1.3. Percentage increased in the investment support by government that advances GERD towards 1.1% of GDP; and
- 1.4. Number of approved strategies that give effect to the agreed dimensions of transformation to be effected in the NSI.

Through outcome 1, the department will strive to improve the alignment of the NSI in contributing to Vision 2030. The alignment and coherence will be directed primarily through the decadal plan which will define critical missions that the country will attend to in 2020-2030. The HESTILL review will be finalised in 2020 and will guide the establishment of new NSI institutions, make proposals towards the geospatial location and dispersion of new entrants as well as propose new institutional forms to expediate the implementation of missions and critical research areas such as astronomy.

If the NSI is to grow its contribution to addressing national priorities, the following focus areas should be addressed:

- Enable the modernisation of sectors of the economy such as manufacturing, agriculture and mining to ensure that these sectors are competitive and can contribute to higher GDP growth;
- Develop R&D-led industries based on new sources of growth such as the Fourth Industrial Revolution and the circular economy;
- Increase the NSI contribution to socio-economic development by putting in place measures to accelerate the conversion of ideas and knowledge to products and services;
- Support grassroots innovators;
- Accelerate inclusivity and support new entrants into the economy, by supporting SMMEs and Co-Ops via targeted RDI instruments; and

- Utilise technological advancement to contribute to an STI-enabled capable state – for improved service delivery and decision making.

The WP proposes that a “whole of society” approach be the cornerstone of the NSI’s contribution to national priorities. The NSI is made up of different actors from government, the private sector, higher education institutions (HEIs), research organisations and civil society. Traditionally partnerships between NSI players have been between HEIs or research councils and government or the private sector. Civil society has been less prominent. Over the strategic plan term, more effort will be directed towards the formalisation of partnerships aligned to the mission approach of the decadal plan with a particular emphasis on non-traditional NSI players such as NGOs, youth civil society organisations etc.

In increasing the number of formalised partnerships between different category actors of the NSI, interdepartmental teams have been established to propose areas of synergy and efficient use of budgets towards the goals of the National Development Plan (NDP), such as increased PhD production, increased knowledge and innovation outputs, increased PhD qualified staff across both the higher education and the science council and research facilities system. Bearing in mind that some sub-sets of the system are already operating optimally (80% of all PhDs and knowledge outputs are produced by the top 5 the universities), a premium emphasis would be put on those aspect of the system that are not operating optimally or underrepresented and underserved. Both historically disadvantaged institutions and individuals would be targeted with development support and funding to ensure that they contribute adequately to the research and knowledge enterprise.

On the international front, the DSI’s intention is to ensure a far greater focus on innovation partnerships involving South Africa, moving away from relatively small-scale, collaborative academic projects towards market-oriented research projects. STI has gained a prominent role in the Sustainable Development Goals (SDGs) which are globally recognised as essential instruments for development. The DSI will continue using the SDGs as a guiding multilateral policy framework for international engagement and cooperation with the view of facilitating a range of

partnerships with development cooperation agencies, philanthropic organisations and multilateral bodies. These engagements will seek to leverage resources available to assist efforts to put STI at the service of South African society, or leverage South African STI expertise to contribute to global development and advance South Africa’s foreign policy, including its international trade and investment agenda.

The DSI will continue with its active leadership role in implementing the African Union’s Science, Technology and Innovation Strategy for Africa (STISA), maximising benefits for the NSI and improving coordination so that strategic synergies can be exploited, especially in African STI partnerships, such as between SADC and the AU. The department will pursue initiatives supporting Agenda 2063 and the SADC Regional Indicative Strategic Development Plan (RISDP). Bilateral cooperation through plans of action agreed to with other African partners will be prioritised.

Outcome 2: Human capabilities and skills for the economy and for development

In support of outcome 2, the Department has identified the following five outcome indicators to measure over the strategic plan horizon. These are:

- 2.1. Number of DSI-funded PhDs graduating annually as a contribution to the NDP target of 100 PhDs/ million population by 2030;
- 2.2. Number of artisans and technicians absorbed into the economy in sectors where DSI has active programmes;
- 2.3. Percentage increase of women and black researchers in South Africa’s research workforce;
- 2.4. Percentage increase of PhD qualified teaching and research staff; and
- 2.5. Improved knowledge about science among the general public.

The 2019 White Paper on Science, Technology and Innovation has identified lack of transformation in the NSI as a challenge that needs to be addressed urgently. The Department will continue and expand on the

transformation agenda in all its strategic science focus areas over the medium-term at four levels namely: Spatial, Institutional, Demographic and Transdisciplinary transformation.

Following the Ministerial Guidelines on Transformation, the department has mainstreamed demographic transformation in all its instruments. The South African Women in Science Awards, the South African Research Chairs Initiative, the centres of excellence, research grants, internships as well as special programmes such as Thuthuka have contributed to improving female representation which has increased to 46% of the scientific workforce.

At institutional level, the South African Research Chairs Initiative (SARChI) has been used to create new chairs to address the gender imbalance in the NSI. The science engagement campaign, guided by the Science Engagement Strategy, advances the intentions of the White Paper on Science, Technology and Innovation to build a science-aware and science-literate society.

At transdisciplinary transformation level, the Department has mainstreamed the themes in research grants covering all knowledge fields using the four unique instruments, namely, the Indigenous Knowledge Systems (IKS) Biennial Interface Conference that brings research grant holders, knowledge holders and students together under specific themes; the annual Indigenous Knowledge Systems (IKS) Conference and Expo that showcases innovation across the fields of IKS; the Global Change Biennial Conference which brings together researchers in Earth Systems Science cutting across multiple disciplines and the South African Research Infrastructure Roadmap a strategic instrument that earmarks multidisciplinary and transdisciplinary access to research infrastructure. Marine, Polar and Palaeosciences are research areas that use research instruments that promote transdisciplinary transformation including the Habitable Earth Programme under the Applied Centre for Climate and Earth System Science (ACCESS) which introduces black students to the concept of Earth System Science.

Formal collaboration between the DSI and DBE dates back to 2004 and continues to encourage learners to participate in science, technology, engineering, mathematics and innovation subjects (STEMI). The DSI has signed direct collaboration agreements with seven provincial

departments of education, which lead to selected schools in these provinces participating in initiatives that contribute to the building of a STEMI human capital pipeline. Between 2020/25, attention will be given to the remaining two provinces, while learners' STEMI activities will be expanded in the provinces already collaborating with the DSI.

The DSI with its entities will continue supporting high-level HCD for the NSI through bursary support for postgraduate training in SET from government for higher education institutions and transforming the NSI's human resource base through postgraduate studies, particularly at PhD level, in terms of gender and race. Postgraduate funding in engineering will be a specific focus, in line with the recommendations of the Academy of Science of South Africa's 2019 Status of Postgraduate Research Training in Engineering in South Africa report.

The DSI-commissioned study recommends the production of more master's and doctoral degrees in engineering in line with the innovation and economic development priorities of the country, as identified in different sector master plans and the STI Decadal Plan currently under development. Liaison between various DSI and DHET budget programmes will contribute to the development of other upstream skills required for the country's economic sectors. Going forward, the focus will be on increasing Masters and PhDs in engineering in line with the innovation and economic development priorities of the country as identified in different sector Master Plans and the Decadal Plan.

The DSI and its entities, particularly the National Research Foundation, have enjoyed strong collaboration with the DHET in research development and support. The DSI, the NRF and the DHET will continue supporting the collaborations that are fostered with industry on the Ikusasa Student Financial Aid Programme in order to extend the initiative to postgraduate support. Between 2017/18 and 2019/20, DHET provided R621 million in funding to the NRF for awarding postgraduate bursaries.

Given the inequitable skew in government's allocated support for undergraduate and postgraduate students, the postgraduate funding policy will be built taking into account the full cost of support for financially needy students – a development that will reduce the

number of students supported if the budget does not grow. Better reporting on bursaries awarded will also be enabled through the finalisation and implementation of a framework that will account for all postgraduate students supported through DSI funds (previously the focus was only on NRF-derived data), including those funded by agencies such as the HSRC and the CSIR.

The emerging researcher segment of the HCD pipeline continues to be under-funded relative to the next generation of researchers and established researchers' segments of the pipeline. Financial resources need to be reprioritised in this area as recommended in the CREST Study on Building a Cadre of Emerging Scholars for Higher Education in South Africa, to help increase the percentage of senior lecturers and lecturers who are PhD-qualified and publishing.

On the international front, the DSI will continue pursuing international human capital development opportunities for South Africans, including access to global research infrastructure, specifically initiatives targeted at historically disadvantaged institutions and individuals as part of the DSI transformation framework.

There is a need for monitoring and evaluation every five years to measure the difference that the science engagement programme is making in the country. Building on the work by the HSRC, which over the past years used the South African Social Attitudes Survey to determine how South Africans relate to science, a dedicated and comprehensive survey will be conducted by 2023/24 and the report published by 2025/26. Issues to be measured through this survey include citizens' interests in science, their knowledge level on selected science topics, as well as their confidence in science. Efforts to improve citizens' awareness of STI activities will continue through the hosting of events and expos that allow citizens to engage in STI awareness activities. This will in most instances be done in partnership with relevant local and international partners.

The department will also support the development of critical high-end skills in selected technology areas such as the bioeconomy, space science and technology, energy, intellectual property management nanotechnology, robotics, photonics and areas of technology convergence that are important in building a knowledge society. This will be done in the form of specialised training

interventions and graduate and postgraduate student support in these areas. Support will also be directed towards the development of technical and artisan skills to support the deployment of newly developed innovations.

Outcome 3: Increase knowledge generation and innovation outputs

In support of outcome 3, the Department has identified the following three outcome indicators to measure over the strategic plan horizon. These are:

- 3.1. Increase South Africa's share (percentage) of global publication outputs;
- 3.2. Percentage increase in prototypes, technology demonstrators, pilot plants that advance industrialisation through innovation; and
- 3.3. Percentage increase in patent applications and design applications filed from publicly financed R & D.

South Africa's research productivity compares favourably with countries such as Mexico, Chile, Greece, Malaysia, Turkey and Poland when it comes to world share and world rank. South Africa's research outputs trebled from 1996 to 2014, and its world share of publications doubled from 0.4% to 0.88%. This contribution by SA is higher than the ratio of the country's population size relative to the global population. The target over the strategic plan term is to improve research productivity to 1% of global output.

South African universities account for 80% of research outputs, with science councils, national facilities and other public research institutions making up the rest. Measured against comparator countries, South African universities have lower ratios of PhD-qualified staff members and the recently completed CREST Study on Building a Cadre of Emerging Scholars for Higher Education in South Africa shows that even PhD-qualified staff members do not publish as a norm. Research productivity will be increased by fast-tracking interventions aimed at PhD qualification attainment in the first place, and capacity-building interventions aimed at inculcating a research publication scholarship among the PhD-qualified staff. Underperforming research institutions such as historically disadvantaged institutions (HDIs) and universities

of technology are to be targeted with customised programmes in line with their missions. This will include ring-fenced budget support for HCD and infrastructure grants.

The DSI together with the DHET under the banner of the HDI Development Grant, will develop targeted programmes aimed at ensuring that there is a critical mass (established) of publishing academics at HDIs and increase research outputs per capita. The DHET, through the Research Outputs Policy, rewards research outputs produced by researchers in public higher education institutions, while science councils which are part of public research institutions do not benefit from the incentive programme. An interdepartmental task team looking at the incentive programme for researchers in the science councils and incentives for innovation and other creative outputs has been established. The task team would look at the alignment of the DHET Research Output Submission System (ROSS) with its Policy on the Evaluation of Creative Outputs and Innovations.

Over the strategic plan term, the department will measure and track the number of outputs commercialised as a result of support provided in designated areas; e.g. licenses, assignments, options of varying nature (such as directed research, joint ventures and the like), start-ups, spin outs, new companies, etc. created; distribution, manufacturing and sales agreements for products, processes and services. The commercialisation of products, processes and services may involve other departments, entities and market players and therefore may fall outside the Department's control. The DSI will focus on investments that are geared towards supporting the translation of publicly financed IP into social and economic value by using NIPMO database of disclosures of publicly financed IP as a basis for tracking the utilisation of IP via conclusion of commercial agreements and introduction of products and services to the public.

The department provides funding support in the form of research infrastructure grants to researchers and institutions across the innovation value chain. The grants include support for innovation infrastructure in the form of pilot plants, technology demonstrators and specialised facilities. The implementation of the South African Research Infrastructure Roadmap (SARIR) will

continue over the MTSF period, with all thirteen research infrastructures approved in the first phase of the roadmap being implemented.

The implementation of the following projects of the National Integrated Cyberinfrastructure System (NICIS) will continue: (i) a multi-institutional national e-science postgraduate teaching and training programme – to be expanded in terms of the disciplines covered and institutions being added; (ii) increasing the number of awards of the e-research support programme; (iii) additional regional Tier 2 data nodes being established; and (iv) the big data strategy being implemented.

An NDP target, under the theme “expanding access to communication technology”, is 100% broadband penetration by 2020. The DSI is contributing to this target through the roll-out of the South African National Research Network (SANReN) project. It is estimated that SANReN's projected total available broadband capacity by the 2024/25 financial year will be 7 100 Gbps, which will be achieved through the addition of several new network links and sites, the upgrading of existing links and transmission equipment, and the activation of additional international West Africa Cable System (WACS) capacity. This translates into giving more than a million users access to broadband connectivity.

The Multiwavelength Astronomy Strategy seeks to position South African as a vibrant hub for astronomy facilities and sciences – harnessing South Africa's geographical advantage of clear, dark skies and radio silence in the Northern Cape. For South Africa to become one of the leading nations in the discipline of astronomy, it has to develop world-class infrastructure and the requisite skills, allowing for notable scientific discoveries – this is already being made possible by the completed MeerKAT telescope. The focus in the current 2020-2025 period will be on enhancing the scientific capabilities of the MeerKAT through the installation of S-band and L-band receivers, and expanding the MeerKAT by an additional 20 dishes. The DSI will also be working closely with the South African Radio Astronomy Observatory (SARAO) and the Northern Cape government to ensure socio-economic benefits to the surrounding communities and to enhance public awareness of the project and the opportunities it presents.

The SKA Organisation is progressing well with preparations for SKA Phase 1, 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) to sign a treaty establishing the SKA Observatory on 12 March 2019. Other countries are expected to join later as the project progresses. 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.

The implementation of the Protection, Promotion, Development and Management of Indigenous Knowledge Act, 2019, will lead to the development of new policy initiatives. Regulations will have to be facilitated to enable the DSI to lead the implementation of the Act. A specialised services delivery unit (SSDU) will be established to serve as the authority regulating the IKS sector. The registration of indigenous knowledge through the National Recordal System will run on the SSDU platform. The setting up of institutional units for the recognition of prior learning in IKS disciplines will be a novel contribution by the DSI to non-traditional ways of developing human capabilities.

In the coming medium-term period, the Department aims to create a capability of knowledge brokerage. The Earth Systems Science Research Programme, introduced under the Global Change Research Plan, has been a driver of several programmes under the National Research Foundation, the South African National Biodiversity Institute, the Council for Scientific and Industrial Research and the Agricultural Research Council. The intention is for the knowledge generated through these programmes to be entered into databases for analytics so that the outputs of knowledge products and services can be deployed in science services to solve problems arising from the climate change crisis, environmental degradation, desertification, loss of biodiversity, etc.

A policy framework for the development of an IKS-based

pharmaceutical industry is envisaged, covering the entire value chain. The development of the framework for the IKS-based pharmaceutical industry and an IKS-based bioinnovation institute are seen as complementary and mutually reinforcing steps towards the long-term vision of an IKS-based pharmaceutical industry in the country and region.

Outcome 4: Knowledge utilisation for economic development –

(a) revitalising existing traditional industries

(b) stimulating R&D-led industrial development

In support of outcome 4, the Department has identified the following four outcome indicators to measure over the strategic plan horizon. These are

- 4.1. Rand value of RDI investment attracted to support RDI needs identified through the sector masterplans process;
- 4.2. Percentage increase in SMMEs/Co-ops whose performance has improved or who have secured new opportunities through support provided by the DSI and its entities;
- 4.3. Percentage increase in the commercialisation of granted IPRs from publicly funded R & D; and
- 4.4. Number of new R&D-led industrial development opportunities initiated by the DSI.

The Department is participating in the development of a number of sectoral masterplans that will be implemented over the strategic planning period. They include amongst others, Agriculture, Oceans Economy, Energy, Mining, and Health. In partnership with other national government departments, provincial and local government, the DSI will implement common flagships programmes in support of priority sectors as reflected in the national re-imagined/revitalised industrial strategy.

Energy security remains a serious challenge for South Africa. Progress in the electrification of rural households is hindered by difficult terrain which impedes the deployment of bulk infrastructure while the growth of informal households in urban areas continues to be exacerbated by the steady in-flux of residents from rural areas of the country leading to the decline in the percentage of households electrified in the economic hubs of Gauteng and Western Cape. Partnering with the Department of Mineral Resources and Energy, the Department of Science and Innovation will continue deploying fuel cells at government buildings, critical infrastructure such as airports as well as rural formal and urban informal settlements to assess whether alternative technologies such as fuel cells can reduce the impact of rolling blackouts on service delivery as well as speed up the rate of electrification. Using industrial ports as the nerve centres for scaling up the use of clean hydrogen is a critical step in the process of building a hydrogen economy in South Africa.

The recently released Integrated Resource Plan gives a clear indication that while solar and wind technologies have an important role in the country's electricity mix a 'just transition' requires STI to speed up the penetration of abatement technologies to minimise the greenhouse gas emissions and pollutant emission from existing and future fossil-based power generation installations. A Carbon Capture, Storage and Use Flagship Programme will be introduced through a public private partnership to find solutions that will protect the sustainable development of the country while revitalising existing sectors of the economy.

The role of energy storage in both the mobility and utility sector has been emphasised by the Green Transport Strategy recently released by the Department of Transport as well as the announcement of Eskom to roll out utility scale batteries in support of the country's power system. Building on the successful launch of the pilot plant for the manufacturing of lithium ion battery precursor materials, the Energy Storage RDI Programme is putting in place strategic international partnerships (i.e. Argonne National Lab) to speed up the commercialisation of technologies in the portfolio while strengthening relationships with local private sector partners. The focus will be on producing

precursor materials based on manganese in the early part of the value chain and using South Africa's abundant mineral resources of fluorspar as a source of electrolytes for lithium-ion batteries.

The introduction of new R&D-led/based products, processes and/or services into the market requires government to create the necessary enabling frameworks, to develop appropriate skills (including expert knowledge in the discipline and relevant to the technology, but also translational and technology commercialisation skills) and infrastructure to enable innovation, to support the demonstration and piloting of new technologies and upscale these where and when appropriate, and to ensure that appropriate IP protection and support mechanisms are in place.

The country's wealth of indigenous knowledge is being harnessed to create new products (traditional medicines, cosmeceuticals, and nutraceuticals including herbal beverages) and to develop new markets (for indigenous plant and animal species) that will support the creation of employment in communities where the knowledge originates.

The indigenous knowledge-based technology innovation initiatives will focus on development of new high-end natural medicines (naturoceuticals), cosmeceuticals, and nutraceuticals including herbal infusions. Clinical trials and product registration systems for African medicines will be prioritised working with the South African Health Products Regulatory Authority (SAHPRA) to facilitate product innovation, commercialisation and beneficiation. The ultimate objective is to mainstream IK-based products.

Medical cannabis research and product development will be elevated to flagship status to strengthen its national master-plan programme for economic development. Partnerships with departments whose mandate is to support business development, incubation, product marketing and commercialisation will be forged in order to support job creation. Both local and international commercialisation partnerships will be sought to fast-track the entry into market. This work is directly contributing to the transformation of the South African economy, making it more inclusive in terms of rural communities, young people, women and the marginalised.

The National Intellectual Property Management Office (NIPMO), which is the implementing office for the IPR Act, stimulates greater economic and social returns (from IP generated through R&D activities conducted using public funds), through a number of interventions, including financial support for the Offices of Technology Transfer at the various research institutions, and the IP Fund. By the end of 2018/19, NIPMO had provided financial support in excess of R176 million for, among other things, the creation of 132 posts for highly skilled individuals through the OTT Support Fund. Furthermore, financial support for the statutory protection and maintenance of IP rights has exceeded R160 million since the inception of the IP Fund. Both areas of support will continue in the 2020/25 strategic term. These interventions are all aimed at equipping institutions to increase knowledge utilisation for advanced economic and social development, through the recognition and protection of IP.

Furthermore, enhanced interventions to build and support a pipeline for the realisation of publicly funded R&D outputs with socio-economic impact will be implemented. This will include exploring models for the roll-out of an enforcement fund to enable publicly financed institutions to prevent third parties infringing their IP rights. In this regard, the modalities explored include state-funded litigation, alternative dispute resolution, contingency fee litigation, licensing and intellectual property insurance. Any of these forms may be appropriate depending on the circumstances and not all of them require government support. The insurance model is generally preferred and has been benchmarked internationally as an acceptable means of protecting IP against third party infringement.

The Department will continue to scale-up its network of technology stations/platforms in order to provide cross-cutting/cross-sector technological support for SMMEs/potential entrepreneurs and co-ops. Access to technological support is essential in new product/process development (or improvement) and in developing prototypes and concept demonstrators.

The Department will also continue managing a portfolio of projects with the potential of creating new industries, or rejuvenating existing industries. The current projects in this portfolio are the Aeroswift Additive Manufacturing

machine, the mining extraction RDI programme, the bioeconomy, hydrogen fuel cells, and the fourth phase of the Fluorochemicals Expansion Initiative.

Outcome 5: Knowledge utilisation for inclusive development

In support of outcome 5, the Department has identified the following two outcome indicators to measure over the strategic plan horizon. These are

- 5.1. Grassroots innovations whose commercialisation has been facilitated by the support/ access of the multi-tiered support package provided by the DSI and its entities; and
- 5.2. Publicly financed IP made available (accessible) in support of grassroots innovators.

In focusing on these two outcomes, the DSI will be advancing its commitment towards an inclusive and responsive NSI, characterised by equitable access to the knowledge infrastructure. These outcomes premised on inclusion are key for re-imagining the NSI as inclusive with a broader concept of innovation in line with the national development profile and social dynamics. In using the multi-tiered package to support commercialisation of grassroots innovations, the key aspects will include technology development; compliance with industry standards (where applicable); protection of IP and mentorship. These aspects are key in enabling the participation of grassroots innovators, who are often marginalised in technology-based economic development opportunities. As part of enhancing the use of IP generated from publicly funded research, the DSI will facilitate access to this IP, working with relevant partners. There will be a more deliberate focus on IP related to solutions that enable and improve access to basic services; strengthen the capacity of the state in service delivery and promote the inclusion of women, youth and people living with disabilities.

In pursuing the two outcomes, the DSI will focus on strengthening partnerships with relevant government departments, research institutions, standards setting and compliance organisations, higher education and post-school institutions, the private sector and non-profit organisations as they are all key in providing systemic

and comprehensive support to grassroots innovation and ensuring that its potential role in economic development is enhanced and realised. The focus on facilitating commercialisation of grassroots innovation and its access to publicly financed IP will be pursued in line with the commitment for the deployment of locally developed technology solutions. The instruments used will include technology demonstrations, agro-processing facilities, and support for entrepreneurs.

While focused on technology development and commercialisation, the aim of knowledge for inclusive development is innovation deployment i.e. ensuring creative ideas find expression in the market. The following are some ways for promoting inclusive development:

- Encouraging science-based risk-taking to enable innovations to be tested for market readiness and transforming the use or application of conventional products or services;
- Full value chain assessment and development (for example in the creation of technology platforms and pre-clinical capabilities);
- Coordinating stakeholders and role-players to maximise transmission to market opportunity (for example using stakeholder committees to steer programmes);
- Co-funding to ensure the limited resources of the DSI are extended (for example through partnerships with sister departments or the private sector); and
- Adopting a National System of Innovation approach, which recognises that skills, resources and opportunities are highly dynamic, and networking and facilitation of partnerships beyond public support is essential.

Outcome 6: Innovation in support of a capable and developmental state

In support of outcome 6, the Department has identified the following four outcome indicators to measure over the strategic plan horizon. These are

- 6.1. Increase in the number of use cases of decision support systems;

- 6.2. Number of demonstrators that have successfully introduced a new way of delivering a service;
- 6.3. Number of districts/ metros supported with technology-based applications as part of the District Development Model for Service Delivery Improvement; and
- 6.4. Evidence informed integration of innovation in service delivery.

The DSI is a national department that does not have a provincial or local footprint, which creates a challenge in implementing national STI interventions. However, through the Regional Innovation Support programmes the DSI is contributing to the development of innovation ecosystem and a capable and developmental state. A concerted effort is made to increase the spatial footprint of innovation support so that innovation would enable localised socio-economic development through Provincial Growth and Development strategies and Local Economic Development strategies. This will enable the DSI to better align innovation support interventions with the District Development Model.

Since service delivery is implemented at local government level, that is where technology deployment in support of a capable state is needed. It is necessary to pilot technologies that facilitate service delivery to ensure appropriate technology deployment - for waste management, water and wastewater management, housing, sanitation and energy provision amongst others. In order to address South Africa's climate change and SDG obligations, technologies for the circular economy must be included to enable the just transition to a low-carbon economy.

To build a coherent system to address both SDGs and climate change effects, a digital economy is required. The DSI will contribute to this through focused programmes that enable innovation and build capacity in the post-school system in ICT domains such as data science, artificial intelligence, the Internet of Things and cybersecurity. Capacity to use 5G and other wireless technologies optimally must also be developed, enabling the state and citizens to take advantage of digital economy opportunities.

ADMINISTRATION

Purpose

To provide strategic policy and planning alignment, ensure effective governance, risk management, and monitoring and evaluation (M&E) within DSI and among entities, and provide strategic science communication and branding of the activities of the DSI, its entities and the national system of innovation (NSI).



Chief directorates

The Ministry and Office of the Director-General

Supports the Minister, Deputy Minister and Director-General by providing professional and executive support. This component is responsible for the systems and mechanisms for handling Parliamentary questions and replies, Cabinet matters, correspondence, submissions and memoranda. It also coordinates activities within the Department to assist in steering the NSI towards the development of a knowledge-intensive economy with higher productivity levels.

Enterprise Risk Management

Provides and drives an enabling environment in support of the identification, management and oversight of risks across strategic, tactical and operational levels in the Department. This role includes ensuring that countering fraud and/or corruption is made an integral part of strategy, operations and administration within the Department.

Policy, Planning, Governance, Monitoring and Evaluation

Supports the DSI leadership in steering the NSI by facilitating the coordination of selected cross-cutting issues in the Department, strategic and operational planning, monitoring and evaluation for the Department and its public entities, and governance of the public entities, in order to assist the Department and its entities to contribute to the realisation of departmental and national priorities.

Internal Audit

Serves as the primary assurance tool for improving the Department's governance, risk management and management controls by providing insight and recommendations based on the analysis and assessment of data and business processes, including annual performance information.

Human Resources Management

Ensures that the Department is able to (a) provide a professional service through accurate, consistent and best employment practices in all its activities; (b) attract, retain and motivate employees who share the organisational vision; (c) champion change and transition, with a view to being a catalyst in the transition of people and the organisation to embrace and implement change; (d) set performance standards and manage performance against them; (e) promote an environment that supports the personal and career development of all employees so that they can reach their full potential and contribute better to the achievement of the Department's strategic objectives; (f) instil a culture of service excellence; and (g) provide an environment that promotes health, wellness and safety, and embraces the value of diversity.

Finance

Ensures the effective, efficient and economical use of financial resources in line with financial prescripts, through the development and implementation of financial systems, policies, frameworks and procedures. This includes budget planning and expenditure monitoring, and the management of procurement, acquisition, logistics, assets and financial transactions.

Information Systems and Knowledge Management

Is responsible for the delivery of services that supports the Department's strategic plan and individual units' objectives successfully through the effective use of information technology, institutionalisation of KM and preservation of the DST's institutional memory. Its purpose is to align the Information Systems and Knowledge Management (ISKM) strategy with the business strategy to ensure that the Department achieves optimum use of its resources. In addition, the chief directorate is tasked with the responsibility of providing cutting-edge technologies that will optimise the use of information in a reliable and secure manner. This includes the implementation of effective and efficient business systems that meet users' needs, the provision of a reliable IT infrastructure and environment, and creating capacity for proper information management and business intelligence.

Science Communication

Provides strategic communication support to raise local and international awareness of the objectives and activities of the Department, its entities and the NSI, as well as to ensure effective communication among DSI, entity and NSI stakeholders. It seeks to provide the public with timely, accurate and clear information that is widely accessible to all South Africans about government policies, programmes, plans, services and initiatives in a non-partisan way, thus making it accountable to the public it serves. Its overall focus is to create public awareness and brand the Department as a custodian of developments, benefits and opportunities in publicly funded STI initiatives across the country's science system. Through the branding of the Department and its entities, it will demonstrate how the Department is "Making sure it's possible", and how, through its various initiatives, science, technology and innovation can transform and empower society. It will promote dialogue between citizens and government, including on policy, and establish partnerships with a range of stakeholders, including the private sector, higher and post-school education institutions, and research institutions.

Legal Services

Responsible for ensuring that the interests of the Department are protected against any legal risk. The component ensures that the Department complies with all relevant legislation, and takes a proactive approach to dealing with matters that have the potential to give rise to conflict or legal challenges.

Table 4: Outcomes, outputs, performance indicators and targets for 2020/21

Outcome	Output	Output performance indicator	Annual Targets						
			Audited performance		Estimated performance				
			2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Innovation in support of a capable and developmental state	DSI public entities' APPs and Shareholder Compact	DSI public entities' annual performance plans and CSIR Shareholder Compact approved by the Minister and Chairpersons of the board	The strategic plans and APPs for DSI public entities (HSRC, SANSa, TIA, ASSAF, NRF, CSIR and NACI) were approved by the Minister by 5 March 2015 and shareholder compacts were signed by 31 March 2017	DST public entities' 2018/19 strategic and annual performance plans and CSIR shareholder compacts signed by the Minister and chairpersons of the boards by 31 March 2018	DST public entities' 2019/20 annual performance plans and annual reports approved by the Minister by 31 March 2019	DST public entities' 2019/20 annual performance plans and annual reports approved by the Minister by 31 March 2020	DSI public entities' 2021/22 Annual Performance Plans (NRF; HSRC; TIA; SANSa; NACI; SACNASP; ASSAF) and CSIR shareholder compact signed by the Minister and Chairpersons of the board by 31 March 2021	DSI public entities' 2022/23 Annual Performance Plans (NRF; HSRC; TIA; SANSa; NACI; SACNASP; ASSAF) and CSIR shareholder compact signed by the Minister and Chairpersons of the board by 31 March 2022	DSI public entities' 2023/24 Annual Performance Plans (NRF; HSRC; TIA; SANSa; NACI; SACNASP; ASSAF) and CSIR shareholder compact signed by the Minister and Chairpersons of the board by 31 March 2023
			-	-	-	-	Finalisation of the Decadal Plan and approval by Cabinet by 31 March 2021	Implementation of the Decadal Plan priorities by 31 March 2022	Implementation of the Decadal Plan priorities by 31 March 2023
			-	-	-	-	75% of all approved funded positions filled by 31 March 2021	80% of all approved funded positions filled by 31 March 2022	90% of all approved funded positions filled by 31 March 2023
Decadal plan for the national system of innovation	Approved decadal plan to implement the 2019 White Paper on Science, Technology and Innovation	Percentage of approved funded positions filled annually	-	-	-	-	Unqualified audit opinion with no financial matters in the audit report from the Auditor-General	Unqualified audit opinion with no financial matters in the audit report from the Auditor-General	Unqualified audit opinion with no financial matters in the audit report from the Auditor-General
			-	-	-	-	Unqualified audit opinion with no financial matters in the audit report from the Auditor-General	Unqualified audit opinion with no financial matters in the audit report from the Auditor-General	Unqualified audit opinion with no financial matters in the audit report from the Auditor-General
			-	-	-	-	Unqualified audit opinion with no financial matters in the audit report from the Auditor-General	Unqualified audit opinion with no financial matters in the audit report from the Auditor-General	Unqualified audit opinion with no financial matters in the audit report from the Auditor-General
Reduce vacancy rate	Good financial governance	Unqualified audit opinion with no financial matters in the audit report from the Auditor-General	-	-	-	-	Unqualified audit opinion with no financial matters in the audit report from the Auditor-General	Unqualified audit opinion with no financial matters in the audit report from the Auditor-General	Unqualified audit opinion with no financial matters in the audit report from the Auditor-General
			-	-	-	-	Unqualified audit opinion with no financial matters in the audit report from the Auditor-General	Unqualified audit opinion with no financial matters in the audit report from the Auditor-General	Unqualified audit opinion with no financial matters in the audit report from the Auditor-General
			-	-	-	-	Unqualified audit opinion with no financial matters in the audit report from the Auditor-General	Unqualified audit opinion with no financial matters in the audit report from the Auditor-General	Unqualified audit opinion with no financial matters in the audit report from the Auditor-General

Annual Targets							
Outcome	Output	Output performance indicator	Audited performance				Medium Term Expenditure Framework Period
			2016/17	2017/18	2018/19	2019/20	
A transformed, inclusive, responsive and coherent NSI	Media and marketing initiatives to profile the DSI and its entities.	Number of media platforms used to promote DSI and its entities	-	-	-	-	2022/23
			-	-	-	-	2021/22
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							2017/18
							2016/17
							2021/22
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							2019/20
							2018/19
							2017/18
							2016/17
							2021/22
							2020/21
							2019/20

Table 5: Indicators, annual and quarterly targets for the 2020/21 financial year

Output Performance Indicator	Annual target	Quarter 1	Quarter 2	Quarter 3	Quarter 4
DSI public entities' annual performance plans and CSIR Shareholder Compact approved by the Minister and Chairpersons of the board	DSI public entities' 2021/22 Annual Performance Plans (NRF; HSRC; TIA; SANSA; NACI; SACNASP; ASSAF) and CSIR shareholder compact signed by the Minister and Chairpersons of the board by 31 March 2021	No target	No target	First draft APPs and shareholder compacts for DSI public entities submitted to NT and the DPME by 31 October 2020	Final draft APPs and shareholder compacts for DSI public entities approved by the Minister by 28 February 2021
Approved Decadal Plan to implement the White Paper on Science Technology and Innovation	Decadal plan finalised and approved by Cabinet by 31 March 2021	Consultation with NSI stakeholders	Consultation with NSI stakeholders	Cabinet approval of the Decadal Plan	Alignment of the Strategic Plans and Annual Performance Plans of the DSI and its entities including CSIR Shareholder compact to the Decadal Plan priorities
Percentage of approved funded positions filled annually	75% of all approved funded positions filled by 31 March 2021	No target	No target	No target	75% of all approved funded positions filled by 31 March 2021
Unqualified audit opinion in the audit report from Auditor-General	Unqualified audit opinion with no financial matters in the audit report from the Auditor-General by 30 September 2020	No target	Unqualified audit opinion with no financial matters in the audit report from the Auditor-General	No target	No target
Number of media platforms used to promote DSI and its entities	Six platforms (print, broadcast, online, media liaison, stakeholder engagement and social media) to profile the DSI and its entities by 31 March 2021	Six platforms (print, broadcast, online, media liaison, stakeholder engagement and social media) to profile the DSI and its entities	Six platforms (print, broadcast, online, media liaison, stakeholder engagement and social media) to profile the DSI and its entities	Six platforms (print, broadcast, online, media liaison, stakeholder engagement and social media) to profile the DSI and its entities	Six platforms (print, broadcast, online, media liaison, stakeholder engagement and social media) to profile the DSI and its entities
Branding initiatives developed and implemented	Two National thematic campaigns reports on the branding roll-out initiatives by 31 March 2021	No target	Roll-out of branding initiatives (thematic bill boards and social media) across Provinces and Metropolitan Municipalities	No target	Roll-out of branding initiatives (thematic bill boards and social media) across Provinces and Metropolitan Municipalities

Table 6: Updated key risks and mitigation – Administration

Outcome	Key risks	Mitigation action
A transformed, inclusive, responsive and coherent NSI	Stakeholders (public) uninformed and/or unaware of the work of the Department	<ul style="list-style-type: none"> Science Communication will schedule meetings/engagements with Programmes to ascertain branding and communication needs which will translate into quarterly thematic campaigns Communication campaigns aimed at external audiences, and reports will be generated at the end of each campaign
Innovation in support of a capable and developmental state	The lack of an institutionalised mechanism for Programme oversight of the technical aspects of the work (implementation and execution of projects) of the entities (and possible misalignment of entities objectives with DSI objectives)	<ul style="list-style-type: none"> No action plans required as all controls are effective, and the residual risk exposure is equal to required residual risk exposure. This a low risk; management will continue to monitor any changes
	The DSI at present may not be fully enabled to effectively coordinate and steer the implementation of the 2019 White Paper on STI	<ul style="list-style-type: none"> Establishment of ministerial-level committee for science, technology and innovation Establishment of the Presidency-level STI Plenary Development of the Decadal Plan for Science, Technology and Innovation Improved stakeholder mapping and targeted engagements to support the implementation of the White Paper
	Delays in the filling of prioritised posts	<ul style="list-style-type: none"> Establish an internal unit for conducting suitability checks Finalise the shortlisting and interview dates immediately after the job advert is published
	The organisational structure may not be aligned to deliver on the objectives of the Department	<ul style="list-style-type: none"> Conduct a review of the organisational structure (action dependent on the finalisation of the Decadal Plan)
	Over and material underspending of the DSI budget	<ul style="list-style-type: none"> Implementation of the budget restructuring process
	Ineffective procurement system	<ul style="list-style-type: none"> Enhance the quality of the budget bids by starting the process earlier Implement the recommendations of the skills audit Improve assessments and quality of bid-related reports

Reconciling performance targets with the budget and MTEF

Table 7: Administration expenditure estimates

R'000 Programme	Expenditure outcome				Adjusted appropriation	Medium-term expenditure estimates		
	2016/17	2017/18	2018/19	2019/20		2020/21	2021/22	2022/23
Ministry	4 213	4 348	4 379	8 126	5 886	6 072	6 297	
*Institutional Support	151 075	161 308	146 517	180 020	146 181	198 106	208 283	
Corporate Services	152 146	145 640	166 993	147 688	142 885	168 155	174 417	
Office Accommodation	4 381	7 548	2 156	36 479	19 013	5 787	6 001	
TOTAL	311 815	318 844	320 045	372 313	313 965	378 120	394 998	
Compensation of employees	145 046	146 178	149 582	182 637	181 399	213 528	224 302	
Goods and services	133 765	134 974	147 013	158 603	113 568	145 845	151 197	
Transfers and subsidies	17 474	16 940	14 312	22 042	15 594	15 894	16 484	
Payments for capital assets	15 434	20 649	9 020	8900	3 404	2 853	3 015	
Payments for financial assets	96	103	118	131-	-	-	-	
TOTAL	311 815	318 844	320 045	372 313	313 965	378 120	394 998	

*Institutional Support: This is as a result of the new approved budget for 2019MTEF and beyond in Programme 1

PROGRAMME 2: TECHNOLOGY INNOVATION

Purpose

To promote technology development and the protection and utilisation of publicly funded intellectual property for innovation with socio-economic impact.



Chief directorates

The Programme is made up of four chief directorates and one specialised service delivery unit.

Bioinnovation

Bioinnovation leads the implementation of the national Bio-economy Strategy, which was approved by Cabinet in 2013 and is intended to ensure that the bioeconomy makes a significant contribution to the South African economy. The strategy focuses on the following:

- Strengthening the research and innovation competencies that form the strategic foundation for the bio-based NSI.
- Developing and/or supporting strategic RDI programmes that provide for new knowledge and innovation outcomes related to the government's priority requirements.

- Coordinating role players across the NSI to ensure that appropriate skills, knowledge and competencies are made available to maximise socio-economic impact.
- Mainstreaming applied IKS-based R&D, inclusive innovation and local manufacturing to support commercialisation models for sustainable livelihoods and improved quality of life.

The chief directorate has four directorates managing thematic priorities aligned to its focus areas, namely, Agriculture, Indigenous Knowledge-Based Technology Innovation, Industry and Environment, and Health Innovation.

Hydrogen and Energy

The chief directorate supports the reduction in greenhouse gas emissions and air pollution while contributing to a more diverse and sustainable energy mix by enabling the widespread commercialisation of battery, fuel cell, renewable and low-carbon technologies

based on publicly funded intellectual property rights. It supports the competitiveness and penetration of clean and alternative energy technologies through research, development and validation efforts with current technologies in terms of cost and performance while fostering strategic partnerships with the public and private sectors to reduce the institutional and market barriers to their commercialisation.

The chief directorate has three directorates managing thematic priorities aligned to its focus areas, namely, Hydrogen and Energy, Transport Fuels, and Power.

Space Science and Technology

The government recognises the potential role of space science and technology to contribute to a wide spectrum of South Africa national priorities, creating jobs and reducing poverty and inequality through natural resource management, urban and rural development planning, and infrastructure monitoring and evaluation.

The chief directorate supports the creation of an environment conducive to the implementation of the National Space Strategy and the South African Earth Observation Strategy, as well as addressing the development of space technologies, innovative solutions and human capital to respond to national priorities and boost socio-economic growth. The chief directorate also play a critical role as an oversight function on the South African National Space Agency (SANSA).

The chief directorate has two directorates managing thematic priorities aligned to its focus areas, namely, Earth Observation and Space Science.

Innovation Priorities and Instruments

The chief directorate supports and strengthens the innovation policy package (and related interventions) with the aim of creating and sustaining an enabling environment for innovation, technology development, and the utilisation, including commercialisation, of publicly funded R&D initiatives. It does this by identifying, developing, creating and supporting policy and institutional structures that facilitate technology development and its progression into national and international markets.

This includes the conceptualisation, piloting and monitoring and evaluation of innovation policy instruments, such as the internship programme for technology transfer managers, fund managers and entrepreneurs. The chief directorate also supports the development and implementation of emerging technologies in areas such as synthetic biology, structural biology, systems biology and functional genomics (collectively comprising the South African Biodesign Initiative), nanotechnology, photonics and robotics and converging technologies that have the potential to influence and affect social and economic development positively.

The chief directorate supports industry internships through the Technology Top 100 companies. It has oversight of the Technology Innovation Agency (TIA) and, where possible, augments seed, technology development and commercialisation funding.

The chief directorate has two directorates managing thematic priorities aligned to its focus areas, namely, Emerging Research Areas and Innovation Instruments.

National Intellectual Property Management Office

NIPMO, established as the implementing agency for the IPR Act, is currently located in the Department as a specialised service delivery unit. NIPMO's mandate is to ensure that intellectual property from publicly financed research and development is identified, protected, utilised and commercialised for the benefit (social, economic, military or any other) of the people of South Africa.

NIPMO ensures this mandate through numerous enabling mechanisms and the enforcement of compliance provisions, as set out in the IPR Act. NIPMO supports OTTs at institutions (27 higher education institutions and 11 Schedule 1 institutions, which are mostly science councils) by providing funding assistance for the salaries of technology transfer professions in the OTT, associated capacity development, operational costs as well as technology transfer-related costs for business case development, intellectual property audits, and techno-economic feasibility analyses, among other things. Funding support is also provided as a rebate through the Intellectual Property Fund for intellectual property prosecution and maintenance costs in line with the

NIPMO guideline. In order to drive the importance of research for socio-economic impact, NIPMO provides incentives to IP creators to encourage them to disclose, protect and utilise their creations. NIPMO also oversees the Innovation Bridge Portal and the commercialisation project management system as an effective means to strategically fund technology development and provide a platform for technologies to find partners and reach the market. Lastly, NIPMO develops numerous guidelines,

practice notes and interpretation notes, including on approvals and mandatory reporting requirements, which provide clarity on how to interpret and apply the IPR Act.

By providing this mix of enabling and compliance services, NIPMO contributes towards increasing the rate of knowledge utilisation from publicly funded R&D, thereby contributing to faster economic development in South Africa.

Planned policy initiatives over the medium term

Planned policy initiatives	Key actions
Sovereign Innovation Fund	<ul style="list-style-type: none"> Identify implementing partners Identify pipeline projects funding Disburse funds to implementing partners and initiatives
The 2nd 5 year review of Hydrogen South Africa (HySA)	<ul style="list-style-type: none"> Review panel made up of both local and international experts appointed by the Director General Independent convenor put in place as a secretariat Draft report put in completed and presented to DSI EXCO Draft report revised based on DSI EXCO comments Outcome of the review communicated to HySA CoCs Recommendations from the review implemented
The review of the IPR-FPRD Act and NIPMO	<ul style="list-style-type: none"> Review, adoption (where appropriate) and implementation of recommendations proposed by the Ministerial Appointed NIPMO Review Panel
Institutional Review of TIA and SANSA	<ul style="list-style-type: none"> Review, adoption (where appropriate) and implementation of recommendations proposed by the Ministerial Appointed SANSA and TIA Review Panels

Table 8: Outcomes, outputs, performance indicators and targets for 2020/21

Outcomes	Outputs	Output Performance indicators	Annual Targets						
			Audited/actual performance		Estimated performance	Medium Term Expenditure Framework Period			
			2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Innovation in support of a capable and developmental state	Decision-support tools	Number of decision-support tools utilised in all spheres of government	3 decision-support interventions maintained by 31 March 2017	3 decision-support interventions maintained by 31 March 2018	2 decision-support interventions maintained by 31 March 2019	3 decision-support interventions maintained by 31 March 2018	3 decision-support tools developed by 31 March 2021	4 decision-support tools developed by 31 March 2022	5 decision-support tools developed by 31 March 2023
	SANSA and TIA oversight to ensure alignment with government priorities	Number of strategic and technical engagements with SANSA and TIA to ensure alignment with national priorities	-	-	-	-	8 strategic and technical engagements with SANSA and TIA to ensure alignment to national priorities by 31 March 2021	8 strategic and technical engagements with SANSA and TIA to ensure alignment to national priorities by 31 March 2022	8 strategic and technical engagements with SANSA and TIA to ensure alignment to national priorities by 31 March 2023
	SANSA Regional Space Weather Centre upgrades completed	Provision of space weather information for the aviation industry in South Africa and the African continent	-	-	-	-	SANSA Regional Space Weather Centre upgrades initiated by 31 March 2021	Products and advisory developed (high-frequency Global Navigation Satellite System applications, satellite communications products developed) by 31 March 2022	Products and advisory developed (high-frequency Global Navigation Satellite System applications, satellite communications products developed) by 31 March 2023

Outcomes	Outputs	Output Performance indicators	Annual Targets						
			Audited/actual performance		Estimated performance	Medium Term Expenditure Framework Period			
			2016/17	2017/18		2018/19	2019/20	2020/21	2021/22
Innovation in support of a capable and developmental state	CubeSat launched	Number of maritime domain awareness (MDA) missions completed in support of the Oceans Economy Phakisa	-	-	-	Flight model delivered and ready for launching by 31 December 2020	Funding to complete the MDA Sat constellation secured and one (1) machine-to-machine learning CubeSats completed and launched by 31 March 2022	Manufacturing of 6 more CubeSats for MDA Sat constellation initiated by 31 March 2023	
Human capabilities and skills for the economy and for development	Support provided to master's and doctoral students ⁴	Number of postgraduate students (master's and doctoral) supported in designated energy, space, Innovation Priorities and Instruments and bioeconomy areas	414 postgraduate students (master's and doctoral) funded in designated areas by 31 March 2017	266 postgraduate students (master's and doctoral) funded in designated areas by 31 March 2018	354 postgraduate students (master's and doctoral) funded in designated areas by 31 March 2019	185 postgraduate students (master's and doctoral) funded in designated areas by 31 March 2020	200 of postgraduate students (master's and doctoral) supported in designated energy, space, Innovation Priorities and Instruments and bioeconomy areas by 31 March 2021	190 of postgraduate students (master's and doctoral) supported in designated energy, space, Innovation Priorities and Instruments, and bioeconomy areas by 31 March 2022	180 of postgraduate students (master's and doctoral) supported in designated energy, space, Innovation Priorities and Instruments, and bioeconomy areas by 31 March 2023
	Artisans and/or technicians trained for the energy, space and agriculture sectors of the economy	Number of artisans and/or technicians trained in the energy and agriculture sectors of the economy	-	-	-	-	20 artisans and/or technicians trained in the energy and agriculture sectors of the economy by 31 March 2021	20 artisans and/or technicians trained in the energy and agriculture sectors of the economy by 31 March 2022	30 artisans and/or technicians trained in the energy and agriculture sectors of the economy by 31 March 2023

4 Different subprogrammes are contributing towards the support for master's and doctoral students and may include contributions from major projects such as SHIP, HISA and ABIPP.

Outcomes	Outputs	Output Performance indicators	Annual Targets						
			Audited/actual performance			Estimated performance			
			2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Human capabilities and skills for the economy and for development	People trained in intellectual property management and technology transfer	Number of trainees upskilled in intellectual property management and technology transfer	307 trainees attending training initiatives in designated areas	256 trainees attending training initiatives in designated areas	336 trainees attending training initiatives in designated areas	230 trainees attending training initiatives in designated areas by 31 March 2020	225 trainees upskilled in intellectual property management and technology transfer skills by 31 March 2021	225 trainees upskilled in intellectual property management and technology transfer skills by 31 March 2022	225 trainees upskilled in intellectual property management and technology transfer skills by 31 March 2023
Increased knowledge generation and innovation outputs	Disclosures received from publicly financed research and development institutions	Number of disclosures, received from publicly financed research and development institutions as reported to NIPMO	251 new disclosure reported by publicly funded institutions	239 new disclosure reported by publicly funded institutions	311 new disclosure reported by publicly funded institutions	210 new disclosure reported by publicly funded institutions	225 disclosures, received from publicly financed research and development institutions as reported to NIPMO by 31 March 2021	235 disclosures, received from publicly financed research and development institutions as reported to NIPMO by 31 March 2022	250 disclosures, received from publicly financed research and development institutions as reported to NIPMO by 31 March 2023
	Improve the filing of publicly funded intellectual property rights ⁵	Number of intellectual property rights filed based on RDI conducted in designated areas	-	-	-	-	4 intellectual property rights filed based on RDI conducted in designated areas by 31 March 2021	4 intellectual property rights filed based on RDI conducted in designated areas by 31 March 2022	4 intellectual property rights filed based on RDI conducted in designated areas by 31 March 2023

5 Different subprogrammes are contributing towards the filing of publicly funded IPRs and may include contributions from major projects such as SHIP, HySA and ABIP.

Outcomes	Outputs	Output Performance indicators	Annual Targets					
			Audited/actual performance		Estimated performance	Medium Term Expenditure Framework Period		
			2016/17	2017/18		2018/19	2019/20	2020/21
Increased knowledge generation and innovation outputs	Technology demonstrations, prototypes, products and services developed ⁶	Number of technology demonstrations, prototypes, products and services developed	-	-	-	10 technology demonstrations, prototypes, products and services developed in designated energy, space, Innovation Priorities and Instruments, and bioeconomy areas by 31 March 2021	17 technology demonstrations, prototypes, products and services developed in designated energy, space, Innovation Priorities and Instruments, and bioeconomy areas by 31 March 2022	18 technology demonstration, prototypes, products and services developed in designated energy, space, Innovation Priorities and Instruments, and bioeconomy areas by 31 March 2023
Knowledge utilisation for economic development in (a) revitalising existing (traditional) industries and (b) stimulating R&D-led development	Deployed stationary fuel cells and/or other clean energy technologies.	Number of stationary fuel cell systems/clean energy technologies deployed in partnership with local and district municipalities in rural and informal settlements	-	-	-	2 stationary fuel cell systems/clean energy technologies deployed in partnership with local and district municipalities in rural and informal settlements by 31 March 2021	2 stationary fuel cell systems/clean energy technologies deployed in partnership with local and district municipalities in rural and informal settlements by 31 March 2022	2 stationary fuel cell systems/clean energy technologies deployed in partnership with local and district municipalities in rural and informal settlements by 31 March 2023
	SMMEs assisted/supported with business development and commercialisation	Number of SMMEs contracted and/or assisted for business development and commercialisation	-	-	-	10 SMMEs assisted with business development and commercialisation by 31 March 2021	15 SMMEs assisted with business development and commercialisation by 31 March 2022	25 SMMEs assisted with business development and commercialisation by 31 March 2023

6 Different subprogrammes are contributing towards the technology demonstrations, prototypes, products and services developed and may include contributions from major projects such as SHIP, HySA and ABIPP.

Outcomes	Outputs	Output Performance indicators	Annual Targets						
			Audited/actual performance			Estimated performance			
			2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Knowledge utilisation for economic development in (a) revitalising existing (traditional) industries and (b) stimulating R&D-led development	Commercial outputs in designated areas ⁷	Number of commercial outputs in designated areas	8 commercial outputs in designated areas by 31 March 2017	5 commercial outputs in designated areas by 31 March 2018	7 commercial outputs in designated areas by 31 March 2019	8 commercial outputs in designated areas by 31 March 2020	4 commercial outputs in designated areas by 31 March 2021	7 commercial outputs in designated areas by 31 March 2022	7 commercial outputs in designated areas by 31 March 2023
	Black emerging farmers benefiting from technology/innovation support programmes	Number of black emerging farmers (subsistence, small-scale, and potential commercial farmers) benefiting from technology/innovation support programmes	-	-	-	-	200 of black emerging farmers (subsistence, small-scale, and potential commercial farmers) benefiting from technology/innovation support programmes by 31 March 2021	250 of black emerging farmers (subsistence, small-scale, and potential commercial farmers) benefiting from technology/innovation support programmes by 31 March 2022	300 of black emerging farmers (subsistence, small-scale, and potential commercial farmers) benefiting from technology/innovation support programmes by 31 March 2023

7 Different subprogrammes are contributing towards commercial outputs and this may include contributions from major projects such as SHIP, Hysa and ABIPP.

Table 9: Indicators, annual and quarterly targets for the 2020/21 financial year

Output Performance Indicator	Annual target	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Number of decision-support tools utilised in all spheres of government	3 decision-support tools developed by 31 March 2021	No target	No target	1 decision-support tool developed/ maintained	2 decision-support tools developed/ maintained by 31 March 2021
Number of strategic and technical engagements with SANSA and TIA to ensure alignment to national priorities	8 strategic and technical engagements with SANSA and TIA to alignment to national priorities by 31 March 2021	2 strategic and technical engagements with SANSA and TIA reports	2 strategic and technical engagements with SANSA and TIA reports	2 strategic and technical engagements with SANSA and TIA reports	2 strategic and technical engagements with SANSA and TIA reports
Provision of space weather information for the aviation industry in South Africa and the African continent	SANSA Regional Space Weather Centre upgrades initiated by 31 March 2021	No target	Research chair appointed	Infrastructure tender awarded	Design planning done
Number of maritime domain awareness (MDA) missions completed in support of the Oceans Economy Phakisa	Flight model delivered and launched by 31 March 2021	Engineering model completed	No target	No target	Flight model delivered and launched by 31 March 2021
Number of postgraduate students (master's and doctoral) supported in designated energy, space, Innovation Priorities and Instruments and bioeconomy areas	200 of postgraduate students (master's and doctoral) supported in designated energy, space, Innovation Priorities and Instruments and bioeconomy areas by 31 March 2021	No target	No target	No target	200 postgraduate students (master's and doctoral) supported in designated energy, space, Innovation Priorities and Instruments and bioeconomy areas by 31 March 2021
Number of artisans/technicians trained in the energy and Agriculture Sector of the economy	20 artisans and/or technicians trained in the energy and agriculture sectors of the economy by 31 March 2021	No target	No target	No target	20 artisans and/or technicians trained in the energy and agriculture sectors of the economy by 31 March 2021
Number of trainees upskilled in intellectual property management and technology transfer	225 trainees upskilled in intellectual property management and technology transfer skills by 31 March 2021	No target	50 trainees upskilled in intellectual property management and technology transfer skills	150 trainees upskilled in intellectual property management and technology transfer skills	25 trainees upskilled in intellectual property management and technology transfer skills

Output Performance Indicator	Annual target	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Number of disclosures, received from publicly financed research and development institutions as reported to NIPMO	225 disclosures received from publicly financed research and development institutions as reported to NIPMO by 31 March 2021	125 disclosures, received from publicly financed research and development institutions as reported to NIPMO	No target	100 disclosures, received from publicly financed research and development institutions as reported to NIPMO	No target
Number of intellectual property rights filed based on RDI conducted in designated areas	4 intellectual property rights filed based on RDI conducted in designated areas by 31 March 2021	No target	No target	No target	4 intellectual property rights filed based on RDI conducted in designated areas by 31 March 2021
Number of technology demonstrations, prototypes, products and services developed.	10 technology demonstrations, prototypes, products and services developed in designated energy, space, and bioeconomy areas by 31 March 2021	No target	No target	2 technology demonstrations, prototypes, products and services developed	8 technology demonstrations, prototypes, products and services developed by 31 March 2021
Number of stationary fuel cell systems/clean energy technologies deployed in partnership with local and district municipalities in rural and informal settlements	2 stationary fuel cell systems/clean energy technologies deployed in partnership with local and district municipalities in rural and informal settlements by 31 March 2021	No target	No target	No target	2 stationary fuel cell systems/clean energy technologies deployed in partnership with local and district municipalities in rural and informal settlements
Number of SMEs contracted and/or assisted with business development and commercialisation	10 SMEs contracted and/or assisted with business development and commercialisation by 31 March 2021	No target	No target	No target	10 SMEs contracted and/or assisted with business development and commercialisation
Number of commercial outputs in designated areas	4 commercial outputs in designated areas by 31 March 2021	No target	No target	2 commercial outputs in designated areas	2 commercial outputs in designated areas
Number of black emerging farmers (subsistence, small-scale and potential commercial farmers) benefiting from technology/innovation support programmes	200 of black emerging farmers benefiting from technology/innovation support programmes by 31 March 2021	No target	No target	No target	200 farmers benefiting from technology/innovation support programmes by 31 March 2021

Table 10: Updated Key risks and mitigation – Technology Innovation

Outcome	Key risks	Mitigation action
Human capabilities and skills for the economy and for development	The Programme may not improve capacity development in priority areas.	Engage with Programme 4 and the NRF to inform the funding policy.
Increased knowledge generation and innovation outputs	Due to capacity constraints, the Programme may be unable to effectively deliver on its strategic and administrative objectives.	Engage with Human Resources on filling prioritised vacant posts.
Knowledge utilisation for economic development in (a) revitalising existing (traditional) industries and (b) stimulating R&D-led development	Possible decline in publicly funded research, development and innovation activities	<ul style="list-style-type: none"> • Increase the number of partnerships with the private sector, NGOs, foundations and non-profit organisations and governments (South African and international). • Solicit strategic infrastructure proposals and submit them to Programme 4 to evaluate and fund successful proposals. • Expand the NIPMO incentive scheme.
Innovation in support of a capable and developmental state	Misalignment in planning instruments and activities between the DSI and its entities	Continue to conduct meetings with senior staff of the entities to ensure alignment of objectives.
	Due to capacity constraints, the Programme may be unable to effectively deliver on its strategic and administrative objectives	Engage with Human Resources on filling prioritised vacant posts.

Reconciling performance targets with the budget and MTEF

Table 11: Technology Innovation expenditure estimates

R'000 Programme	Expenditure outcome			Adjusted appropriation 2019/20	Medium-term expenditure estimates		
	2016/17	2017/18	2018/19		2020/21	2021/22	2022/23
*Office of the Deputy Director-General	3 923	4 374	5 247	6 661	3 695	5 333	5 530
Space Science	167 803	191 823	170 132	229 078	210 633	252 231	232 052
Hydrogen and Energy	143 594	147 467	164 828	117 927	181 438	194 468	201 501
Bioeconomy	220 205	161 933	215 302	229 217	215 629	215 255	223 512
Innovation Priorities and Instruments	442 047	526 793	531 360	582 502	725 911	1 151 853	1 176 036
NIPMO	42 211	88 165	62 093	54 907	53 029	59 115	61 252
TOTAL	1 019 783	1 120 555	1 148 962	1 280 292	1 390 335	1 878 255	1 899 883
Compensation of employees	45 785	44 980	45 440	56 744	55 097	65 160	67 586
Goods and services	13 790	13 815	20 133	22 063	7 359	24 103	25 003
Transfers and subsidies	960 164	1 061 702	1 083 375	1 201 484	1 327 879	1 788 992	1 884 495
Payments for capital assets	44	-	-	-	-	-	-
Payments for financial assets	-	58	14	1	-	-	-
TOTAL	1 019 783	1 120 555	1 148 962	1 280 292	1 390 335	1 878 255	1 899 883

*This is as a result of the new approved budget for 2019MTEF and beyond.

BUDGET PROGRAMME 3: INTERNATIONAL COOPERATION AND RESOURCES

Purpose

To develop, promote and manage international partnerships that strengthen the national system of innovation (NSI) and enable the exchange of knowledge, capacity, innovation and resources between South Africa and its international partners, particularly in Africa, in support of South African foreign policy through science, knowledge and innovation diplomacy.



Chief directorates

International Resources

Works to increase the flow of international funding into South African STI initiatives, as well as African regional and continental programmes, through foreign investment promotion efforts, and fostering strategic partnerships with partners such as the European Union, as well as foundations and philanthropic organisations and the multinational private sector.

Multilateral Cooperation and Africa

Advances and facilitates South Africa's participation in bilateral STI cooperation initiatives with other African

partners, in African multilateral programmes, especially SADC and AU programmes, and in broader multilateral STI partnerships, with a strategic focus on South-South cooperation and the Sustainable Development Goals.

Overseas Bilateral Cooperation

Promotes and facilitates South Africa's bilateral STI cooperation with partners in Europe, the Americas, Asia and Australasia, especially for STI HCD, for collaborative research and innovation, and to secure partners' support for joint cooperation with other African partners.

Planned policy initiatives over the medium term

Planned policy initiatives	Key actions
African Strategy	<ul style="list-style-type: none"> • Consult with NSI role players • Implement plans of action with bilateral partners • Support SADC Regional Indicative Strategic Development Plan (RISPD) initiatives • Support Agenda 2063 initiatives
EU engagements	<ul style="list-style-type: none"> • The future of ESASTAP • Framework Programme participation • Sector Budget Support funding • European and Developing Countries Clinical Trials Partnership participation • Africa-EU Policy Dialogue • SA-EU Strategic Partnerships Dialogue Facility

Table 12: Outcomes, outputs, performance indicators and targets for 2020/21

Outcomes	Outputs	Output Performance indicators	Annual Target							
			Medium Term Expenditure Framework Period							
			2016/17	2017/18	2018/19	2019/20	2020/21			
A transformed, inclusive, responsive and coherent NSI	International resource-leveraging engagements undertaken by the Department	Number of international resource-leveraging engagements undertaken by the Department	-	-	-	43 dedicated international resource-leveraging engagements undertaken by 31 March 2017	43 dedicated international resource-leveraging engagements undertaken by 31 March 2018	43 dedicated international resource-leveraging engagements undertaken by 31 March 2019	43 dedicated international resource-leveraging engagements undertaken by 31 March 2020	43 dedicated international resource-leveraging engagements undertaken by 31 March 2021
			210 South African students participating in international training programmes offering a postgraduate qualification as part of cooperation initiatives facilitated by the DST by 31 March 2017	241 South African students participating in international training programmes offering a postgraduate qualification as part of cooperation initiatives facilitated by the DST by 31 March 2018	1 470 South African students participating in international training programmes offering a postgraduate qualification as part of cooperation initiatives facilitated by the DST by 31 March 2019	680 South African students participating in international training programmes offering a postgraduate qualification as part of cooperation initiatives facilitated by the DST by 31 March 2020	326 new South African students participating in international training programmes as part of cooperation initiatives facilitated by DSI by 31 March 2021	326 new South African students participating in international training programmes as part of cooperation initiatives facilitated by DSI by 31 March 2022	326 new South African students participating in international training programmes as part of cooperation initiatives facilitated by DSI by 31 March 2023	
Human capabilities and skills for the economy and for development	South African students participating in international training programmes as part of cooperation initiatives facilitated by DSI	Number of South African students participating in international training programmes	210 South African students participating in international training programmes offering a postgraduate qualification as part of cooperation initiatives facilitated by the DST by 31 March 2017	241 South African students participating in international training programmes offering a postgraduate qualification as part of cooperation initiatives facilitated by the DST by 31 March 2018	1 470 South African students participating in international training programmes offering a postgraduate qualification as part of cooperation initiatives facilitated by the DST by 31 March 2019	680 South African students participating in international training programmes offering a postgraduate qualification as part of cooperation initiatives facilitated by the DST by 31 March 2020	326 new South African students participating in international training programmes as part of cooperation initiatives facilitated by DSI by 31 March 2021	326 new South African students participating in international training programmes as part of cooperation initiatives facilitated by DSI by 31 March 2022	326 new South African students participating in international training programmes as part of cooperation initiatives facilitated by DSI by 31 March 2023	
	Capacity building initiatives for international cooperation specifically targeting historically disadvantaged institutions and individuals	Number of capacity-building initiatives for international cooperation specifically targeting historically disadvantaged institutions and individuals	-	-	-	32 capacity-building initiatives for international cooperation specifically targeting historically disadvantaged institutions and individuals by 31 March 2017	32 capacity-building initiatives for international cooperation specifically targeting historically disadvantaged institutions and individuals by 31 March 2018	32 capacity-building initiatives for international cooperation specifically targeting historically disadvantaged institutions and individuals by 31 March 2019	32 capacity-building initiatives for international cooperation specifically targeting historically disadvantaged institutions and individuals by 31 March 2020	32 capacity-building initiatives for international cooperation specifically targeting historically disadvantaged institutions and individuals by 31 March 2021

Outcomes	Outputs	Output Performance indicators	Annual Target						
			Audited/actual performance		Estimated performance				
			2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Human capabilities and skills for the economy and for development	International policy dialogues and technical exchanges to support the policy intents of the White Paper on STI	Number of international policy dialogues and technical exchanges to support the policy intents of the White Paper on STI	-	-	-	-	34 international policy dialogues and technical exchanges to support the 2020 Decadal Plan priorities by 31 March 2021	34 international policy dialogues and technical exchanges to support the 2020 Decadal Plan priorities by 31 March 2022	34 international policy dialogues and technical exchanges to support the 2020 Decadal Plan priorities by 31 March 2023
Knowledge utilisation for economic development in (a) revitalising existing (traditional) industries and (b) stimulating R&D-led industrial development	STI initiatives targeting objectives of Agenda 2063 supported	Number of STI initiatives targeting objectives of Agenda 2063 supported	-	-	-	-	15 new STI initiatives targeting objectives of Agenda 2063 supported by 31 March 2021	15 new STI initiatives targeting objectives of Agenda 2063 supported by 31 March 2022	15 new STI initiatives targeting objectives of Agenda 2063 supported by 31 March 2023
	STI initiatives targeting the objectives of the SADC Regional Indicative Strategic Development Plan (RISDP) supported	Number of STI initiatives targeting the objectives of the SADC RISDP supported	-	-	-	-	17 new STI initiatives targeting the objectives of the SADC RISDP supported by 31 March 2021	17 new STI initiatives targeting the objectives of the SADC RISDP supported by 31 March 2022	17 new STI initiatives targeting the objectives of the SADC RISDP supported by 31 March 2023
	Bilateral STI plans of action implemented with African partners	Number of bilateral STI plans of action implemented with African partners	-	-	-	-	6 new bilateral STI plans of action implemented with African partners by 31 March 2021	6 new bilateral STI plans of action implemented with African partners by 31 March 2022	6 new bilateral STI plans of action implemented with African partners by 31 March 2023

Outcomes	Outputs	Output Performance indicators	Annual Target					
			Audited/actual performance		Estimated performance	Medium Term Expenditure Framework Period		
			2016/17	2017/18		2018/19	2019/20	2020/21
Innovation in support of a capable and developmental state	Engagements with global science leaders to advance national priorities in multilateral forums	Number of engagements with global science leaders to advance national priorities in multilateral forums	-	-	-	12 engagements with global science leaders to advance national priorities in multilateral forums by 31 March 2021	12 engagements with global science leaders to advance national priorities in multilateral forums by 31 March 2022	12 engagements with global science leaders to advance national priorities in multilateral forums by 31 March 2023
	International STI initiatives focused on SDGs supported by South Africa	Number of international STI initiatives focused on SDGs supported by South Africa	-	-	-	8 new international STI initiatives focused on SDGs supported by South Africa by 31 March 2021	8 new international STI initiatives focused on SDGs supported by South Africa by 31 March 2022	8 new international STI initiatives focused on SDGs supported by South Africa by 31 March 2023

Table 13: Indicators, annual and quarterly targets for the 2020/21 financial year

Output Performance indicator	Annual target	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Number of international resource-leveraging engagements undertaken by the Department	43 dedicated international resource-leveraging engagements undertaken by 31 March 2021	5 international resource-leveraging engagements	6 international resource-leveraging engagements	21 international resource-leveraging engagements	11 international resource-leveraging engagements
Number of South African students participating in international training programmes	326 new South African students participating in international training programmes as part of cooperation initiatives facilitated by DSI by 31 March 2021	10 South African students participating in international training programmes	50 South African students participating in international training programmes	82 South African students participating in international training programmes	184 South African students participating in international training programmes
Number of capacity-building initiatives for international cooperation specifically targeting historically disadvantaged institutions and individuals	32 capacity-building initiatives for international cooperation specifically targeting historically disadvantaged institutions and individuals by 31 March 2021	2 capacity-building initiatives for international cooperation	6 capacity-building initiatives for international cooperation	8 capacity-building initiatives for international cooperation	16 capacity-building initiatives for international cooperation
Number of international policy dialogues and technical exchanges to support the policy intents of the White Paper on STI	34 international policy dialogues and technical exchanges the policy intents of the White Paper on STI by 31 March 2021	8 international policy dialogues and technical exchanges to support the policy intents of the White Paper on STI	4 international policy dialogues and technical exchanges to support the policy intents of the White Paper on STI	11 international policy dialogues and technical exchanges to support the policy intents of the White Paper on STI	11 international policy dialogues and technical exchanges to support the policy intents of the White Paper on STI
Number of STI initiatives supported targeting objectives of Agenda 2063	15 new STI initiatives supporting Agenda 2063 by 31 March 2021	No target	1 STI initiative supporting Agenda 2063	2 STI initiatives supporting Agenda 2063	12 STI initiatives supporting Agenda 2063
Number of STI initiatives supported targeting the objectives of the SADC RISDP	17 new STI initiatives supported targeting the objectives of the SADC RISDP	2 STI initiatives supporting the SADC RISDP	4 STI initiatives supporting the SADC RISDP	6 STI initiatives supporting the SADC RISDP	5 STI initiatives supporting the SADC RISDP
Number of STI plans of action implemented with bilateral African partners	6 STI plans of action implemented with bilateral African partners	No target	1 STI plan of action implemented with bilateral African partners	2 STI plan of action implemented with African partners	3 STI plan of action implemented with bilateral African partners
Number of engagements with global science leaders to advance national priorities in multilateral forums	12 engagements with global science leaders to advance national priorities in multilateral forums	1 engagement with a global science leader	3 engagements with global science leaders	3 engagement with global science leaders	5 engagement with global science leaders
Number of international STI initiatives focused on SDGs supported by South Africa	8 New international STI initiatives focused on SDGs supported by South Africa by 31 March 2021	1 international STI initiatives focused on SDGs supported by South Africa	No target	1 international STI initiative focused on SDGs supported by South Africa	6 international STI initiatives focused on SDGs supported by South Africa

Table 14: Updated Key Risks and mitigation – International Cooperation and Resources

Outcome	Key risks	Mitigation action
<p>A transformed, inclusive, responsive and coherent NSI</p> <p>Human capabilities and skills for the economy and for development</p>	<p>Negative perception by foreign partners of SA as a viable destination for STI investments</p> <ul style="list-style-type: none"> • Insufficient national SA funds to support South African students studying abroad • Developing of inappropriate and irrelevant capacity-building initiatives not aligned with the needs of historically disadvantaged institutions and individuals • Lack of interest and/or unwillingness by international partners to share STI expertise and resources with South Africa 	<p>Continuous dialogue and reviews with international partners through strategic engagements at joint committee meetings and other forums.</p> <ul style="list-style-type: none"> • Implementation of the Global Knowledge Partnerships Platform in close cooperation with the NRF and DHET to strategically engage international partners on co-investment for international postgraduate training programmes. • Involvement of relevant expertise in all phases of planning and execution of capacity-building initiatives designed to assist historically disadvantaged institutions and individuals. Develop and implement specific engagement approaches for each target group identified based on specific needs. • Targeted formation of mutually beneficial strategic partnerships with partners of priority interest to South Africa. Develop and implement partner specific engagement plans for major international partner.
<p>Knowledge utilisation for economic development in (a) revitalising existing industries and (b) stimulating R&D-led industrial development</p>	<ul style="list-style-type: none"> • Decline in investment by African partner countries in STI programmes with South Africa • Institutional paralysis at continental or regional level delaying progress of AU or SADC initiatives 	<ul style="list-style-type: none"> • Proposal to partners of cooperation programmes providing for investment according to capacities and aligned with their strategic objectives • Develop and implement partner specific engagement plans for major African partners • Implement initiatives to advance continental and regional agenda not constrained by institutional frameworks • Enhanced strategic planning to design and implement SADC and AU initiatives
<p>Innovation in support of a capable and developmental state</p>	<ul style="list-style-type: none"> • External geopolitical factors negatively impacting South African influence of international STI decision-making 	<ul style="list-style-type: none"> • Close cooperation with DIRCO and other relevant departments in multilateral engagements including to exploit support from regional and other strategic alliances • Develop and implement a partner-specific engagement approach for particular international partners

Reconciling performance targets with the budget and MTEF

Table 15: International Cooperation and Resources expenditure estimates

R'000 Programme	Expenditure outcome				Adjusted appropriation	Medium-term expenditure estimates		
	2016/17	2017/18	2018/19	2019/20		2020/21	2021/22	2022/23
*Office of the Deputy Director-General	7 372	6 081	6 883	6 903	4 197	5 710	5 923	
Multilateral Cooperation and Africa	30 408	31 353	36 123	32 674	27 593	35 832	37 160	
International Resources	54 204	61 481	61 851	65 841	52 752	73 127	75 843	
Overseas Bilateral Cooperation	33 854	37 764	41 898	43 713	32 233	48 604	50 406	
TOTAL	125 838	136 679	146 755	149 131	116 775	163 273	169 332	
Compensation of employees	48 889	51 026	53 379	58 456	56 778	65 823	68 269	
Goods and services	16 052	21 426	25 201	18 577	3 296	19 686	20 416	
Transfers and subsidies	60 897	64 224	68 165	72 098	56 701	77 764	80 647	
Payments for financial assets	-	-	-	-	-	-	-	
TOTAL	125 838	136 679	146 755	149 131	116 775	163 273	169 332	

*This is as a result of the new approved budget for 2019 MTEF and beyond

PROGRAMME 4: RESEARCH DEVELOPMENT AND SUPPORT

Purpose

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



Chief directorates

Human Capital and Science Promotion

This chief directorate formulates and implements policies and strategies that address the availability of human capital for STI, and that provide fundamental support for research activities. The chief directorate provides strategic direction and support to institutions mandated to develop human capital and increase knowledge production, as well as interfacing with relevant stakeholders in this regard. In addition, the chief directorate is responsible for the development of a society that is scientifically literate and critically engaged with science through public engagement in STI and enhancing youth access to STI.

The chief directorate has three directorates managing thematic priorities aligned to its focus areas, namely,

Research Development, Science Promotion and Research Support.

Basic Sciences and Infrastructure

Facilitates the strategic implementation of research and innovation equipment and facilities to promote knowledge production in areas of national priority and to sustain R&D-led innovation. The chief directorate also promotes the development and strengthening of basic or foundational sciences, such as physics, chemistry, mathematics, computer science, biological and life sciences, geographic and geological sciences, and the human and social sciences.

The chief directorate has two directorates managing thematic priorities aligned to its focus areas, namely, research infrastructure (including Cyberinfrastructure) and Basic Sciences.

Science Missions

Promotes the development of research and the production of scientific knowledge and human capital in science areas in which South Africa enjoys a geographic advantage. These areas include the dynamics of climate change and its impact on Earth Systems, Antarctic and Marine research, the palaeosciences, and indigenous knowledge systems (IKS). The chief directorate has four directorates managing thematic priorities aligned to its focus areas, namely, Marine, Polar Research and Palaeosciences; Earth Systems Science; Indigenous Knowledge Systems (IKS) Knowledge Management; and IKS Policy and Advocacy.

Astronomy

This chief directorate supports the development of astronomical sciences around the new Multiwavelength

Astronomy Strategy. The strategy highlights the current status of astronomy in South Africa, its importance to the South African socio-economic landscape, the astronomy heritage in South Africa and how this could be further strengthened, and a strategic approach for continued investments in astronomy in South Africa. The strategy sets out strategic objectives and a strategic agenda defined by the key priority areas for astronomy, also outlining relevant cross-cutting support programmes needed to give effect to the shared vision.

The chief directorate has two directorates managing thematic priorities aligned to the focus areas of the Astronomy namely: Multiwavelength Astronomy, and the Astronomy Management Authority.

Planned policy initiatives over the medium term

Planned Policy	Policy Initiatives
Open Science Policy	<ul style="list-style-type: none"> A framework outlining the structure of the Open Science Policy A draft South African Open Science Policy
Postgraduate Funding Policy (to cater for financially needy students)	<ul style="list-style-type: none"> Minister’s approval of the Postgraduate Funding Policy
A framework for reporting on postgraduate bursaries across Programmes and DSI entities	<ul style="list-style-type: none"> Presentation of the Framework to Exco Communication of the reporting compliance requirements to internal (DSI) and external stakeholders
A framework for an efficient, holistic financial aid ecosystem (covering both undergraduate and postgraduate funding), and including funds leveraged from international partners	<ul style="list-style-type: none"> DSI-DHET-NRF task team appointed Consultation with industry and other potential funders Development and approval of the framework
Policy recommendations: Training of postgraduate engineering students	<ul style="list-style-type: none"> Approval of policy recommendations
Tracer study of PhD graduates by Water Research Council (WRC)	<ul style="list-style-type: none"> Terms of reference developed and approved Appointment of service provider for the study
Full roll-out and implementation of the digital platform for tracking NRF-funded students	<ul style="list-style-type: none"> Sharing NRF’s conditions for bursary grants with SARS, for SARS to make input
Finalise the SACNASP Amendment Bill	<ul style="list-style-type: none"> Approved by the State Law Advisor Determination of outcome on Socio Economic Impact Assessment System Presentation to the Economic Sectors, Investment, Employment and Infrastructure Development Cluster
A study on the feasibility of an astronomy institute undertaken by the Government Technical Advisory Centre, including advice on where it would be located	<ul style="list-style-type: none"> Approval of study by the DG

Table 16: Outcomes, outputs, performance indicators and targets for 2020/21

Outcomes	Outputs	Output performance indicators	Annual Targets						
			Audited/actual performance		Estimated performance				
			2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Human capabilities and skills for the economy and for development	PhD students awarded bursaries annually	Number of PhD students awarded bursaries annually as reflected in the reports from the NRF and other relevant entities	3 454 PhD students awarded bursaries through NRF and DST-managed programmes as reflected in the NRF and DST project reports by 31 March 2017	No fewer than 3 621 PhD students awarded bursaries annually as reflected in the reports from the NRF and other relevant entities by 31 March 2018	No fewer than 3 380 PhD students awarded bursaries annually as reflected in the reports from the NRF and other relevant entities by 31 March 2019	No fewer than 3 100 PhD students awarded bursaries annually as reflected in the reports from the NRF and other relevant entities by 31 March 2020	No fewer than 2 400 PhD students awarded bursaries annually as reflected in the reports from the NRF and other relevant entities by 31 March 2021	No fewer than 2 700 PhD students awarded bursaries annually as reflected in the reports from the NRF and other relevant entities by 31 March 2022	No fewer than 3 000 PhD students awarded bursaries annually as reflected in the reports from the NRF and other relevant entities by 31 March 2023
	Pipeline postgraduate students awarded bursaries annually	Number of pipeline postgraduate students awarded bursaries annually as reflected in the reports from the NRF and other relevant entities	10 268 pipeline postgraduate students awarded bursaries through NRF and DST-managed programmes as reflected in the NRF and DST project reports by 31 March 2017	10 601 pipeline postgraduate students awarded bursaries annually as reflected in the reports from the NRF and other relevant entities by 31 March 2018	9 774 pipeline postgraduate students awarded bursaries annually as reflected in the reports from the NRF and other relevant entities by 31 March 2019	No fewer than 10 800 pipeline postgraduate students awarded bursaries annually as reflected in the reports from the NRF and other relevant entities by 31 March 2020	No fewer than 8 000 pipeline postgraduate students awarded bursaries annually as reflected in the reports from the NRF and other relevant entities by 31 March 2021	No fewer than 8 200 pipeline postgraduate students awarded bursaries annually as reflected in the reports from the NRF and other relevant entities by 31 March 2022	No fewer than 8 500 pipeline postgraduate students awarded bursaries annually as reflected in the reports from the NRF and other relevant entities by 31 March 2023
	Graduates and students placed in DST-funded work preparation programmes	Number of graduates and students placed in DST-funded work preparation programmes in SETI institutions	962 graduates and students placed in DST-funded work preparation programmes in SETI institutions by 31 March 2017	823 graduates and students placed in DST-funded work preparation programmes in SETI institutions by 31 March 2018	802 graduates and students placed in DST-funded work preparation programmes in SETI institutions by 31 March 2019	No fewer than 650 graduates and students placed in DST-funded work preparation programmes in SETI institutions by 31 March 2020	No fewer than 750 graduates and students placed in DST-funded work preparation programmes in SETI institutions by 31 March 2021	No fewer than 750 graduates and students placed in DST-funded work preparation programmes in SETI institutions by 31 March 2022	No fewer than 750 graduates and students placed in DST-funded work preparation programmes in SETI institutions by 31 March 2022

Outcomes	Outputs	Output performance indicators	Annual Targets						
			Audited/actual performance		Estimated performance				
			2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
A transformed, inclusive, responsive and coherent NSI	Research infrastructure grants	Number of research infrastructure grants awarded	72 research infrastructure grants awarded as per award letters by 31 March 2017	28 research infrastructure grants awarded as per award letters by 31 March 2018	35 research infrastructure grants awarded as per award letters by 31 March 2019	20 research infrastructure grants awarded as per award letters by 31 March 2020	20 research infrastructure grants awarded by 31 March 2021	25 research infrastructure grants awarded by 31 March 2022	30 research infrastructure grants awarded by 31 March 2023
	Broadband capacity	Total available broadband capacity provided by SANReN per annum	3 500 Mbps average broadband capacity provided by SANReN site by 31 March 2017	3 292 Gbps total available broadband capacity provided by SANReN by 31 March 2018	3 557 Gbps total available broadband capacity provided by SANReN by 31 March 2019	3 500 Gbps total available broadband capacity provided by SANReN by 31 March 2020	5 000 Gbps total available broadband capacity provided by SANReN by 31 March 2021	5 800 Gbps total available broadband capacity provided by SANReN by 31 March 2022	6 200 Gbps total available broadband capacity provided by SANReN by 31 March 2023
Increased knowledge generation and innovation output	Researchers awarded research grants	Number of researchers awarded research grants through NRF-managed programmes as reflected in the NRF project reports	4 539 researchers awarded research grants through NRF-managed programmes as reflected in the NRF project reports by 31 March 2017	4 707 researchers awarded research grants annually through NRF-managed programmes as reflected by the NRF project reports by 31 March 2018	4 633 researchers awarded research grants annually through NRF-managed programmes as reflected by the NRF project reports by 31 March 2019	No fewer than 4 500 researchers awarded research grants annually through NRF-managed programmes as reflected by the NRF project reports by 31 March 2020	No fewer than 3 000 researchers awarded research grants through NRF-managed programmes as reflected by the NRF project reports by 31 March 2021	No fewer than 3 000 researchers awarded research grants through NRF-managed programmes as reflected by the NRF project reports by 31 March 2022	No fewer than 3 000 researchers awarded research grants through NRF-managed programmes as reflected by the NRF project reports by 31 March 2023

Outcomes	Outputs	Output performance indicators	Annual Targets						
			Medium Term Expenditure Framework Period						
			2016/17	2017/18	2018/19	2019/20	2020/21		
Increased knowledge generation and innovation output	Internationally accredited research articles from researchers awarded research grants through NRF-managed programmes	Number of research articles published by NRF-funded researchers and cited in the Web of Science Citation Database as reflected in the NRF project reports	8 156 ISI-accredited research articles published by NRF-funded researchers and cited in the Thomson Reuters Web of Science Citation Database as reflected in the NRF project reports by 31 March 2017	9 159 research articles published by NRF-funded researchers and cited in the Thomson Reuters Web of Science Citation Database as reflected in the NRF project reports by 31 March 2019	No fewer than 7 000 research articles published by NRF-funded researchers and cited in the Thomson Reuters Web of Science Citation Database as reflected in the NRF project reports by 31 March 2020	6 000 Internationally accredited research articles from researchers awarded research grants by 31 March 2021	7 000 Internationally accredited research articles from researchers awarded research grants by 31 March 2022	7 000 Internationally accredited research articles from researchers awarded research grants by 31 March 2023	
	S-Band science mode receivers installed	Number of additional receivers installed on the MeerKAT telescope to enhance the performance of the MeerKAT telescope	32-antennae single polarisation array commissioned 31 March 2017	64-antennae commissioned for a single polarisation array 31 March 2018	64 ultra-high frequency science mode receivers installed on the MeerKAT by 31 March 2019	8 large survey projects science mode receivers installed on MeerKAT correlator	64 S-Band science mode receivers installed on MeerKAT by 31 March 2021	Production plan approved for the L-band receivers for the additional 20 MeerKAT antennae by 31 March 2022	Production completed for the L-band receivers for the additional 20 MeerKAT antennae by 31 March 2023
	Additional antennae installed on the MeerKAT telescope ⁸	Number of additional MeerKAT telescope antennae	-	-	-	-	System design review of MeerKAT extension approved by 31 March 2021	MeerKAT Extension dish tender awarded by 31 March 2022	4 MeerKAT Extension antennae installed by 31 March 2023

8 Pending on the approved system design review (SDR) of the MeerKAT extension

Annual Targets									
Outcomes	Outputs	Output performance indicators	Audited/actual performance				Estimated performance		
			2016/17	2017/18	2018/19	2019/20	Medium Term Expenditure Framework Period		
			2020/21	2021/22	2022/23				
Increased knowledge generation and innovation output	Regulations approved by Minister under the Protection, Promotion and Development of Indigenous Knowledge Act (IK Act)	Number of components of the IK legal architecture implemented	-	-	-	-	Regulations for the IK Act approved by the Minister by 31 March 2021	Launch of the National Recordal System for registration and access to indigenous knowledge by 31 March 2022	Intellectual property instruments launched by 31 March 2023
Increased knowledge generation and innovation output	South African science survey report	First South African public relationship with science survey report published	-	-	-	-	Sample ⁹ and technical report frameworks for the First South African public relationship with science survey approved by 31 March 2021	Data collection instruments for the First South African public relationship with science survey produced by 31 March 2022	First South African public relationship with science survey conducted by 31 March 2023
	Oversight over NRF and ASSAF to ensure that they respond to government priorities	Number of strategic and technical engagements with the NRF, ASSAF and SACNASP to ensure alignment to national priorities	-	-	-	-	12 strategic and technical engagements with NRF, SACNASP and ASSAF to ensure alignment to national priorities by 31 March 2021	12 strategic and technical engagements with NRF, SACNASP and ASSAF to ensure alignment to national priorities by 31 March 2022	12 strategic and technical engagements with NRF, SACNASP and ASSAF to ensure alignment to national priorities by 31 March 2023

Table 17: Indicators, annual and quarterly targets for the 2020/21 financial year

Output performance indicator	Annual target	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Total number of PhD students awarded bursaries annually as reflected in the reports from the NRF and other relevant entities	No fewer than 2 400 PhD students awarded an annual bursary as reflected in the reports from the NRF and other relevant entities by 31 March 2021	No fewer than 1 000 PhD students awarded an annual bursary as reflected in the reports from the NRF and other relevant entities	No fewer than 1 500 PhD students awarded an annual bursary as reflected in the reports from the NRF and other relevant entities	No fewer than 2 000 PhD students awarded an annual bursary as reflected in the reports from the NRF and other relevant entities	No fewer than 2 400 PhD students awarded an annual bursary as reflected in the reports from the NRF and other relevant entities by 31 March 2021
Total number of pipeline postgraduate students awarded bursaries annually as reflected in the reports from the NRF and other relevant entities	No fewer than 8 000 pipeline postgraduate students awarded an annual bursary as reflected in the reports from the NRF and other relevant entities by 31 March 2021	No fewer than 3 000 pipeline postgraduate students awarded an annual bursary as reflected in the reports from the NRF and other relevant entities	No fewer than 5 000 pipeline postgraduate students awarded an annual bursary as reflected in the reports from the NRF and other relevant entities	No fewer than 6 500 pipeline postgraduate students awarded an annual bursary as reflected in the reports from the NRF and other relevant entities	No fewer than 8 000 pipeline postgraduate students awarded an annual bursary as reflected in the reports from the NRF and other relevant entities by 31 March 2021
Total number of graduates and students placed in DSI-funded work preparation programmes in SETI institutions	750 graduates and students placed in DSI-funded work preparation programmes in SETI institutions by 31 March 2021	400 graduates and students placed in DSI-funded work preparation programmes in SETI institutions	550 graduates and students placed in DSI-funded work preparation programmes in SETI institutions	650 graduates and students placed in DSI-funded work preparation programmes in SETI institutions	750 graduates and students placed in DSI-funded work preparation programmes in SETI institutions by 31 March 2021
Number of research infrastructure grants awarded	20 annual research infrastructure grants awarded by 31 March 2021	No target	Call for proposals on awarding of research infrastructure grants issued	No target	20 annual research infrastructure grants awarded by 31 March 2021
Total available broadband capacity provided by SANReN per annum	5 000 Gbps total available broadband capacity provided by SANReN by 31 March 2021	No target	New links and upgrade plan finalised	No target	5 000 Gbps total available broadband capacity provided by SANReN by 31 March 2021
Total number of researchers awarded research grants through NRF-managed programmes as reflected in the NRF project reports	No fewer than 3 000 researchers awarded research grants through NRF-managed programmes as reflected by the NRF project reports by 31 March 2021	No fewer than 1 300 researchers awarded research grants through NRF-managed programmes	No fewer than 2 000 researchers awarded research grants through NRF-managed programmes	No fewer than 2 500 researchers awarded research grants through NRF-managed programmes	No fewer than 3 000 researchers awarded research grants through NRF-managed programmes as reflected by the NRF project reports by 31 March 2021

9 "Sample framework" refers to the overall sample size and stratification approach to be adopted to yield the expected disaggregation of data. "Technical report framework" refers to the format in which the report will be presented to the public.

Output performance indicator	Annual target	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Number of research articles published by NRF-funded researchers and cited in the Clarivate Web of Science Citation Database as reflected in the NRF project reports	No fewer than 6 000 research articles published by NRF-funded researchers and cited in the Clarivate Web of Science Citation Database as reflected in the NRF project reports by 31 March 2021	No target	No target	No target	No fewer than 6 000 research articles published by NRF-funded researchers and cited in the Clarivate Web of Science Citation Database as reflected in the NRF project reports by 31 March 2021
Number of additional receivers installed on the MeerKAT telescope to enhance the performance of the MeerKAT telescope	64 S-Band science mode receivers installed on MeerKAT by 31 March 2021	Installation plan approved by SKA SA Project Director	Progress report on implementation of installation plan approved by SKA SA Project Director	SKA SA Project approved progress report with reference to installation plan provided	64 S-Band science mode receivers installed on MeerKAT by 31 March 2021
Number of additional MeerKAT antennas produced, installed and commissioned; Approved system design review (SDR) of the MeerKAT extension	System design review of the MeerKAT extension approved by 31 March 2021	No target	Progress report on system design review (SDR) of MeerKAT extension approved by SARA O Director on the MeerKAT extension	No target	Progress report on system design review (SDR) of MeerKAT extension approved by SARA O Director on the MeerKAT extension by 31 March 2021
Number of components of the IK legal architecture implemented	Regulations for the IK Act approved by the Minister by 31 March 2021	Consultation on the Regulations for IK Act with government departments	Consultation on the Regulations for IK Act with communities	Consultation on the Regulations for IK Act with business, research councils and higher education institutions	Minister's approval of the Regulations under the IK Act
First report on the South African relationship with science published	Sample and technical report frameworks for the first South African relationship with science survey approved by Exco by 31 March 2021	No target	Draft sample and technical report frameworks for the first South African relationship with science survey produced	No target	Sample and technical report frameworks for the first South African relationship with science survey approved by Exco by 31 March 2021
Number of strategic and technical engagements with NRF, SACNASP and ASSAF to ensure alignment to national priorities	12 strategic and technical engagements with NRF, SACNASP and ASSAF to ensure alignment to national priorities by 31 March 2021	3 bilateral engagement report	3 bilateral engagement reports	3 bilateral engagement reports	3 bilateral engagement report

Table 18: Key risks – Research Development and Support

Outcome	Key risks	Mitigation action
A transformed, inclusive, responsive and coherent NSI	Postgraduate bursaries provided are not sufficient in value and fall short of meeting the critical target numbers required	<ul style="list-style-type: none"> Implement the postgraduate funding policy (subject to the Minister's approval), which will incorporate full cost of study support for financially needy students. Develop and implement an efficient, sustainable and holistic ecosystem for both undergraduate and postgraduate students.
Human capabilities and skills for the economy and for development	High attrition rate of postgraduate students	<ul style="list-style-type: none"> Implementation of the postgraduate funding policy (subject to the Minister's approval of the Postgraduate Funding Policy that incorporates the full cost of study support for financially needy students). A joint DHET-DSI report to the Minister on an efficient holistic financial aid ecosystem for both undergraduate and postgraduate students support. (The joint report will create synergies between DSI and DHET bursary support and will make recommendations to leverage third party support such as industry and international partners).
	Use of public funds to support postgraduate students in areas that do not contribute to South Africa's socio-economic development and growth needs (priority areas)	Review and update the list of priority areas informed by the White Paper and the Decadal Plan (Research prioritisation document).
	Science engagement campaigns/programmes that do not interest those targeted owing to inability relate to and engage with the science messages being communicated	Finalise the establishment of an accredited science communication qualification in collaboration with the University of Limpopo (focusing on the development of basic science communication skills).
Increased knowledge generation and innovation output	Failure to provide quality (acquisition of new, replacement and/or upgrade of existing infrastructure) and competitive world-class research infrastructure (both physical infrastructure and non-physical cyberinfrastructure) to ensure a sustainable enabling environment for research and innovation.	<ul style="list-style-type: none"> Periodic review, evaluation and monitoring on the state of research infrastructure. (The evaluation report will be used to improve or enhance the implementation of the National Equipment Programme and to evaluate the socio-economic impact on the science system, e.g. publications, citations, journals.) Targeted interventions between NRF and DSI to improve the quality of the proposals submitted for infrastructure funding.
	Inadequate support for emerging researchers	Minister's approval and implementation of the policy recommendations emanating from the findings of the CREST Study on Building a Cadre of Emerging Scholars for Higher Education in South Africa, which will leverage resources from the DHET, ASSAF and Universities South Africa
	Stagnant scientific output from geographic advantage knowledge areas	Finalise the development of Regulations for the IK Act
	Ineffective protection of Astronomy Advantage Areas	Finalise the signing and implementation of memoranda of agreement at different levels to ensure that radio astronomy and other government activities do not interfere with each other within the declared Karoo Central Astronomy Advantage Area

Reconciling performance targets with the budget and MTEF

Table 19: Research Development and Support expenditure estimates

R'000 Programme	Expenditure outcome			Adjusted appropriation	Medium-term expenditure estimates		
	2016/17	2017/18	2018/19		2020/21	2021/22	2022/23
*Office of the Deputy-Director General	4 908	4 543	3 820	3 354	3 775	4 660	4 833
Human Capital and Science Promotion	2 354 551	2 379 550	2 447 150	2 631 959	2 293 189	2 836 994	2 942 151
Science Missions	213 069	201 731	223 348	239 532	202 443	262 655	272 396
Basic Science and Infrastructure	895 535	977 488	1 095 294	979 128	843 137	1 154 256	1 198 747
Astronomy	689 473	733 156	750 834	729 703	500 440	866 755	898 375
TOTAL	4 157 536	4 296 468	4 520 446	4 583 676	3 842 984	5 125 320	5 316 502
Compensation of employees	38 320	38 764	37 853	42 640	41 440	49 020	50 844
Goods and services	14 925	13 279	15 313	14 925	8 840	17 071	17 711
Transfers and subsidies	4 104 261	4 244 374	4 467 265	4 526 109	3 792 704	5 059 229	5 247 947
Payments for capital assets	-	-	12	-	-	-	-
Payments for financial assets	30	51	3	2	-	-	-
TOTAL	4 157 536	4 296 468	4 520 446	4 583 676	3 842 984	5 125 320	5 316 502

**This is as a result of the new approved budget for 2019MTEF and beyond*

BUDGET PROGRAMME 5: SOCIO-ECONOMIC INNOVATION PARTNERSHIPS

Purpose

To enhance the growth and development priorities of government through targeted S&T-based innovation interventions and the development of strategic partnerships with other government departments, industry, research institutions and communities and the provision of statistics and analysis for purposes of system-level monitoring and evaluation.



Chief directorates

Technology Localisation, Beneficiation and Advanced Manufacturing

Funds technology and innovation development programmes to advance strategic medium and long-term sustainable economic growth and sector development priorities, as well as government service delivery through the following value-adding functions:

- Investing in the medium and long-term knowledge-generation capabilities of the NSI in targeted innovation areas.
- In partnership with other government departments and economic actors, spearheading focused efforts that exploit knowledge capabilities for economic benefit. Economic benefits include the development of advanced technologies and industries, improved

government service delivery, improved productivity and competitiveness, and technology transfer and support to SMMEs and manufacturing firms in the supply chains of large-scale public procurement programmes.

The chief directorate has four directorates managing thematic priorities aligned to its focus areas, namely, Technology Localisation; Mining, Mineral and Beneficiation; Chemicals and Related Industries; and Advanced Manufacturing.

Information and Communications Technology and Service Industry

Provides policy, strategy and direction-setting support for the R&D-led growth of strategic sectors of the economy and to enhance S&T capacity to support a transition to a green economy. The chief directorate does this through the following:

- Facilitating the implementation of high-impact S&T interventions.
- Identifying and initiating S&T programmes that support the growth of the environmental technologies and services sector in South Africa.
- Facilitating policy and strategy development on R&D interventions that support the growth of the ICT sector (excluding the ICT retail sector).
- Providing innovation policy and planning support to economic actors in priority economic sectors and provincial and local governments.

The chief directorate has three directorates managing thematic priorities aligned to its focus areas, namely, Environmental Services and Technologies; Sector and Local Innovation; and Information Communication and Technology.

Innovation for Inclusive Development

Provides leadership and guidance for harnessing science, technology and innovation for the delivery of basic services, local economic development and inculcating the culture of innovation across government through the following interventions:

- Leading the development, demonstration, transfer and diffusion of innovative solutions towards supporting evidence-based policy service delivery making and practice.
- Strengthening STI capacity, maturity and collaboration with local government and sector departments towards a capable and innovative state.

- Coordinating collaborative science, technology and innovation catalytic local industries, clusters and value-chains in line with provincial and local development plans.
- Coordinating and inculcating science, technology and innovation initiatives in support of the District Development Model.

The chief directorate has two directorates managing thematic priorities aligned to its focus areas, namely, Technology for Sustainable Livelihoods; and Science and Technology for Sustainable Human Settlements.

Science and Technology Investment

Leads and supports the development of indicators and instruments for measuring and monitoring investments in S&T and the performance of the NSI, and ways of strengthening the NSI and innovation policy. This includes an annual R&D survey, innovation measurement, the development of S&T indicators, and the national S&T expenditure tables, and the implementation of section 11D of the Income Tax Act, 1962, to promote private-sector R&D investment.

The chief directorate has three directorates managing thematic priorities aligned to its focus areas, namely: Research and Development Tax Incentive; Research and Development Planning; and Science and Technology Indicators.

Planned policy initiatives over the medium term

Planned policy initiatives	Key actions
Living Labs in community learning centres	Increasing the spatial footprint of innovation through community learning centres
Preferential Procurement Policy Framework Act and designation	The role of public procurement in transforming service delivery
Budget coordination	<ul style="list-style-type: none"> • Position paper on arrangements finalised and agreed with National Treasury and STI-intensive national government departments by 31 March 2021. • Tailor-made arrangements in place as part of the budget process to enhance the strategic deployment of public funding for science, technology and innovation by 2025

Table 20: Outcomes, outputs, performance indicators and targets for 2020/21

Outcomes	Outputs	Output Performance indicators	Annual Targets						
			Audited/actual performance			Estimated performance	Medium Term Expenditure Framework Period		
			2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Innovation in support of a capable and developmental state	Knowledge products	Number of knowledge products on innovation for inclusive development published	5 evaluation/research reports developed and published on the DST website by 31 March 2017	6 knowledge products on innovation for inclusive development published by 31 March 2018	8 knowledge products on innovation for inclusive development published by 1 April 2015 and 31 March 2019	At least 6 knowledge products on innovation for inclusive development published by 1 April 2015 and 31 March 2020	At least 4 knowledge products on innovation for inclusive development published by 1 April 2020 and 31 March 2021	At least 4 knowledge products on innovation for inclusive development published by 1 April 2020 and 31 March 2022	At least 4 knowledge products on innovation for inclusive development published by 1 April 2020 and 31 March 2023
Knowledge utilisation for inclusive development	Decision-support interventions	Number of decision-support interventions introduced and maintained	7 decision-support systems maintained and improved by 31 March 2017	10 decision-support systems maintained and improved by 31 March 2018	10 decision-support systems maintained and improved by 31 March 2019	At least 10 decision-support systems maintained and improved by 31 March 2020	At least 10 decision-support systems maintained and improved by 31 March 2021	At least 10 decision-support systems maintained and improved by 31 March 2022	At least 10 decision-support systems maintained and improved by 31 March 2023
Knowledge utilisation for inclusive development	Learning interventions (seminars, policy round tables)	Number of learning interventions (seminars/policy round tables) Hosted	10 learning interventions (seminars) generated by 31 March 2017	13 learning interventions (seminars) generated by 31 March 2018	10 learning interventions (seminars) generated by 31 March 2019	At least 10 learning interventions (seminars) generated by 31 March 2020	At least 4 learning interventions (seminars/policy round tables) hosted by 31 March 2021	At least 4 learning interventions (seminars/policy round tables) hosted by 31 March 2022	At least 4 learning interventions (seminars/policy round tables) hosted by 31 March 2023

Outcomes	Outputs	Output Performance indicators	Annual Targets						
			Audited/actual performance			Estimated performance			
			2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Human capabilities and skills for the economy and for development	High-level HCD built for competitiveness and new industry development	Number of high-level research students (honours, master's and doctoral students) fully funded or co-funded in designated niche areas (advanced manufacturing, aerospace, chemicals, mining, advanced metals, ICTs and SIFs) by 31 March 2017	334 master's and doctoral students fully funded or co-funded in designated niche areas (advanced manufacturing, aerospace, chemicals, mining, advanced metals, ICTs and SIFs) by 31 March 2017	At least 291 master's and doctoral students fully funded or co-funded in designated niche areas (advanced manufacturing, aerospace, chemicals, mining, advanced metals, ICTs and SIFs) by 31 March 2018	At least 242 master's and doctoral students fully funded or co-funded in designated niche areas (advanced manufacturing, aerospace, chemicals, mining, advanced metals, ICTs and SIFs) by 31 March 2019	At least 252 master's and doctoral students fully funded or co-funded in designated niche areas (advanced manufacturing, aerospace, chemicals, mining, advanced metals, ICTs and SIFs) by 31 March 2020	At least 313 honours, master's and doctoral students fully funded or co-funded in designated niche areas (advanced manufacturing, aerospace, chemicals, mining, advanced metals, ICTs, the Industry Innovation Programme – incl. SIFs and green economy) by 31 March 2021	At least 392 honours, master's and doctoral students fully funded or co-funded in designated niche areas (advanced manufacturing, aerospace, chemicals, mining, advanced metals, ICTs, the Industry Innovation Programme – incl. SIFs and green economy) by 31 March 2022	At least 392 honours, master's and doctoral students fully funded or co-funded in designated niche areas (advanced manufacturing, aerospace, chemicals, mining, advanced metals, ICTs, the Industry Innovation Programme – incl. SIFs and green economy) by 31 March 2023

Outcomes	Outputs	Output Performance indicators	Annual Targets					Medium Term Expenditure Framework Period			
			Audited/actual performance					2019/20	2020/21	2021/22	2022/23
			2016/17	2017/18	2018/19	2019/20	2020/21				
Increased knowledge generation and innovation output	Knowledge and innovation products added to the industrial development and green economy IP portfolios	Number of knowledge and innovation products added to the industrial development and green economy IP portfolios through fully funded or co-funded research initiatives	36 knowledge and innovation products (patents, prototypes, technology demonstrators or technology transfer packages) added to the IP portfolio by 31 March 2017	38 knowledge and innovation products (patents, prototypes, technology demonstrators or technology transfer packages) added to the industrial development IP portfolio by 31 March 2018	42 industrially relevant knowledge and innovation products (patents, prototypes, technology demonstrators or technology transfer packages) added to the industrial development IP portfolio by 31 March 2019	At least 50 industrially relevant knowledge and innovation products (patents, prototypes, technology demonstrators or technology transfer packages) added to the industrial development IP portfolio by 31 March 2020	An annual total of at least 42 industrially relevant knowledge and innovation products (patents, prototypes, technology demonstrators or technology transfer packages) added to the industrial development and green economy IP portfolio by 31 March 2021	An annual total of at least 60 industrially relevant knowledge and innovation products (patents, prototypes, technology demonstrators or technology transfer packages) added to the industrial development and green economy IP portfolio by 31 March 2022	An annual total of at least 60 industrially relevant knowledge and innovation products (patents, prototypes, technology demonstrators or technology transfer packages) added to the industrial development and green economy IP portfolio by 31 March 2023		
	Funding instruments to increase localisation, competitiveness and R&D-led industry development	Number of instruments funded in support of increased localisation, competitiveness and R&D-led industry development	9 instruments funded in support of increased localisation, competitiveness and R&D-led industry development by 31 March 2017	6 instruments funded in support of increased localisation, competitiveness and R&D-led industry development by 31 March 2018	9 instruments funded in support of increased localisation, competitiveness and R&D-led industry development by 31 March 2019	At least 9 instruments funded in support of increased localisation, competitiveness and R&D-led industry development by 31 March 2020	At least 5 instruments funded in support of increased localisation, competitiveness and R&D-led industry development by 31 March 2021	At least 5 instruments funded in support of increased localisation, competitiveness and R&D-led industry development by 31 March 2022	At least 5 instruments funded in support of increased localisation, competitiveness and R&D-led industry development by 31 March 2023		

Outcomes	Outputs	Output Performance indicators	Annual Targets								
			Audited/actual performance			Estimated performance			Medium Term Expenditure Framework Period		
			2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23		
Knowledge utilisation for inclusive development	Innovation-support interventions funded or co-funded that strengthen with provincial or rural innovation systems	Number of innovation-support interventions funded or co-funded that strengthen provincial or rural innovation systems	7 innovation-support interventions funded or co-funded that strengthen provincial or rural innovation systems by between 1 April 2016 and 31 March 2017	8 innovation-support interventions funded or co-funded that strengthen provincial or rural innovation systems between 1 April 2016 and 31 March 2018	11 innovation-support interventions funded or co-funded that strengthen provincial or rural innovation systems between 1 April 2016 and 31 March 2019	12 innovation-support interventions funded or co-funded that strengthen provincial or rural innovation systems between 1 April and 31 March 2020	At least 14 innovation-support interventions funded or co-funded that strengthen provincial or rural innovation systems between 1 April 2020 and 31 March 2021	At least 14 innovation-support interventions funded or co-funded that strengthen provincial or rural innovation systems between 1 April 2020 and 31 March 2022	At least 15 innovation-support interventions funded or co-funded that strengthen provincial or rural innovation systems between 1 April 2020 and 31 March 2023		

Outcomes	Outputs	Output Performance indicators	Annual Targets						
			Audited/actual performance		Estimated performance		Medium Term Expenditure Framework Period		
			2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Innovation in support of a capable and developmental state	Statistical reports and policy briefs approved by Exco for publication and/or submitted to Cabinet and/or disseminated to policy audience	Number of statistical reports and policy briefs approved by Exco for publication and/or submitted to Cabinet and/or disseminated to policy audience	6 reports and policy briefings on the innovation system and innovation policy approved by Exco / published by 31 March 2017: <ul style="list-style-type: none"> 2015/16 STA report; 2014/15 R&D survey report; 2015/16 R&D tax incentive report <ul style="list-style-type: none"> Baseline survey report of Intellectual Property and Technology Transfer of publicly funded research report on R&D trends of the state-owned enterprises. DST position document on identified R&D tax incentive policy issues approved and presented to the National Treasury 	3 statistical reports or policy briefs submitted to Cabinet by 31 March 2018	5 statistical reports or policy briefs approved by Exco for publication and/or submitted to Cabinet by 31 March 2019	7 statistical reports or policy briefs approved by Exco for publication and/or submitted to Cabinet by 31 March 2020	6 statistical reports or policy briefs approved by Exco for publication and/or submitted to Cabinet and/or disseminated to policy audience by 31 March 2021	6 statistical reports or policy briefs approved by Exco for publication and/or submitted to Cabinet and/or disseminated to policy audience by 31 March 2022	6 statistical reports or policy briefs approved by Exco for publication and/or submitted to Cabinet and/or disseminated to policy audience by 31 March 2023

Outcomes	Outputs	Output Performance indicators	Annual Targets								
			Audited/actual performance			Estimated performance			Medium Term Expenditure Framework Period		
			2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23		
Knowledge utilisation for economic development in (a) revitalising existing (traditional) industries and (b) stimulating R&D-led industrial development	Companies accessing the R&D tax incentive	Turnaround time in providing pre-approval decisions on applications for the R&D tax incentive	By 31 March 2017, only 13 applications had received decision letters within 120 days. The average number of days for providing decisions was reduced from 266 days (applications received in 2015) to 147 days (applications received in 2016).	Preapproval decisions provided within 101 days (on average)	Preapproval decision provided within 90 days on 39% (or 51) of the 131 applications received from 1 January 2018 to 31 December 2018. Overall, of all the 131 applications received over the same period, 95 (or 73%) have been provided with decision	Preapproval decisions provided within 90 days from date of receipt for 80% of applications for the R&D tax incentive received between 1 January 2019 and 31 March 2020	Preapproval decisions provided within 90 days from date of receipt for 80% of applications for the R&D tax incentive received between 1 January 2020 and 31 March 2021	Preapproval decisions provided within 90 days from date of receipt for 80% of applications for the R&D tax incentive received between 1 January 2020 and 31 March 2022	Preapproval decisions provided within 90 days from date of receipt for 80% of applications for the R&D tax incentive received between 1 January 2020 and 31 March 2023		
Innovation in support of a capable and developmental state	Oversight over the CSIR and HSRC to ensure they respond to government priorities	Number of strategic and technical engagements with CSIR and HSRC to ensure alignment to national priorities	-	-	-	-	8 strategic and technical engagements with CSIR and HSRC to ensure alignment to national priorities by 31 March 2021	8 strategic and technical engagements with CSIR and HSRC to ensure alignment to national priorities by 31 March 2022	8 strategic and technical engagements with CSIR and HSRC to ensure alignment to national priorities by 31 March 2023		

Table 21: Indicators, annual and quarterly targets for the 2020/21 financial year

Output Performance indicator	Annual target	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Number of knowledge products on innovation for inclusive development published	At least 4 knowledge products on innovation for inclusive development published by 31 March 2021 <i>(cumulative target)</i>	1 At least knowledge product on innovation for inclusive development published	At least 2 knowledge products on innovation for inclusive development published	At least 3 knowledge products on innovation for inclusive development improved	At least 4 knowledge products on innovation for inclusive development published on Department's website by 31 March 2021
Number of decision-support interventions introduced and maintained	At least 10 decision-support systems maintained and improved by 31 March 2021 <i>(cumulative target)</i>	Annual work plan approved for at least 2 decision-support systems	Annual work plan approved for at least 8 decision-support systems	Annual work plan approved for at least 10 decision-support systems	At least 10 decision-support systems maintained and improved between 1 April 2020 and 31 March 2021
Number of learning interventions (seminars/policy round tables) hosted	At least 4 learning (seminars/policy round tables) hosted by 31 March 2021 <i>(cumulative target)</i>	At least 1 learning intervention hosted	At least 2 learning interventions hosted	At least 3 learning interventions hosted	At least 4 learning interventions hosted by 31 March 2021
Number of high-level research students (honours, master's and doctoral students) fully funded or co-funded in designated niche areas (advanced manufacturing, aerospace, chemicals, mining, advanced metals, ICTs, the Industry Innovation Programme (incl. SIFs) and the green economy	At least 313 honours, master's and doctoral students fully funded or co-funded in designated niche areas (advanced manufacturing, aerospace, chemicals, mining, advanced metals, ICTs, the Industry Innovation Programme – incl. SIFs) and the green economy by 31 March 2021 <i>(cumulative target)</i>	At least 86 honours, master's and doctoral students fully funded or co-funded in designated niche areas (advanced manufacturing, aerospace, chemicals, mining, advanced metals, ICTs, Industry Innovation Programme and the Sector Innovation Fund) and green economy	No target	No target	Additional 227 honours, master's and doctoral students funded or co-funded by 31 March 2021 taking the total for the year to 313

Output Performance indicator	Annual target	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Number of knowledge and innovation products added to the industrial development and green economy IP portfolios through fully funded or co-funded research initiatives	An annual total of at least 42 industrially relevant knowledge and innovation products (patents, prototypes, technology demonstrators or technology transfer packages) added to the industrial development and green economy IP portfolio by 31 March 2021 <i>(cumulative target)</i>	At least 3 industrially relevant knowledge or innovation product added to the industrial development IP portfolio	At least 11 industrially relevant knowledge or innovation products added to the industrial development IP portfolio	At least 10 industrially relevant knowledge or innovation products added to the industrial development IP portfolio	An annual total of at least 42 industrially relevant knowledge or innovation products added to the industrial development IP portfolio between 1 April 2020 and 31 March 2021
Number of instruments funded in support of increased localisation, competitiveness and R&D-led industry development in aerospace, advanced manufacturing, chemicals, mining, advanced metals, and ICTs, Industry Innovation Programme and the sector innovation fund	At least 5 instruments funded in support of increased localisation, competitiveness and R&D-led industry development by 31 March 2021 <i>(cumulative target)</i>	Annual workplans or contract approved for at least 5 support instruments	No target	No target	Annual workplans or contract approved for 5 support instruments between 1 April 2020 and 31 March 2021
Number of innovation-support interventions funded or co-funded that strengthen provincial or rural innovation systems	At least 14 innovation-support interventions funded or co-funded that strengthen provincial or rural innovation systems by 31 March 2021 <i>(cumulative target)</i>	No target	Annual workplan approved for at least 10 innovation-support interventions	No target	Annual workplan approved for at least 14 innovation-support interventions between 1 April 2020 and 31 March 2021
Number of statistical reports and policy briefs approved by Exco for publication and/or submitted to Cabinet and/or disseminated to policy audience	At least 6 statistical reports and policy briefs approved by Exco for publication and/or submitted to Cabinet and/or disseminated to policy audience between 1 April 2020 and 31 March 2021 <i>(cumulative target)</i>	No target	No target	At least 1 statistical report approved by Exco for publication and/or submitted to Cabinet and/or disseminated to policy audience	At least 6 statistical reports approved by Exco for publication and/or submitted to Cabinet and/or disseminated to policy audience between 1 April 2020 and 31 March 2021

Output Performance indicator	Annual target	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Turnaround time for providing preapproval decisions on applications for the R&D tax incentive	Preapproval decisions provided within 90 days from date of receipt on 80% of applications for the R&D tax incentive received between 1 January 2020 and 31 December 2020	Preapproval decisions provided within 90 days on 80% of applications received between 1 January 2020 and 31 March 2020	Preapproval decisions provided within 90 days on 80% of applications received between 1 April 2020 and 30 June 2020	Preapproval decisions provided within 90 days on 80% of applications received between 1 July 2020 and 30 September 2020	Preapproval decisions provided within 90 days on 80% of applications received between 1 October 2020 and 31 December 2020
Number of Strategic and Technical engagements with CSIR and HRSC to ensure alignment to national priorities	8 strategic and technical engagements with the CSIR and HRSC to ensure alignment to national priorities by 31 March 2021 <i>(cumulative target)</i>	2 Bilateral engagement reports	2 Bilateral engagement reports	2 Bilateral engagement reports	2 Bilateral engagement reports

Implementing the Presidential Youth Employment Initiative (PYEI)

The PYEI is a new initiative introduced in 2020/21 as an employment stimulus based on the announcement by the President in April 2020 of an allocation of R100 billion for job creation and retention as part of the R500 billion economic stimulus. The youth employment Project Management Office within the Presidency is leading the effort. The Special Adjustment Budget in response to COVID 19 recommitted a R100 billion stimulus in 2020/21. To secure funding from this initiative, the DSI has had to include this indicator as part of its APP (an explicit requirement of the PYEI). An amount of R 67, 811 773, 00 has been tentatively secured from the Presidency.

Outcome	Output	Output Performance indicator	Audited/actual performance			Estimated performance			
			2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Human capabilities and skills for the economy and for development	Presidential Youth Employment Initiative	Number of Presidential Youth Employment Initiative (PYEI) beneficiaries	New Indicator	New Indicator	New Indicator	New Indicator	1 700 Presidential Youth Employment Initiative (PYEI) beneficiaries by 31 March 2021	2 500 Presidential Youth Employment Initiative (PYEI) beneficiaries by 31 March 2022	3 000 Presidential Youth Employment Initiative (PYEI) beneficiaries by 31 March 2023

Performance indicator	Annual target	Quarter 1	Quarter 2	Quarter 3	Quarter 4
		2020/21	2020/21	2020/21	2020/21
Number of Presidential Youth Employment Initiative (PYEI) beneficiaries	1 700 Presidential Youth Employment Initiative (PYEI) beneficiaries by 31 March 2021 <i>(cumulative target)</i>	No target	No target	1 400	300

Table 22: Updated Key risks and mitigations – Socio-economic Innovation Partnerships

Outcome	Key risks	Mitigation action
Human capabilities and skills for the economy and for development	Projects not delivered as planned by implementation entities	Improve the quality of the reports from the implementing agencies
Increased knowledge generation and innovation output	<p>Due to capacity constraints the Programme may be unable to keep up with the evolving area for the development of public policies relating to environmental management</p> <p>The Programme may be unable to fully implement the Water and Waste RDI initiatives</p>	Engage with Human Resources for appropriate staffing solutions
Innovation in support of a capable and developmental state	<p>Projects not delivered as planned by implementation entities</p> <p>Statistics and indicators commissioned may not adequately adapt to changing methodology requirements</p> <p>Production of poor quality (e.g. coverage, accuracy) statistics</p>	<p>Continue engagements with the private sector to leverage funding</p> <p>Improve the quality of the reports from the implementing agencies</p>
Knowledge utilisation for inclusive development	<p>Administrative and adjudication errors in processing R&D tax incentive applications</p> <p>Not achieving the targeted turnaround time in providing a decision to applicant companies</p> <p>Provincial and local government may not provide funding or take ownership of catalytic interventions</p> <p>Lack of inclusivity of catalytic interventions</p>	<p>Assess new statistics and indicator needs based on the results of the South African Foresight Exercise for STI and the White Paper on STI</p> <ul style="list-style-type: none"> • Regularly monitor adherence to timelines by Directorate: Science and Technology Indicators and Directorate: Research and Development Planning • Maintenance of the established benchmarks/standards for assessing the quality of each statistical report <p>Conduct research to understand R&D activities in the financial technology industry versus the current provisions</p> <ul style="list-style-type: none"> • Extend the functionality of the online application system to cover the entire value chain up to approval/non-approval stage • Engage with HR about filling vacancies <p>Continue the Regional Innovation Support Programme to support interventions that enable innovation in a particular location</p> <p>Continue the Regional Innovation Support Programme to support interventions that enable innovation in a particular location</p>

Reconciling performance targets with the budget and MTEF

Table 23: Socio-economic Innovation Partnerships expenditure estimates

R'000 Programme	Expenditure outcome			Adjusted appropriation	Medium-term expenditure estimates		
	2016/17	2017/18	2018/19		2020/21	2021/22	2022/23
*Office of the Deputy Director-General	4 611	4 355	4 498	5 128	2 989	3 641	3 779
Sector Innovation and Green Economy	1 016 814	985 314	1 102 855	1 043 183	987 206	1 122 598	1 164 095
Innovation for Inclusive Development	344 448	356 729	339 953	374 158	360 117	401 278	416 171
Science and Technology Investment	22 158	22 198	29 935	36 534	31 329	43 976	45 634
Technology Localisation and Advanced Manufacturing	380 592	248 404	278 477	327 889	316 388	261 365	271 123
TOTAL	1 768 623	1 617 000	1 755 718	1 786 892	1 698 029	1 832 858	1 900 802
Compensation of employees	40 997	42 858	44 496	48 628	47 279	55 852	57 935
Goods and services	10 344	6 853	7 742	8 715	6918	10 359	10 752
Transfers and subsidies	1 717 282	1 567 284	1 703 472	1 729 549	1 643 832	1 766 647	1 832 115
Payments for capital assets	-	-	-	-	-	-	-
Payments for financial assets	-	5	8	-	-	-	-
TOTAL	1 768 623	1 617 000	1 755 718	1 786 892	1 698 029	1 832 858	1 900 802

**This is as a result of the new approved budget for 2019MTEF and beyond*

The DSI public entities

The Public Finance Management Act (PFMA), 1999 (Act No. 1 of 1999), requires the oversight of public entities reporting to the executive authority. Section 63(2) of the PFMA states that “The executive authority responsible for a public entity under the ownership control of a national or a provincial executive must exercise that executive’s ownership control powers to ensure that the public entity complies with this Act and the financial policies of that executive”.

To fulfil the statutory functions of the Minister, the DSI provides support and advice to the Minister on matters regarding the public entities. The DSI, in consultation with its public entities, has developed the Governance Framework for the Entities Reporting to the Minister of Science and Technology. The framework guides the relationship between the DSI and its entities, and outlines the governance structures, systems and processes put in place to advance matters of national interest.

Table 24: Public entities reporting to the DSI

Name of public entity	Mandate	Outcomes	Current Annual Budget
Academy of Science of South Africa (ASSAF)	<ul style="list-style-type: none"> To promote common ground in scientific thinking across all disciplines, including the physical, mathematical and life sciences, as well as the human, social and economic sciences To encourage and promote innovative and independent scientific thinking. To promote the optimum development of the intellectual capacity of all people To provide effective advice and facilitate appropriate action in relation to the collective needs, opportunities and challenges of all South Africans To link South Africa with scientific communities of the highest levels, within the SADC, the rest of Africa and the rest of the world 	<ul style="list-style-type: none"> Increased knowledge generation and innovation output Innovation in support of a capable and developmental state 	R25 108 000
Council for Scientific and Industrial Research (CSIR)	<ul style="list-style-type: none"> To foster, in the national interest and in the fields which in its opinion should receive preference, industrial and scientific development, either by itself or in cooperation with principals from the public or private sector, and thereby to contribute to the improvement of the quality of life of the people of South Africa, and to perform any other functions that may be assigned to it by or under the Scientific Research Council Act 	<ul style="list-style-type: none"> Knowledge utilisation for economic development (a) in revitalising existing industries and (b) in stimulating R & D led industrial development Increased knowledge generation and innovation output Innovation in support of a capable and developmental state 	R1 215 256 000

Name of public entity	Mandate	Outcomes	Current Annual Budget
Human Sciences Research Council	<ul style="list-style-type: none"> To initiate, undertake and foster strategic basic and applied research in the human sciences, and to gather, analyse and publish data relevant to developmental challenges in South Africa, elsewhere in Africa and in the rest of the world, especially by means of projects linked to public sector oriented collaborative programmes To inform the effective formulation and monitoring of policy and to evaluate the implementation of policy To stimulate public debate through the effective dissemination of fact-based research results To help build research capacity and infrastructure for the human sciences in South Africa and the rest of Africa To foster and support research collaboration, networks and institutional linkages within the human sciences research community To respond to the needs of vulnerable and marginalised groups in society by researching and analysing developmental problems, thereby contributing to the improvement of the quality of their lives To develop and make publicly available new datasets to underpin research, policy development and public discussion of the key issues of development, and to develop new and improved methodologies for use in their development 	<ul style="list-style-type: none"> Innovation in support of a capable and developmental state Increased knowledge generation and innovation output Knowledge utilisation for inclusive development 	R292 090 000
National Advisory Council	<ul style="list-style-type: none"> To advise the Minister for Science and Technology and, through the Minister, Cabinet, on the role and contribution of science, mathematics, innovation and technology, including indigenous technologies, in promoting and achieving national objectives, namely, to improve and sustain the quality of life of all South Africans, develop human resources for science and technology, build the economy, and strengthen the country's competitiveness in the international arena. 	<ul style="list-style-type: none"> A transformed, inclusive, responsive and coherent NSI Innovation in support of a capable and developmental state 	R20 826 000
National Research Foundation (NRF)	<ul style="list-style-type: none"> To support and promote research through funding, human resource development and the provision of the necessary research facilities in order to facilitate the creation of knowledge, innovation and development in all fields of S&T, including indigenous knowledge, and thereby to contribute to the improvement of the quality of lives of all the people of South Africa 	<ul style="list-style-type: none"> A transformed, inclusive, responsive and coherent NSI Increased knowledge generation and innovation output Human capabilities and skills for the economy and for development 	R3 693 522 000

Name of public entity	Mandate	Outcomes	Current Annual Budget
South African Council for Natural and Scientific Professions	<ul style="list-style-type: none"> To administer the registration of professional, candidate and certificated natural scientists, and related matters. 	<ul style="list-style-type: none"> A transformed, inclusive, responsive and coherent NSI Human capabilities and skills for the economy and for development 	R4 000 000
South African National Space Agency (SANSA)	<ul style="list-style-type: none"> To promote the peaceful use of space To support the creation of an environment conducive to industrial development in space technology To foster research in space S&T, communications, navigation and space physics To advance scientific, engineering and technological competence and capabilities through HCD outreach programmes and infrastructure development To foster international cooperation in space-related activities 	<ul style="list-style-type: none"> Increased knowledge generation and innovation output Innovation in support of a capable and developmental state Knowledge utilisation for economic development (a) in revitalising existing industries and (b) in stimulating R & D led industrial development 	R163 878 000
Technology Innovation Agency	<ul style="list-style-type: none"> To support the state in stimulating and intensifying technological innovation in order to improve economic growth and the quality of life of all South Africans by developing and exploring technological innovation 	<ul style="list-style-type: none"> Knowledge utilisation for economic development (a) in revitalising existing industries and (b) in stimulating R & D led industrial development Increased knowledge generation and innovation output Innovation in support of a capable and developmental state 	R410 272 000

Table 25: Infrastructure projects

Project name	Programme	Project description	Outputs	Project start date	Project completion date	Current allocation (R million)
Square Kilometre Array (SKA)	4	Phase 1 of the SKA will include the installation of 2 of 3 science modes (UHF, LSP and S-Band) by 31 March 2020	Installation of 2 (UHF and LSP) of the 3 science modes	2018/19	2021/22	2020/21 allocation = R456 679 2021/22 allocation = R856 807
South African Research Infrastructure Roadmap (SARIR)	4	Initiation of the establishment of 4 large research infrastructure (RI) projects over MTEF period (2020/21 to 2022/23) as part of the implementation of SARIR	The 4 RIs to be initiated: 1. South African Marine and Antarctic Research Facility 2. Nano Manufacturing facility 3. Solar Research Facility 4. Materials Characterisation Facility	2016/17	2023/24	2020/21 allocation = R319 041 (all 4 projects for Phase I, i.e. first 3 years of implementation)
National Integrated Cyberinfrastructure System (NICIS)	4	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.	1. Increase the total available broadband capacity provided by SANReN annually 2. Increase the data storage capability through DIRISA projects 3. Conduct a feasibility study to increase the compute capability to 10 PFlops 4. Graduating master's students in e-Science through the National e-Science Postgraduate Teaching and Training Platform	2017/18	On-going project	2021/22 allocation = R60 000 000



PART D:

Technical

Indicator Descriptions (TIDs)

Programme 1: Administration

Indicator title 1	DSI public entities' annual performance plans and CSIR Shareholder Compact approved by the Minister and Chairpersons of the board
Definition	The DSI entities' (HSRC, NRF, SANSa, ASSAf, TIA and NACI) Strategic Plans (SP) and the Annual Performance Plans (APP) and the CSIR's shareholder compact approved by the Minister and signed by the DSI entities' board chairpersons
Source of data	The DSI entities SPs and APPs signed by the Minister <ul style="list-style-type: none"> Signed final draft Proof of submission to National Treasury and the Department of Planning, Monitoring and Evaluation Minister submission approving the final APP and SP Letter signed by the Minister with a stamp for tabling in Parliament
Method of calculation/ assessment	The indicator is a quantitative indicator and requires no calculation rather the assessment of the source data provided
Means of verification	DSI entities' strategic plans, annual performance plans and signed shareholder compacts
Assumption	Engagements and assessment of draft plan as stated on the Exco approved planning cycle
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	n/a
Calculation type	Non-Cumulative
Reporting cycle	Biannually (Q3 and Q4)
Desired performance	DSI public entities' 2021/22 Annual Performance Plans (NRF; HSRC; TIA; SANSa; NACI; SACNASP; ASSAf) and CSIR shareholder compact signed by the Minister and Chairpersons of the board
Indicator responsibility	Director: Governance
	Chief Director: Policy, Planning, Governance, Monitoring and Evaluation

Indicator title 2	Approved Decadal Plan to implement the 2019 White Paper on STI
Definition	Sets out the plan for implementing the White Paper on STI and indicators for the system to measure contribution and efficiency
Source of data	<ul style="list-style-type: none"> • The approved Decadal Plan on STI signed by the Minister • Signed DG and Minister submission • Stakeholder engagement on the Decadal Plan • Presentation to Portfolio Committee/s • Exco submission approval • Minister submission approval • Approved Cabinet memorandum
Method of calculation/ assessment	The indicator is a qualitative indicator and requires no calculation. The source data provided must be assessed.
Means of verification	Approved Cabinet memorandum
Assumption	Engagement with the broader NSI
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	n/a
Calculation type	Non-Cumulative
Reporting cycle	Annually
Desired performance	Decadal plan finalised and approved by Cabinet
Indicator responsibility	Senior Specialist: Policy
	Chief Director: Policy, Planning, Governance, Monitoring and Evaluation

Indicator title 3	Percentage of approved funded positions filled annually
Definition	The indicator intends to determine the percentage of funded positions filled annually
Source of data	PERSAL system
Method of calculation/ assessment	Total number of filled positions on PERSAL / total number of funded positions on PERSAL x 100
Means of verification	PERSAL reports
Assumption	The Department will maintain a 10% vacancy rate
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	n/a
Calculation type	Non-Cumulative
Reporting cycle	Annually
Desired performance	75% of all approved funded positions filled
Indicator responsibility	Chief Director: Human Resources
	Deputy Director-General: Corporate Services

Indicator title 4	Unqualified audit (clean audit) opinion with no financial matters in the audit report
Definition	It measures efficiency and compliance with regulatory frameworks
Source of data	<ul style="list-style-type: none"> BAS and Logis, and populated Treasury templates for financial statements Audit report from Auditor-General of South Africa
Method of calculation/ assessment	The Auditors opinion is the only way it could be measured for example qualified opinion means that management did not comply with prescripts therefore did not meet the minimum expected standards of financial performance. Unqualified means that the Department performed and an acceptable level. Clean audit meaning the department exceeded the expected standard and the policies are effective.
Means of verification	Trial balance, detailed reports and commitment reports from Logis and financial statements.
Assumption	Compliance with regulatory frameworks, policies and National Treasurer Instruction notes.
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	n/a
Calculation type	Non-Cumulative
Reporting cycle	Annually
Desired performance	<p>High performance: Unqualified audit opinion</p> <p>(A qualified opinion means that management did not comply with prescripts and therefore did not meet the minimum expected standards of financial performance.</p> <p>An unqualified audit opinion means that the Department performed at an acceptable level of financial performance was achieved. Clean audit means that the Department exceeded the expected standard and the policies are effective.)</p>
Indicator responsibility	Chief Financial Officer
	Deputy Director-General: Corporate Services

Indicator title 5	Number of media platforms used to promote DSI and its entities
Definition	To raise the profile of the Department through the publication of articles, conducting broadcasts, media liaison activities, online, internal and external stakeholder engagement, social media initiatives that is based on thematic content.
Source of data	Media coverage in community and mainstream publications, live broadcasts and pre-recorded content on television and radio, online media articles and videos, media statements and media briefings, and social media activities.
Method of calculation/ assessment	Cumulative
Means of verification	<ul style="list-style-type: none"> • Media monitoring reports • Published articles • Broadcasted content • Tweets, infographics and social media videos • Media statements
Assumption	Media plans
Disaggregation of beneficiaries (where applicable)	Target for women: Yes, through community based media and stakeholder engagement
	Target for youth: Yes, through community based media and digital platforms
	Target for people with disabilities: Yes
Spatial transformation (where applicable)	Focus will be on targeting historically disadvantaged and rural communities
Calculation type	Cumulative
Reporting cycle	Quarterly
Desired performance	Six platforms (print, broadcast, online, media liaison, stakeholder engagement and social media) to profile the DSI and its entities
Indicator responsibility	Director: Media
	Chief Director: Science Communication

Indicator title 6	Branding initiatives developed and implemented
Definition	Roll-out of approved Branding initiatives on a project-to-project basis.
Source of data	<ul style="list-style-type: none"> Approved project specifications prepared / advertised e.g. corporate video with new brand messaging, billboard advertising etc. List of projects developed / implemented / installed.
Method of calculation/ assessment	All approved projects developed and implemented in identified provinces.
Means of verification	Reports on Branding initiatives rolled-out.
Assumption	Available (billboard) advertising space, new marketing platforms available.
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	n/a
Calculation type	Cumulative
Reporting cycle	Bi-annual (Q2 and Q4)
Desired performance	High performance: Two National thematic campaign reports on the roll-out of branding initiatives
Indicator responsibility	Director: Communications, Science Communication
	Chief Director: Science Communication

Programme 2: Technology Innovation

Indicator title 1	Number of decision-support tools developed or maintained in all spheres of government
Definition	<p>Decision-support tools help people think about choices they face; they describe where and why choice exists; they provide information about options, including, where reasonable, the option of taking no action. These interventions aim to help people to deliberate, independently or in collaboration with others, about options by considering relevant attributes to help them forecast how they might feel about short, intermediate and long-term outcomes which have relevant consequences. They support the process of constructing preferences and eventual decision making, appropriate to their individual situation.</p> <p>A decision-support tool will be considered “developed” once it has been approved by one or more designated members of the DSI Exco.</p> <p>A decision-support tool will be considered maintained once funding has been transferred to a relevant institution/department, the tool has been transferred to a relevant institution/department, or support has been provided through promotional activities, e.g. workshops that would be used as a marketing and adoption tool.</p>
Source of data	<p>Hydrogen and Energy; Bioinnovation; Innovation Priorities and Instruments; and NIPMO</p> <ul style="list-style-type: none"> • Signed contract • Signed annual report/draft annual report/signed summary reports from implementing agency indicating number and an appendix with the name of decision-support intervention supported or maintained <p>OR</p> <ul style="list-style-type: none"> • Website which shows the developed and/or maintained interventions • Approved submission and payment stub <p>Space Science and Technology</p> <ul style="list-style-type: none"> • Website link to an interactive portal <p>OR</p> <ul style="list-style-type: none"> • Workshop report or report of stakeholder engagements approved by a designated member of Exco. • Proof of transfer to relevant department or institutions
Method of calculation/ assessment	<p>$A = B + C$</p> <p>Where A = total number of decision-support tools developed and/or maintained</p> <p>B = decision-support interventions developed and/or maintained</p> <p>C = decision-support interventions developed and/or maintained.</p>
Means of verification	<p>The relevant Programme officials will check the input received against the source data and check whether the target can be claimed. Hard or soft copy data will be used and the evidence will be saved on Alfresco.</p>

Indicator title 1	Number of decision-support tools developed or maintained in all spheres of government
Assumption	<p>In some cases, there may be a delay in obtaining the relevant data given dependence on other internal or external stakeholders. This will also affect the quality of the data obtained.</p> <p>"Approved" will include "noted" as there will be circumstances in which approval is not required.</p> <p>Given the needs/requirements of government, a number of interventions other than those specified may fall within the definition of decision-support interventions and may be included in totals for the financial year. It should be noted that the baseline will fluctuate from year to year because of the uncertainty associated with the requirements of government and the DSI's ability to respond.</p>
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities:
Spatial transformation (where applicable)	n/a
Calculation type	Cumulative: The sum of all decision-support tools developed and/or maintained
Reporting cycle	Annually
Desired performance	Higher performance desired - 3 decision-support tools developed
Indicator responsibility	Deputy Director-General: Technology Innovation

Indicator title 2	Number of strategic and technical engagements with SANSA and TIA to ensure alignment to national priorities.
Definition	This is an oversight function of the DSI (DDG: TI and Chief Director: Space S&T) to ensure that SANSA and TIA adhere to the government framework in their APPs and SPs, and to ensure that the APPs and SPs are aligned to the DSI's APP and SP. The SANSA and TIA APPs and SPs should respond to the DSI (Decadal Plan, White Paper) and broader government priorities (NDP, MTSF).
Source of data	<ul style="list-style-type: none"> • The TIA and SANSA APPs and SPs have transformation, poverty alleviation and inequality targets in support of the Department's outcomes <li style="padding-left: 20px;">OR • Reports that resulted from strategic engagements <li style="padding-left: 20px;">OR • Minutes of meetings
Method of calculation/ assessment	Number of meetings convened per year, number of SMMEs supported, BBBEE, women and youth benefiting
Means of verification	Annual/quarterly reports
Assumption	That these engagements with the entities take place as planned, and the inputs are taken into consideration when the draft APP and SP are completed. That SANSA and TIA APPs and SP are approved by the Minister.
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where application)	Focus on rural areas, townships and informal settlements
Calculation type	Cumulative: Total number of meetings convened between the DSI and SANSA, and between the DSI and TIA
Reporting cycle	Quarterly
Desired performance	Higher performance desirable - 8 strategic and technical engagements with SANSA and TIA to alignment to national priorities
Indicator responsibility	Deputy Director-General: Technology Innovation

Indicator title 3	Provision of space weather information for the aviation industry in South Africa and the African continent
Definition	SANSA has been appointed the regional space weather centre for the African region by the International Civil Aviation Organization. The centre will be upgraded to ensure that it provides 24/7 space weather services for the African continent.
Source of data	Applicable contract/agreement, approved submissions, quarterly reports
Method of calculation/ assessment	Number of quarterly reports with clear milestones and deliverables as per the contract
Means of verification	Quarterly and annual reports of the upgraded infrastructure and facility; and derived and usage of products and services by the aviation sector.
Assumption	That the SANSA Regional Space Weather Centre is upgraded, fully operational, and capable of providing 24/7 space weather information for the aviation sector in the country and continent
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	n/a
Calculation type	Non-Cumulative: Total number of quarterly reports with milestones and deliverables as per the contract
Reporting cycle	Quarterly (Q2, Q3, Q4)
Desired performance	SANSA Regional Space Weather Centre upgrades initiated
Indicator responsibility	Chief Director: Space Science and Technology
	Deputy Director-General: Technology Innovation

Indicator title 4	Number of maritime domain awareness (MDA) missions completed in support of the Oceans Economy Phakisa
Definition	As part of the National Space Programme satellite build programme, the DSI has committed to contribute to the Oceans Economy Phakisa through the development of 9 satellite missions for maritime domain awareness. The satellites will provide information for decision support, ocean governance and marine protection, and marine spatial planning.
Source of data	Applicable contract, agreement, approved submissions, quarterly reports
Method of calculation/ assessment	Number of quarterly reports with milestones and deliverables
Means of verification	The DSI will verify the deliverable and milestones through site visits to the lab to view the progress in the manufacturing of various components and subsystems.
Assumption	That the satellites are successfully developed and operational as per the technical specifications
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	n/a
Calculation type	Non-Cumulative: Total number of quarterly reports with clear deliverables and milestones as per the contract
Reporting cycle	Bi-annually (Q1, Q4)
Desired performance	High performance on the number of satellites launched into the outer space in the correct orbit and operational providing quality maritime domain awareness data and information for decision support and marine spatial planning
Indicator responsibility	Chief Director: Space Science and Technology
	Deputy Director-General: Technology Innovation

Indicator title 5	Number of postgraduate students (master's and doctoral) funded in designated energy, space, Innovation Priorities and Instruments and bioeconomy areas
Definition	This indicator refers to master's and doctorates supported as a result of the Department funding initiatives in the designated areas. Designated areas include space science, energy, bio-innovation, emerging research areas, IP management, and technology transfer and technology commercialisation
Source of data	<p>Only master's and doctoral students supported within the 2020 calendar year will be used for the final calculation.</p> <p>Bio-Innovation; Hydrogen and Energy; Innovation Priorities and Instruments; Innovation Priorities and Instruments; Space Science and Technology</p> <ul style="list-style-type: none"> • Signed contracts • Approved submission and proof of payment • Signed reports which indicates total number of postgraduate (master's and doctoral) students supported <p>OR</p> <ul style="list-style-type: none"> • Proof of enrolment (proof of registration on an official letterhead, stamped and signed) for postgraduate students from institutions.
Method of calculation/ assessment	If 100 postgraduate students are supported during the year, then the total supported at the end of Quarter 4 is 100.
Means of verification	The relevant Programme officials will check the input received against the source data and check that the target can be claimed. Hard or soft copy data will be used and the evidence will be saved on Alfresco.
Assumption	Postgraduate students are produced by the universities. The Programme provides funding support, infrastructure and resource support through universities, science councils and its agencies, as appropriate. Given this scenario and the resulting dependence on other internal or external stakeholders, there may be delays in obtaining the relevant data. This will also affect the quality of data obtained. There may also be variances from the planned target as students may complete their research over a shorter or longer period.
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	N/A
Calculation type	Non-Cumulative: Sum of all master's and PhD students supported during 2020
Reporting cycle	Annually
Desired performance	Higher performance desired - 200 of postgraduate students (master's and doctoral) supported in designated energy, space, Innovation Priorities and Instruments and bioeconomy areas
Indicator responsibility	Deputy Director-General: Technology Innovation

Indicator title 6	Number of artisans/technicians trained in the energy and agriculture sectors of the economy
Definition	This indicator seeks to measure and track the number of artisans/technicians trained in the energy and agriculture sectors of the economy. A key aspect is that training is not limited to research but that technology services in the sector are supported.
Source of data	<ul style="list-style-type: none"> • Approved submission where appropriate • Funding agreement/contracts where appropriate • Training supported where appropriate – linked to projects • Signed reports/signed summary reports from implementing agency, and letter from the employing institutions confirming absorption
Method of calculation/assessment	Total number receiving employment contracts by the end of the financial year.
Means of verification	The relevant Programme officials will check the input received against the source data and check whether the target can be claimed. Hard or soft copy data will be used and the evidence will be saved on Alfresco.
Assumption	In some cases, there may be a delay in obtaining the relevant data given dependencies on other internal or external stakeholders. This also affects the quality of data obtained. Caveat: Depending on the timing of training period for absorption into the energy and agriculture sector of the economy. Absorbed means employed (temporary or permanent) at a lab/company/university/etc. may differ.
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: Yes
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	n/a
Calculation type	Non-Cumulative: Sum of all of the technicians/artisans absorbed during all quarters of the financial year.
Reporting cycle	Annually in Quarter 4
Desired performance	Higher performance desired - 20 artisans and/or technicians trained in the energy and agriculture sectors of the economy
Indicator responsibility	Deputy Director-General: Technology Innovation

Indicator title 7	Number of trainees upskilled in intellectual property management and technology transfer
Definition	This indicator refers to the number of individuals trained in the area of intellectual property management and technology transfer through workshops and World Intellectual Property Organization (WIPO) distance learning courses and the Nanotechnology Summer School.
Source of data	Attendance registers (applicable only for workshops) OR Attendance certificates OR Letter of registrants to WIPO (applies only to distance learning courses)
Method of calculation/ assessment	Total number of registrants at the end of the financial year (applies only to the WIPO distance learning courses) Total number of participants at the end of the financial year (applies only to workshops/ summer school)
Means of verification	The relevant officials will check the input received and verify that the target can be claimed.
Assumption	The individuals who have registered the WIPO distance learning courses will complete the course (Nanotechnology Summer School held once every 2 years). All participants will attend throughout the workshop.
Disaggregation of beneficiaries (where applicable)	Target for women: Yes
	Target for youth: Yes
	Target for people with disabilities: Yes
Spatial transformation (where applicable)	n/a
Calculation type	Cumulative
Reporting cycle	Bi-annually
Desired performance	Higher performance desired - 225 trainees upskilled in intellectual property management and technology transfer skills
Indicator responsibility	Deputy Director-General: Technology Innovation

Indicator title 8	Number of disclosures, received from publicly financed research and development institutions as reported to NIPMO
Definition	This indicator refers to the number of disclosures (or IP7 forms) received by NIPMO from publicly financed research and development institutions.
Source of data	Disclosures submitted to NIPMO on the knowledge and information management (KIM) system
Method of calculation/ assessment	<ul style="list-style-type: none"> • Acknowledgement letters confirming the number of disclosures received • Database of IP7 forms received, approved by the Head of NIPMO
Means of verification	The disclosure will be reported in the first and third quarter, NIPMO will review the submitted information and reports received and make its own report in the second and fourth quarter
Assumption	There is an assumption that publicly financed research and development institutions will enter into licence agreements (which may be dependant of various factors)
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	n/a
Calculation type	Cumulative: Total number of disclosures from publicly financed research and development institutions
Reporting cycle	Quarter 1 and Quarter 3
Desired performance	Higher performance desired - 225 disclosures received from publicly financed research and development institutions as reported to NIPMO
Indicator responsibility	Head of NIPMO
	Deputy Director-General: Technology Innovation

Indicator title 9	Number of intellectual property rights filed based on RDI conducted in designated areas
Definition	Filings/applications of IPRs**** in energy, emerging research areas, and the bioeconomy. (****IPRs are inclusive of the following categories of IPRs: patents and trademarks, copyright, designs, plant breeders' rights and geographical indications).
Source of data	<p>Only IPR applications/filings during the period 1 April 2020 to 31 March 2021 either in South Africa or in other countries will be counted.</p> <ul style="list-style-type: none"> • Signed project funding agreements, memoranda of agreement, or contracts • Signed annual reports/draft annual reports/signed summary reports from implementing agency with number and list of IPRs applications/filings; • Proof of application/filing of IPRs • Approved submission and payment stub where applicable
Method of calculation/ assessment	Total number of IPRs filed at the end of the financial year = the sum of the IPRs applications/filings produced during each quarter of the financial year
Means of verification	The relevant Programme officials will check the input received against the source data and check whether the target can be claimed. Hard or soft copy data will be used and the evidence will be saved on Alfresco.
Assumption	In most cases there are delays in obtaining the final data given dependencies on other internal or external stakeholders. This also affects the quality of data obtained/reported. Moreover, given that the results of research and development are difficult to predict, variations from the planned outputs can be expected.
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where application)	n/a
Calculation type	Non-Cumulative: Sum of all IPRs filed during 2020
Reporting cycle	Bi-annually (Q2, Q3 and Q4)
Desired performance	Higher performance desired - 4 intellectual property rights filed based on RDI conducted in designated areas
Indicator responsibility	Deputy Director-General: Technology Innovation

Indicator title 10	Number of technology demonstrations, prototypes, products and services developed.
Definition	This indicator refers to prototypes, pilots, demonstrators, technology transfer packages, software, and pre-commercial products, processes or services developed in the following designated areas: space science, energy, bio-innovation, emerging research areas, IP management, technology transfer and technology commercialisation.
Source of data	<ul style="list-style-type: none"> Signed contracts Signed reports or signed summary report from implementing agency as appropriate with number and names of knowledge application products funded during the period Approved submission and payment stub
Method of calculation/ assessment	Total number of technology demonstrations, prototypes, products and services developed at the end of the financial year = the sum of the technology demonstrations, prototypes, products and services developed during each quarter of the financial year
Means of verification	The relevant Programme officials will check the input received against the source data and check whether the target can be claimed. Hard or soft copy data will be used and the evidence will be saved on Alfresco.
Assumption	In some cases, there may be a delay in obtaining the relevant data given dependencies on other internal or external stakeholders. This also affects the quality of data obtained. Caveat: Depending on the design and implementation of initiatives, consultation with stakeholders, resource limitations/reprioritisation and other factors affecting this performance the development of technology demonstrations, prototypes, products and services may be postponed or terminated or replaced or merged with another relevant technology demonstrations, prototypes, products and services developed other than those specified may be included in the totals for the financial year.
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	n/a
Calculation type	Cumulative: Sum of all of the knowledge application products developed during all quarters of the financial year.
Reporting cycle	Annually
Desired performance	Higher performance desirable - 10 technology demonstrations, prototypes, products and services developed in designated energy, space, and bioeconomy areas
Indicator responsibility	Chief Director: Hydrogen and Energy
	Deputy Director-General: Technology Innovation

Indicator title 11	Number of stationary fuel cell systems/clean energy technologies deployed in partnership with local and district municipalities in rural and informal settlements
Definition	This indicator refers to prototypes, pilots, demonstrators, technology transfer packages, software, and pre-commercial products, processes or services deployed in rural and informal settlements in South African in partnership with local/district municipalities.
Source of data	<ul style="list-style-type: none"> Signed reports or signed summary report from implementing agency as appropriate with number and names of knowledge application products funded during the period;
Method of calculation/ assessment	Total number of technology demonstrations, prototypes, products and services developed at the end of the financial year = the sum of the technology demonstrations, prototypes, products and services developed during each financial year
Means of verification	The relevant Programme officials will check the input received against the source data and check whether the target can be claimed. Hard or soft copy data will be used and the evidence will be saved on Alfresco.
Assumption	In some cases, there may be a delay in obtaining the relevant data given dependencies on other internal or external stakeholders. This also affects the quality of data obtained. Caveat: Depending on the design and implementation of initiatives, consultation with stakeholders, resources limitations/reprioritisation and other factors impacting on this performance indicator, the development of technology demonstrations, prototypes, products and services may be postponed or terminated or replaced or merged with another relevant technology demonstrations, prototypes, products and services developed other than those specified may be included in the totals for the financial year.
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where application)	The focus will be on dealing with energy access challenges in rural communities as well as informal settlements in urban and peri-urban areas.
Calculation type	Non-Cumulative: Sum of the stationary fuel cell systems/clean energy technologies deployed during all quarters of the financial year.
Reporting cycle	Annually in Q4
Desired performance	Higher performance desirable - 2 stationary fuel cell systems/clean energy technologies deployed in partnership with local and district municipalities in rural and informal settlements
Indicator responsibility	Chief Director: Hydrogen and Energy
	Deputy Director-General: Technology Innovation

Indicator title 12	Number of small, medium and micro-enterprises (SMMEs) contracted and/or assisted for business development and commercialisation
Definition	The indicator refers to research, development and innovation projects that supports and assist SMMEs with value-addition, product development, technology transfer, incubation, branding and marketing. This includes preclinical and clinical studies, business development initiatives, brand development, exhibitions/expositions and commercialisation events. Included will be actual sales of products and commercial licences and agreements signed and manufacturing contracts offered to SMMEs
Source of data	Signed reports, signed contracts and Alfresco. Reports may include signed preliminary documents, drafts quarterly and annual reports. Websites which show the information related to the interventions where appropriate. Approved submissions and payment stubs.
Method of calculation/ assessment	Total number of organisations supported financially, for product development (innovations), technology transfer, business development and commercialisation
Means of verification	Programme managers will monitor inputs against the source of data and check whether the target can be claimed. Hard or soft copies of reports and related evidence will be saved on Alfresco
Assumption	Delay may be experienced from entities depending on their internal approval processes for reports to be sent to the DSI. This work involves multiple stakeholders and value-chain processes where one organisation may be delayed by another. Innovation and business development in IKS involves the community, and the time this takes is often unpredictable. As a result, there may be variations in planned outputs.
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	This work involves rural development where pre-processing facilities and plant propagation for agri-businesses are supported. Land is often acquired from royal authorities and local municipalities.
Calculation type	Non-Cumulative: Sum total of SMMEs supported through Earth observation and IK-Based Technology Innovation initiatives during the 2020 financial year
Reporting cycle	Bi-annually
Desired performance	Higher performance desirable - 10 SMMEs contracted and/or assisted with business development and commercialisation
Indicator responsibility	Director: IK-Based Technology Innovation Director: Earth Observations Deputy Director-General: Technology Innovation

Indicator title 13	Number of commercial outputs in designated areas
Definition	This indicator seeks to measure and track the number of outputs commercialised as a result of support provided in designated areas, e.g. licences, assignments, options of various natures (e.g. directed research and joint ventures); start-ups, spin outs, new companies, etc. created; distribution, manufacturing, sales agreements and the like for products, processes and services. The commercialisation of products, processes and services may involve other departments, entities and market players and therefore may fall outside the Department's control.
Source of data	<ul style="list-style-type: none"> • Approved submission where appropriate • Funding agreement/contracts where appropriate • Signed reports/signed summary reports from implementing agency, or letters indicating number and names of commercial outputs that arose as a result of support, or other evidence, such as an invoice or licence agreement or royalty payment to show that the product is available on the market • Photographs of the relevant outputs where appropriate
Method of calculation/assessment	Total number of commercial outputs at the end of the financial year = the sum of all the commercialised outputs during each quarter of the financial year
Means of verification	The relevant Programme officials will check the input received against the source data and check whether the target can be claimed. Hard or soft copy data will be used and the evidence will be saved on Alfresco.
Assumption	In some cases, there may be a delay in obtaining the relevant data given dependencies on other internal or external stakeholders. This also affects the quality of data obtained. Caveat: Depending on the design and implementation of initiatives, consultation with stakeholders, resources limitations/reprioritisation and other factors impacting on this performance indicator the development of technology demonstrations, prototypes, products and services may be postponed or terminated or replaced or merged with another relevant technology demonstrations, prototypes, products and services developed other than those specified may be included in the totals for the financial year.
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	n/a
Calculation type	Cumulative: Sum of all of the commercial outputs funded during all quarters of the financial year
Reporting cycle	Annually
Desired performance	Higher performance desirable - 4 commercial outputs in designated areas
Indicator responsibility	Chief Director: Hydrogen and Energy Chief Director: Bio Innovation Deputy Director-General: Technology Innovation

Indicator title 14	Number of black emerging farmers (subsistence, small-scale and potential commercial farmers) benefiting from technology/innovation support programmes
Definition	This indicator seeks to measure emerging farmers (subsistence, small-scale and potential commercial) benefiting from technology/innovation support programmes. The benefits will include one or more of the following: Assistance with production inputs; Gaining knowledge and obtaining results through demonstration trials; Receiving training; Participation in targeted awareness sessions; Mentoring and technical support; and Innovation support
Source of data	<ul style="list-style-type: none"> • Approved submission where appropriate • Funding agreement/contracts where appropriate • Signed reports/signed summary reports from implementing agency confirming type of technology/innovation support and beneficiaries
Method of calculation/assessment	Total number of farmers (subsistence, small-scale emerging and potential commercial) at the end of the financial year. Types of benefit include farmer development support programmes, access to technology/innovation or training or participation in technology/innovation demonstration linked to projects supported.
Means of verification	The relevant Programme officials will check the input received against the source data and check whether the target can be claimed. Hard or soft copy data will be used and the evidence will be saved on Alfresco.
Assumption	In some cases, there may be a delay in obtaining the relevant data given dependencies on other internal or external stakeholders. This also affects the quality of data obtained.
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial Transformation (where application)	Emerging black farmers
Calculation type	Non-Cumulative: Sum of all of emerging farmers benefiting from technology/innovation support programmes during all quarters of the financial year.
Reporting cycle	Annually
Desired performance	Higher performance desirable - 200 of black emerging farmers benefiting from technology/innovation support programmes
Indicator responsibility	Chief Director: Bio Innovation
	Deputy Director-General: Technology Innovation

Programme 3: International Cooperation and Resources

Indicator title 1	Number of international resource-leveraging engagements undertaken by the Department
Definition	This indicator refers to the number of engagements held with international partners to leverage resources for the benefit of NSI.
Source of data	<p>An official written communication (email/ letter) from the international partner or investor.</p> <p>Confirming the resource leveraging engagement</p> <p>OR</p> <p>Agreements/contracts</p> <p>OR</p> <p>Memo by CD: International Resources supported by Overseas Bilateral Cooperation and Multilateral Cooperation and Africa</p>
Method of calculation/ assessment	Number of engagement with foreign partners to leverage resources
Means of verification	<p>Email from international partner; or contract</p> <p>OR</p> <p>Memo by CD</p>
Assumption	The target will be achieved regardless of specifically planned annual STI initiatives correctly.
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	n/a
Calculation type	Cumulative
Reporting cycle	Quarterly
Desired performance	Higher performance desirable - 43 dedicated international resource-leveraging engagements undertaken
Indicator responsibility	Deputy Director-General: International Cooperation and Resources

Indicator title 2	Number of South African students participating in international training programmes
Definition	This indicator refers to the amount of South African students accepted into international training programmes as part of cooperation initiatives facilitated by the DSI
Source of data	<p>Official documentation from the implementing organisation of the international training programme indicating the formal acceptance of the South African student into the programme (name, ID of student or student number where possible), document with a list of international training programmes and the number of SA students participated in such programmes</p> <p>OR</p> <p>Memo by the CDs: International Resources, Multilateral Cooperation and Africa, and Overseas Bilateral Cooperation</p>
Method of calculation/ assessment	The sum of all South African students accepted into international programmes, as part of cooperation initiatives facilitated by the DSI
Means of verification	<p>Official letter from the implementing organisation</p> <p>OR</p> <p>International partner email from the implementing organisation of the international training programme indicating the formal acceptance of the South African student into the programme.</p> <p>OR</p> <p>Memo by the CD</p>
Assumption	The target will be achieved using the planned annual STI initiatives correctly.
Disaggregation of beneficiaries (where applicable)	Target for women: 55%
	Target for youth: 60%
	Target for people with disabilities:
Spatial transformation (where applicable)	n/a
Calculation type	Cumulative
Reporting cycle	Quarterly
Desired performance	Higher performance desirable - 326 new South African students participating in international training programmes as part of cooperation initiatives facilitated by DSI
Indicator responsibility	Deputy Director-General: International Cooperation and Resources

Indicator title 3	Number of capacity-building initiatives for international cooperation specifically targeting historically disadvantaged institutions and individuals
Definition	This indicator refers to capacity-building initiatives aimed at increasing opportunities for historically disadvantaged institutions and individuals
Source of data	<p>Official communication from the National Research Foundation on calls published where HDIs participated</p> <p>Official communication from DSI targeting historically disadvantaged institutions on theme-specific engagements, e.g. workshop minutes</p> <p>OR</p> <p>Memo by CD: International Resources, CD: Multilateral Cooperation and Africa and CD: Overseas Bilateral Cooperation</p>
Method of calculation/ assessment	Number of capacity-building initiatives for HDIs
Means of verification	<p>Calls/theme-specific workshops</p> <p>OR</p> <p>Memo by CD</p>
Assumption	The target will be achieved using the planned annual STI initiatives correctly.
Disaggregation of beneficiaries (where applicable)	Target for women: Yes, but numbers cannot not be confirm nor verified
	Target for youth: Yes through BRICS Young Scientist Forum Initiatives and other capacity-building initiatives
	Target for people with disabilities: Yes, but numbers cannot not be confirm nor verified
Spatial transformation (where applicable)	Focus will be meanly on historically disadvantaged institutions (HDIs) and previously disadvantaged individuals (PDIs).
Calculation type	Cumulative
Reporting cycle	Quarterly
Desired performance	Higher performance desirable - 32 capacity-building initiatives for international cooperation specifically targeting historically disadvantaged institutions and individuals
Indicator responsibility	Deputy Director-General: International Cooperation and Resources

Indicator title 4	Number of international policy dialogues and technical exchanges to support the policy intents of the White Paper on STI
Definition	Dedicated international technical exchanges such as workshops, seminars or training programmes, undertaken to build or reinforce South Africa's capabilities in key STI domains with the support of international partners facilitated by the DSI
Source of data	The official recording per officially signed documentation (reports on or minutes of workshops/seminars OR Memo by the CD: International Resources; CD: Multilateral Cooperation and Africa and CD: Overseas Bilateral Cooperation with the relevant information attached confirming the relevance of the data
Method of calculation/ assessment	The sum of the individual technical exchanges, e.g. the organisation of a technical workshop facilitated by the DSI during the financial year
Means of verification	Confirmation of the successful organisation of the technical exchange with the international partner OR Memo by CD
Assumption	The target will be achieved using the planned annual STI initiatives correctly.
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	n/a
Calculation type	Cumulative
Reporting cycle	Quarterly
Desired performance	Higher performance desirable - 34 international policy dialogues and technical exchanges the policy intents of the White Paper on STI
Indicator responsibility	Deputy Director-General: International Cooperation and Resources

Indicator title 5	Number of STI initiatives supported targeting objectives of the Agenda 2063
Definition	This indicator refers to the amount of STI initiatives targeting objectives of Agenda 2063
Source of data	An official written communication (email or letter) from the international partner confirming the DSI's participation OR Agreements/contracts OR Memo by CD: International Resources, CD: Multilateral Cooperation and Africa and CD: Overseas Bilateral Cooperation
Method of calculation/ assessment	Confirmation of successful initiatives/ activities with the international partner
Means of verification	Agreements/contract/minutes of meetings OR Memo by CD
Assumption	The target will be achieved by using the planned annual STI initiatives correctly.
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where application)	n/a
Calculation type	Cumulative
Reporting cycle	Quarterly
Desired performance	Higher performance desirable - 15 new STI initiatives supporting Agenda 2063
Indicator responsibility	Deputy Director-General: International Cooperation and Resources

Indicator title 6	Number of STI initiatives supported targeting objectives of the SADC Regional Indicative Strategic Development Plan (RSIDP)
Definition	This indicator refers to the number of initiatives supported by DSI targeting objectives of the SADC RISDP by 31 March 2021
Source of data	An official written communication (email/letter) from the international partner confirming DSI's participation OR Agreements/contracts OR Memo by CD: International Resources, CD: Multilateral Cooperation and Africa and CD: Overseas Bilateral Cooperation
Method of calculation/ assessment	Sum of activities committed by DSI in support of initiatives supporting the SADC RISDP
Means of verification	Minutes of meetings/ technical exchanges or workshops OR Contracts OR Memo by CD
Assumption	The target will be achieved using the planned annual STI initiatives correctly.
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	n/a
Calculation type	Cumulative
Reporting cycle	Quarterly
Desired performance	Higher performance desirable - 17 new STI initiatives supported targeting the objectives of the SADC RISDP
Indicator responsibility	Deputy Director-General: International Cooperation and Resources

Indicator title 7	Number of STI Plans of action implemented with bilateral African partners
Definition	This indicator refers to the plans of action implemented with African partners
Source of data	An official written and signed communication between DSI and African partners on the implementation of agreements/ contracts OR Memo by CD: Multilateral Cooperation and Africa
Method of calculation/ assessment	Confirmation of the successful implementation plans undertaken by South Africa and African partners led by DSI
Means of verification	Minutes of workshops, seminars and technical exchanges OR Memo by Chief Director: Multilateral Cooperation and Africa
Assumption	The target will be achieved using the planned annual STI initiatives correctly.
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	n/a
Calculation type	Cumulative
Reporting cycle	Quarterly
Desired performance	Higher performance desirable - 6 STI plans of action implemented with bilateral African partners
Indicator responsibility	Deputy Director-General: International Cooperation and Resources

Indicator title 8	Number of engagements with global science leaders to advance national priorities in multilateral forums
Definition	Interactions with individuals in global science leadership positions to leverage their influence to benefit the NSI
Source of data	Official correspondence or email from international partner indicating interaction with global science leaders to benefit the NSI OR Memo by CD: International Resources, CD: Multilateral Cooperation and Africa and CD: Overseas Bilateral Cooperation
Method of calculation/ assessment	The total number of topic specific interactions with global science leaders to benefit the NSI
Means of verification	Responses received from global science leaders OR Memo by CD
Assumption	The global leaders will act on the interactions to benefit the NSI
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	n/a
Calculation type	Cumulative
Reporting cycle	Quarterly
Desired performance	Actual performance is high - 12 engagements with global science leaders to advance national priorities in multilateral forums
Indicator responsibility	Deputy Director-General: International Cooperation and Resources

Indicator title 9	Number of International STI initiatives focused on SDGs supported by South Africa
Definition	All international STI initiatives addressing SDGs in which South Africa actively participate
Source of data	<p>Official correspondence (Minutes of meetings, e-mails from international partners agreements, funding and in-kind support) that confirm South Africa's STI participation in international SDG initiatives</p> <p>OR</p> <p>Memo by CD: International Resources, CD: Multilateral Cooperation and Africa and CD: Overseas Bilateral Cooperation</p>
Method of calculation/ assessment	The number of STI initiatives addressing SDGs in which South Africa participates
Means of verification	<p>Memo by CD</p> <p>OR</p> <p>Approved Minister submission</p> <p>OR</p> <p>DG submission</p> <p>OR</p> <p>DDG submission</p>
Assumption	The official decisions will translate in the active involvement of South African scientists and innovators
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	n/a
Calculation type	Cumulative
Reporting cycle	Quarterly
Desired performance	Actual performance is high - 8 New international STI initiatives focused on SDGs supported by South Africa
Indicator responsibility	Deputy Director-General: International Cooperation and Resources

Programme 4: Research Development and Support

Indicator title 1	Number of PhD students awarded bursaries annually as reflected in the reports from the NRF and other relevant entities
Definition	Total number of PhD bursaries awarded annually as reflected in the reports from NRF and other relevant entities. PhD students receiving bursary support from the NRF, CSIR, SANSA and ARC
Source data	<ul style="list-style-type: none"> Contracts entered into with the NRF and other relevant entities (CSIR, SANSA and ARC) Database of award letters (with letterhead, stamped and signature by the Registrar) from the institution or entity in Q4 Database of PhD students with ID numbers, student numbers, course details, etc. BAS forms on funds transferred relating to the bursaries. Progress reports on individual programmes or letter confirming the reported quarterly outputs Payment stubs on funds transferred relating to the bursaries
Method of calculation/ assessment	Total number of PhD bursaries awarded annually through NRF, CSIR, SANSA and ARC-funded programmes.
Means of verification	Contracts, reports, performance information letter
Assumption	The NRF quarterly reports that do not contain the final quarterly data on students due to the late finalisation and auditing of data from their side, thus resulting in the DSI first reporting on preliminary data contained in an email from the NRF. The preliminary data is then updated when the agency sends a formal performance information letter to the DSI. These are bursaries awarded from Programme 4 funds through the NRF and other relevant entities, including the CSIR, SANSA and the Agricultural Research Council.
Disaggregation of beneficiaries (where applicable)	Target for black people: 80%
	Target for women: 55%
	Target for youth: The nature of the KPI is such that most of the students will fall into youth category
	Target for people with disabilities: 2%
Spatial transformation (where applicable)	PhD students in all public universities
Calculation type	Cumulative: Numerical
Reporting cycle	Quarterly (Q1, Q2, Q3, Q4)
Desired performance	Higher performance desirable - No fewer than 2 400 PhD students awarded an annual bursary as reflected in the reports from the NRF and other relevant entities
Indicator responsibility	Director: Research Development
	Deputy Director-General: Research Development and Support

Indicator title 2	Number of pipeline postgraduate students awarded bursaries annually as reflected in the reports from the NRF and other relevant entities
Definition	Total number of bursaries awarded to pipeline postgraduate students (BTech/honours and master's) annually as reflected in the reports from the NRF and other relevant entities. Postgraduates research students receiving bursary support from the NRF and other relevant entities
Source data	<p>Contracts entered into with the NRF and other relevant entities (CSIR, SANSA, ARC)</p> <p>Payment stubs on funds transferred relating to the bursaries</p> <p>Progress reports on individual programmes or letter confirming the reported quarterly outputs</p> <p>Database of award letters (with letterhead, stamped and signature by the Registrar) from the institution or entity in Q4</p> <p>Database of postgraduate students with ID numbers, student numbers, course details, etc.</p>
Method of calculation/ assessment	Number of bursaries awarded through NRF and other relevant entities'-funded programmes (BTech/honours and master's degrees)
Means of verification	Contracts, reports, performance information letter
Assumption	<p>The NRF quarterly reports that do not contain final quarterly data on students due to the late finalisation and auditing of data at the NRF, thus resulting in the DSI first reporting on preliminary data contained in an email from the NRF. The preliminary data is then updated when the agency sends a formal performance information letter to the Department.</p> <p>The bursaries are awarded from Programme 4 funds through the NRF and other relevant entities, including the CSIR, SANSA and the Agricultural Research Council</p>
Disaggregation of beneficiaries (where applicable)	Target for black people: 80%
	Target for women: 55%
	Target for youth: The nature of the KPI is such that most of the students will fall into youth category
	Target for people with disabilities: 2%
Spatial transformation (where applicable)	Pipeline students in all public universities
Calculation type	Cumulative: Numerical
Reporting cycle	Annually
Desired performance	Higher performance desirable - No fewer than 8 000 pipeline students awarded an annual bursary as reflected in the reports from the NRF and other relevant entities
Indicator responsibility	Director: Research Development
	Deputy Director-General: Research Development and Support

Indicator title 3	Number of graduates and students placed in DSI-funded work preparation programmes in SETI institutions
Definition	Total number of graduates and students placed in DSI-funded work preparation programmes (through internship programme and the National Youth Service) in science, engineering, technology and innovation (SETI) institutions
Source data	<ul style="list-style-type: none"> • Consolidated HCD contract entered into with the NRF on the funding of interns • BAS forms on funds transferred relating to the workplace preparation programmes • NRF progress reports on workplace preparation programmes or letter confirming the reported quarterly outputs • DSI-NRF internship database (interns register in all quarters) • DSI-National Youth Service database of students in all quarters
Method of calculation/ assessment	Total number of graduates and students placed through DSI-NRF Internship Programme and National Youth Service
Means of verification	Contracts, reports, and performance information letter
Assumption	Data focuses on students and graduates that have been placed in the programme in a given year. The success rate of employment can be determined after the internship year. The database for the total number of graduates and interns to be available at the end of the financial year.
Disaggregation of beneficiaries (where applicable)	Target for black people: 80%
	Target for women: 55%
	Target for youth: The nature of the KPI is such that most of the students will fall into youth category
	Target for people with disabilities: 2%
Spatial transformation (where applicable)	Unemployed graduates across nine provinces (including rural communities and townships)
Calculation type	Cumulative: Numerical
Reporting cycle	2020/21
Desired performance	Higher performance desirable - No fewer than 750 graduates and students placed in DSI-funded work preparation
Indicator responsibility	Director: Research Support
	Deputy Director-General: Research Development and Support

Indicator title 4	Number of research infrastructure grants awarded
Definition	The provision of research infrastructure across the entire innovation value chain
Source data	<ul style="list-style-type: none"> Contracts with implementing agency (NRF) and other DSI entities such as the CSIR Annual report from implementing agency (NRF) and other DSI entities such as the CSIR Payment stub of funds transferred to implementing agencies
Means of verification	Reports, contracts
Method of calculation/ assessment	Adding the total number of grants funded annually through internal DSI and external NRF processes. These research infrastructure grants will include single and multiple-year funding.
Assumption	Research infrastructure is an enabler for research, education, innovation and training
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	Countrywide (The NSI, government departments, academia)
Calculation type	Non-Cumulative: Numerical
Reporting cycle	Quarterly
Desired performance	Higher performance desirable - 20 research infrastructure grants awarded
Indicator responsibility	Chief Director: Basic Sciences and Infrastructure
	Deputy Director-General: Research Development and Support

Indicator title 5	Total available broadband capacity provided by SANReN per annum
Definition	Total available broadband capacity provided by SANReN per annum through upgrades, new sites added to the network
Source data	Signed letter indicating the TABC calculation for the financial year A spreadsheet capturing the details of the calculation Internal audited annual report from the CSIR (NICIS annual report)
Method of calculation/ assessment	Adding the total bandwidth available through all links constituting the network
Means of verification	Annual report, contracts
Assumption	The SANReN bandwidth is crucial for transmission of research data, facilitating research collaboration and enabling online teaching and providing access to online teaching and training material
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	Countrywide: (The NSI, government departments, all public research-performing institutions , Skills development in academic institutions)
Calculation type	Non-Cumulative: Available broadband capacity
Reporting cycle	Quarterly
Desired performance	Higher performance desirable - 5 000 total available bandwidth capacity provided by SANReN
Indicator responsibility	Chief Director: Basic Sciences and Infrastructure
	Deputy Director-General: Research Development and Support

Indicator title 6	Number of researchers awarded research grants through NRF-managed programmes as reflected in the NRF project reports
Definition	<p>Total number of researchers awarded research grants through NRF-managed programmes as reflected in the NRF project reports</p> <p>Researchers awarded research grants to conduct research and supervise postgraduate students (e.g. including research chairs, rated researchers, centre of excellence researchers)</p>
Source data	<p>Contracts entered into with the NRF in respect of programmes aimed at the funding of researchers</p> <p>BAS forms on funds transferred relating to funding of researchers</p> <p>NRF progress report on researchers awarded research grants (with a list of participating programmes) or letter confirming the reported quarterly outputs</p> <p>Database of researchers (with names, ID, institution number etc.) in all quarters</p>
Method of calculation/ assessment	Sum of researchers that are awarded research
Means of verification	Contract; Quarterly Reports; and Performance information letter
Assumption	The NRF quarterly reports that do not contain final quarterly data on researchers due to late finalisation and auditing of data at the NRF, thus resulting in the Department first reporting on preliminary data contained in an email from the NRF. The preliminary data is then updated when the agency sends a formal performance information letter to the DSI.
Disaggregation of beneficiaries (where applicable)	Target for black people: 42%
	Target for women: 41%
	Target for people with disabilities: 2%
Spatial transformation (where applicable)	Researchers in all public universities, and declared research institutions
Calculation type	Cumulative: Numerical
Reporting cycle	Annually
Desired performance	Higher performance desirable - No fewer than 3 000 researchers awarded research grants through NRF-managed programmes as reflected in the NRF project reports
Indicator responsibility	Director: Research Support
	Deputy Director-General: Research Development and Support

Indicator title 7	Number of research articles published by NRF-funded researchers and cited in the Web of Science Citation Database as reflected in the NRF project reports
Definition	<p>Number of accredited research articles published by NRF-funded researchers and cited in the Web of Science Citation Database as reflected in the NRF project reports</p> <p>The articles reported on are those published within the financial year (1 April to 31 March) and each article reported on is distinct.</p>
Source data	<p>Consolidated HCD contracts entered into with the NRF on funding of researchers</p> <p>BAS forms on funds transferred relating to the funds in the consolidated contract.</p> <p>Database or list of peer-reviewed accredited research papers published</p> <p>The articles reported on are those published within the financial year (1 April to 31 March) and each article reported on is distinct</p>
Method of calculation/ assessment	Approximately 1,6 research output units per NRF funded researcher
Means of verification	Report, contract
Assumption	The collection of data is done by the implementing agency and the comprehensive information is only available after the close of the financial year (4th quarter). The articles reported on are those published within the calendar year and each article reported on is distinct.
Disaggregation of beneficiaries (where applicable)	Not applicable
Spatial transformation (where applicable)	Researchers in all public universities, and declared research institutions
Calculation type	Non-Cumulative: Numerical
Reporting cycle	Annually
Desired performance	Higher performance desirable - No fewer than 6 000 research articles published by NRF-funded researchers and cited in the Web of Science Citation Database as reflected in the NRF project reports
Indicator responsibility	<p>Director: Research Support</p> <p>Deputy Director-General: Research Development and Support</p>

Indicator title 8	Number of additional receivers installed on the MeerKAT telescope to enhance the performance of the MeerKAT telescope
Definition	S-Band and L-Band receivers installed on MeerKAT antennas
Source data	Quarterly and annual reports from SARAO
Means of verification	Reports
Method of calculation/ assessment	Number of receivers installed and milestones towards installation of receivers
Assumption	All science mode receivers installed
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	n/a
Calculation type	Non-Cumulative: Numerical
Reporting cycle	Quarterly
Desired performance	Higher performance desirable - 64 S-Band receivers installed on MeerKAT antennas
Indicator responsibility	Director: Multiwavelength Astronomy and Director AMA
	Deputy Director-General: Research Development and Support

Indicator title 9	Number of additional MeerKAT telescope antennae
Definition	Approved system design review of the MeerKAT extension
Source data	Quarterly and annual reports from the South African Radio Astronomy Observatory (SARAO)
Method of calculation/ assessment	Milestones achieved towards the approved system design review
Means of verification	Signed letters from SARAO Director and Review Committee
Assumption	The system design is reviewed and approved
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	n/a
Calculation type	Non-Cumulative
Desired performance	Higher performance desirable - System design review of the MeerKAT extension approved
Indicator responsibility	Director: Multiwavelength Astronomy Deputy Director-General: Research Development and Support

Indicator title 10	Number of components of the IK legal architecture implemented
Definition	The Regulations will guide the implementation of the Protection, Promotion, Development and Management of Indigenous Knowledge Act, 2019 (Act No. 6 of 2019).
Source data	Quarterly reports on the milestones.
Method of calculation/ assessment	Approval of the Regulations at various levels of delegated authority
Means of verification	Approved submission
Assumption	Without the Regulations, the IK Act cannot be implemented
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	Countrywide
Calculation type	Non-Cumulative
Reporting cycle	Quarterly (Q1, Q2, Q3, Q4)
Desired performance	Higher performance desirable - Approved Regulations for the implementation of the IK Act
Indicator responsibility	Chief Director: Science Missions
	Deputy Director-General: Research Development and Support

Indicator title 11	First South African public relationship with science survey report published and launched
Definition	Science engagement programme impact study to determine the difference the programme is making towards its ultimate strategic intention
Source data	Research report
Method of calculation/ assessment	Representative sample
Means of verification	Quarter reports, contracts
Assumption	A scientific research methodology to be followed as a primary data source and existing project records to serve as secondary data source
Disaggregation of beneficiaries (where applicable)	Demographics and/or living standards measures may be used, depending on impact measure category
Spatial transformation (where applicable)	n/a
Calculation type	Non-Cumulative: Social science research methodology
Reporting cycle	Biannually
Desired performance	Higher performance desirable - Sample and technical report frameworks for the first South African relationship with science survey approved by Exco
Indicator responsibility	Director: Science Promotion Deputy Director-General: Research Development and Support

Indicator title 12	Number of strategic and technical engagements with NRF, SACNASP and ASSAf to ensure alignment to national priorities
Definition	Budget Programme oversees functions of NRF, SACNASP and ASSAf
Source of data	Entity technical reports or Bilateral engagement minutes
Method of calculation/ assessment	Total of number of quarterly engagement reports
Means of verification	DG submission
Assumption	Tactical and strategic engagements with entities are conducted.
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	n/a
Calculation type	Cumulative
Reporting cycle	Quarterly (Q1, Q2, Q3, Q4)
Desired performance	Higher performance desirable - 12 strategic and technical engagements with NRF, SACNASP and ASSAf to ensure alignment to national priorities
Indicator responsibility	Director: Research Development
	Deputy Director-General: Research Development and Support

Programme 5: Socio-economic Innovation and Partnerships

Indicator title 1	Number of knowledge products on innovation for inclusive development published.
<p>Definition</p>	<p>Count the number of knowledge products, including, but not limited to, briefing notes, policy briefs, case studies, technical briefs, research reports, evaluation reports and books (or part/s thereof).</p> <p>Various knowledge products may be required to provide the knowledge and evidence required by decision-makers in order to adopt a new technology-based approach.</p> <p>A policy brief is a document that outlines the rationale for selecting a particular policy alternative and aims to convince the target audience that an existing problem can be addressed by adopting an alternative policy or course of action.</p> <p>A case study is a detailed description and exploration of a particular project, with a specific focus on challenges, lessons, and success factors, and is usually targeted to people involved in implementation.</p> <p>A technical brief refers to a range of knowledge products providing project performance data that deals with specifications or which deals with a specific technical challenge that can impact on the adoption of a particular technology.</p> <p>A research report refers to a document that presents research undertaken to address a particular issue of concern. It includes evaluation studies (can be an evaluation report) that contain a rigorous analysis of completed or ongoing activities that determine or support management accountability, effectiveness and efficiency.</p> <p>An evaluation report is the key product of the evaluation process. Its purpose is to provide a transparent basis for accountability for results, decision-making on policies and programmes, for learning, for drawing lessons and for improvement.</p> <p>A research paper refers to a substantial piece of academic writing in which the author does independent research into a topic and writes a description of the findings of that research, which may or may not be presented at a conference or published in a journal.</p> <p>A book is a printed or digital publication based on in-depth research in a particular subject matter or knowledge area.</p> <p>Provision is made for other knowledge products not yet defined should a need for a new form of knowledge product emerge that cannot be classified under a current category.</p> <p>A single project or initiative can support the production of several of the knowledge products described above. Knowledge products can also be complemented by a decision-support intervention. A knowledge product has to meet the needs of a particular user-community and therefore decision-support interventions provide significant interaction to determine what would be of value and how such value can be realised.</p>

Indicator title 1	Number of knowledge products on innovation for inclusive development published.
Source of data	Register 1: IID knowledge products The following documentation is required for a valid registration of a knowledge product <ul style="list-style-type: none"> • Copy of the knowledge product to be published • Submission to Chief Director: Innovation for Inclusive Development requesting formal approval for publication and distribution In case of a knowledge product from an implementing agency, optional additional documentation will include a letter from the implementation agency to the DSI confirming that the knowledge product was a result of funding support from the DSI.
Method of calculation/ assessment	A = the total number of knowledge products registered B = briefing notes C = policy briefs D = case studies E = technical briefs F = research reports G = evaluation reports H = research paper I = Book J = Other
Means of verification	Information gathered and generated quarterly on knowledge products to be registered
Assumption	The sum of knowledge products has been registered
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	n/a
Calculation type	Cumulative
Reporting cycle	Quarterly (Q1, Q2, Q3, Q4)
Desired performance	Higher performance desirable - At least 4 knowledge products on innovation for inclusive development published
Indicator responsibility	Chief Director: Innovation for Inclusive Development
	Deputy Director-General: Socio-economic Innovation Partnerships

Indicator title 2	Number of decision-support interventions introduced, maintained and improved.
Definition	Decision-support interventions help people think about choices they face; they describe where and why choice exists; they provide information about options, including, where reasonable, the option of taking no action. These interventions aim to help people to deliberate, independently or in collaboration with others, about options by considering relevant attributes to help them forecast how they might feel about short, intermediate and long-term outcomes, which have relevant consequences. They support the process of constructing preferences and eventual evidence-informed decision making, appropriate to their individual situation.
Source of data	Register 2: IID Decision-Support Systems Registration or re-registration will happen annually. The following documentation is required for a valid registration: <ul style="list-style-type: none"> • Annual workplan • Internal DSI submission providing formal approval for the workplan
Method of calculation/ assessment	$A = B + C + D$ <p>A = total number of decision-support interventions registered</p> <p>B = decision-support interventions introduced</p> <p>C = decision-support interventions maintained</p> <p>D = decision-support intervention improved</p>
Means of verification	<ul style="list-style-type: none"> • Total number of decision support systems as per action category, that is, either introduced, maintained, or improved. • Pre-defined Excel Spreadsheet pivot-table
Assumption	Information gathered and generated quarterly on decision support systems are re-registered.
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	In districts and metros where DSI has an STI footprint
Calculation type	Non-Cumulative
Reporting cycle	Biannually
Desired performance	Higher performance desirable - At least 10 decision-support systems maintained and improved
Indicator responsibility	Chief Director: Innovation for Inclusive Development
	Deputy Director-General: Socio-economic Innovation Partnerships

Indicator title 3	Number of learning interventions (seminars, policy round table discussions) hosted.
Definition	<p>In this context a learning intervention refers to an event conceptualised and/or resourced by the Department. The learning intervention can be organised and run by an implementing agency contracted by the DSI or by the DSI itself. The Department can also partner with other organisations in organising the event or in presenting evidence-based position at an event.</p> <p>The event is structured in terms of a number of formats (e.g. seminars, lectures, learning interventions, workshops or policy dialogues).</p> <p>Notwithstanding the specific format used, the intention is to bring together a select group of knowledgeable researchers, policy analysts, experts and/or practitioners to advance collective understanding of a specific theme aligned to the strategic objective. Each learning intervention is unique with respect to the format used and the group of participants.</p>
Source of data	<p>Register 3: Innovation for inclusive development learning interventions</p> <p>The following documentation will be required for a valid registration:</p> <ul style="list-style-type: none"> Signed learning intervention report for each learning intervention compiled by the organiser (implementing agency or DSI) Internal departmental approval of the learning intervention report
Method of calculation/ assessment	$A = B + C + D + E + F + G$ <p>A = total number of learning interventions registered</p> <p>B = seminars</p> <p>C = lectures</p> <p>D = learning forums</p> <p>E = Policy dialogues</p> <p>F = Workshops</p> <p>G = Other</p>
Means of verification	Learning interventions registered during the applicable reporting period.
Assumption	Total number of learning interventions by type, that is, workshop, seminar policy round table discussion, etc.
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	In districts and metros where DSI has an STI footprint
Calculation type	Cumulative
Reporting cycle	Quarterly (Q1, Q2, Q3, Q4)
Desired performance	Higher performance desirable - At least 4 learning (seminars/policy round tables) hosted
Indicator responsibility	Chief Director: Innovation for Inclusive Development
	Deputy Director-General: Socio-economic Innovation Partnerships

Indicator title 4	Number of high-level research students (honours, master's and doctoral students) fully funded or co-funded in designated niche areas (advanced manufacturing, aerospace, chemicals, mining, advanced metals, ICTs, SIFs, and green economy)
Definition	<p>High-level human capital refers to students who are enrolled at universities or universities of technology for an honours, master's or doctoral qualification.</p> <p>Co-funded is where the Department pays only a portion of the student's fees.</p> <p>The niche areas identified to support industrial development include the advanced manufacturing, aerospace, chemicals, mining, advanced metals, ICTs, selected Sector Innovation Funds, the green economy, and selected CSIR Industry Development Centres</p>
Source of data	<p>Register 6: Industrial development student beneficiaries</p> <p>and</p> <p>Register 4: Green economy student beneficiaries</p> <p>Registration of student beneficiaries will take place in quarter 1 and quarter 4. For a valid registration, the following documentation will be used:</p> <ul style="list-style-type: none"> • Annual registration letter from the university where the student is registered • A letter from the implementation agent confirming the students that are being funded through a sign contract with the DSI. The letter will include a schedule providing additional core profile information of the students (name, ID number, race, gender) <p>The register will include additional profile information that is required for management and analytical purposes. The proof of registration should contain the letterhead and stamp of the tertiary education institution. The proof of registration will be accepted as valid for a specific calendar year, which implies that it covers two DSI financial years. As an example, DSI can count the student as being funded in Q4, and also in Q1 to Q3 (of the next financial year) with the same proof or evidence.</p>
Method of calculation/ assessment	<p>The sum of students on the beneficiary register disaggregated by individual contract</p> <p>For Register 4, students are calculated as follows:</p> $A = B + C + D$ <p>A = the total number of students funded or co-funded</p> <p>B = honours, master's and doctoral students (funded water initiatives)</p> <p>C = honours, master's and doctoral students (funded waste initiatives)</p> <p>D = honours, master's and doctoral students (Paper Manufacturers Association of South Africa (PAMSA) and Sugar Milling Research Institute (SMRI) sector innovation funds (SIFs)</p>
Means of verification	Schedule from implementing agent
Assumption	The contract between the DSI and the implementing agency will include the sum of students on the disaggregated beneficiary register on individual contract.
Disaggregation of beneficiaries (where applicable)	Target for women: Yes
	Target for youth: The nature of the KPI is such that most of the students will fall into youth category
	Target for people with disabilities: Yes
Spatial transformation (where applicable)	All nine provinces are targeted.

Indicator title 4	Number of high-level research students (honours, master's and doctoral students) fully funded or co-funded in designated niche areas (advanced manufacturing, aerospace, chemicals, mining, advanced metals, ICTs, SIFs, and green economy)
Calculation type	<p>Cumulative</p> $A = B + C + D + E + F + G$ <p>Where</p> <p>A = The total number of students funded or co-funded</p> <p>B = honours, master's and doctoral students (funded water initiatives)</p> <p>C = honours, master's and doctoral students (funded waste initiatives)</p> <p>D = honours, master's and doctoral students (funded Ecological Infrastructure initiatives)</p> <p>E = honours, master's and doctoral students (PAMSA and SMRI SIFs)</p> <p>F = honours, master's and doctoral students (Biorefinery Industry Development Centre)</p> <p>G = honours, master's and doctoral students (other)</p>
Reporting cycle	Biannually (Quarter 1 and 4)
Desired performance	Higher performance desirable - At least 313 honours, master's and doctoral students fully funded or co-funded in designated niche areas (advanced manufacturing, aerospace, chemicals, mining, advanced metals, ICTs, the Industry Innovation Programme – incl. SIFs) and the green economy
Indicator responsibility	<p>Chief Director: Technology Localisation, Beneficiation and Advanced Manufacturing</p> <p>Chief Director: Sector Innovation and Green Economy</p> <p>Deputy Director-General: Socio-economic Innovation Partnership</p>

Indicator title 5	Number of knowledge and innovation products added to the industrial development and green economy IP portfolios through fully funded or co-funded research initiatives
Definition	<p>Number: the number of knowledge or innovation products.</p> <p>Knowledge or innovation product: the output (discrete intermediate steps or final) of knowledge or innovation (process, market, product or improved service delivery) that is quantifiable (e.g. invention disclosure, patent, prototype, technology (transfer) package, technology demonstrator, etc.). It should be noted that different technologies/processes have slightly different phases or designated conventions/names.</p> <p>Intellectual property (IP) portfolio: The collection of IP products funded/co-funded by the Department. The IP products may be related or unrelated to the progress of maturing one specific technology.</p> <p>Funded: Reflects where DSI is funding or co-funding a specific research/technology initiative. An initiative does not need to be 100% DSI-funded to be eligible to be counted.</p>
Source of data	<p>Register 8: Register of industrial development knowledge and innovation products</p> <p>Register 5: Register of green economy knowledge and innovation products</p> <p>The following documentation will be required for a valid registration</p> <ul style="list-style-type: none"> • A signed declaration from an implementation agency of a potential qualifying knowledge or innovation product. The declaration will provide essential information, including type of product, registration number (if applicable) and appropriate supporting information • A signed confirmation by a registrar (currently Chief Director: Technology Localisation, Beneficiation and Advanced Manufacturing for Register 8 and D: Environmental Services and Technologies for Register 5) that the knowledge or innovation product met the required qualifying criteria and can be registered

Indicator title 5	Number of knowledge and innovation products added to the industrial development and green economy IP portfolios through fully funded or co-funded research initiatives
Method of calculation/ assessment	<p>Total number of registrations during the applicable reporting period disaggregated by funded initiative</p> <p>For Register 5:</p> $A = B + C + D + E$ <p>A = total number of registrations of knowledge and innovation products</p> <p>B = Registrations (funded water initiatives)</p> <p>C = Registrations (funded waste initiatives)</p> <p>D = Registrations (SMRI and PAMSA SIFs)</p> <p>E = Registrations (Biorefinery Industry Development Facility)</p> <p>For Register 8:</p> <p>The Industry Innovation Partnership (IIP) fund formally includes the Sector Innovation Fund (SIF) and other funds, and instruments funded under the IIP can be counted.</p> <p>The SIF also includes funding via the various areas of the Industry Innovation Programme (IIP) and they can therefore also be counted.</p> <p>Number: refers to the number of instruments (e.g. programmes) and not the individual beneficiaries.</p> <p>The following instruments currently qualify to be counted:</p> <ol style="list-style-type: none"> 1. Technology Stations Programme, incorporating the Institutes of Advanced Tooling, consisting of 18 entities, but counts as one funding instrument 2. Centres of competence (titanium and any other) count as one 3. Incubators (there is one for ICT) 4. Technology Development Grant scheme 5. Sector-wide technology assistance packages 6. Firm-level technology assistance packages 7. Science, Engineering and Technology Industry Internship Programme 8. Collaborative R&D networks (e.g. the Collaborative Carbon Fibre RDI Programme) where the R&D agenda is almost exclusively defined by industry. This also includes the Sector Innovation Funds, where the R&D agenda is defined by the respective industry association/body, representing the R&D needs of the respective sector. 9. R&D networks led by science councils and/or universities, where the R&D agenda is determined primarily from the R&D stakeholders. This includes R&D programmes aimed at unlocking new opportunities based on local knowledge and/or IP. <p>Instrument: a defined support mechanism, as described above.</p> <p>The indicator (funding instrument) will be formally referred to in a contract and be described by supporting, internal DSI document defining the objective, procedures, scope and evaluation parameters.</p>
Means of verification	Excel spreadsheet.
Assumption	The IP declaration from implementation agency meet the criteria of the TIDs

Indicator title 5	Number of knowledge and innovation products added to the industrial development and green economy IP portfolios through fully funded or co-funded research initiatives
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	n/a
Calculation type	Cumulative
Reporting cycle	Quarterly (Q1, Q2, Q3, Q4)
Desired performance	Higher performance desirable - At least 42 industrially relevant knowledge and innovation products (patents, prototypes, technology demonstrators or technology transfer packages) added to the industrial development and green economy IP portfolio
Indicator responsibility	Chief Director: Technology Localisation, Beneficiation and Advanced Manufacturing Chief Director: Sector Innovation and Green Economy Deputy Director-General: Socio-economic Innovation Partnership

Indicator title 6	Number of instruments funded in support of increased localisation, competitiveness and R&D-led industry development in aerospace, advanced manufacturing, chemicals, mining, advanced metals, and ICTs, Industry Innovation Programme and the sector innovation fund
Definition	<p>Number: The number of instruments (e.g. programmes) and not the individual beneficiaries.</p> <p>Instrument: A formally established (by contract) entity (also virtual) that is used in support of R&D-led industry development.</p> <p>R&D-led industry development: This includes R&D performed in the defined areas of aerospace; advanced manufacturing; mining; minerals beneficiation; chemical related industries, ICTs and sector innovation funds.</p> <p>Funded: Reflects where DSI is funding, or co-funding a specific instrument. An instrument does not need to be 100% funded to be legible to be considered as an instrument funded by DSI.</p>
Source of data	<p>Register 9: Innovation support instruments</p> <p>Registration or re-registration will happen annually. The following documentation is required for a valid registration</p> <ul style="list-style-type: none"> • Annual workplan • Internal DSI submission or signed contract.
Method of calculation/ assessment	The sum of support instruments registered or re-registered
Means of verification	Summary information captured and archived on PIMS
Assumption	The information provided on the contracts or workplan meet the TID requirements
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	n/a
Calculation type	Cumulative
Reporting cycle	Biannually (Q1 and Q4)
Desired performance	Higher performance desirable - At least 5 instruments funded in support of increased localisation, competitiveness and R&D-led industry development
Indicator responsibility	Chief Director: Technology Localisation, Beneficiation and Advanced Manufacturing
	Deputy Director-General: Socio-economic Innovation Partnership

Indicator title 7	Number of innovation-support interventions funded or co-funded that strengthen provincial or rural innovation systems.
Definition	<p>An intervention includes analytical, planning and coordination support as well as catalytic activities that enhance provincial or local innovation.</p> <p>Provincial and rural and production system = the system of innovation at provincial, regional, local levels, including those linked to rural and the informal economic activities.</p> <p>Analytical, planning and coordination support – means any form of study or strategy development that can assist provincial and local governments with their planning, decision making and implementation of innovation programmes. Also includes funding for innovations forums and capacity building.</p> <p>Catalytic interventions are DSI supported initiatives or projects that help stimulate the growth of existing innovation initiatives, or enable the development of innovation enabling ecosystems.</p>
Source of data	<p>Register 14: Provincial and rural innovation interventions</p> <p>The following documentation is required for a valid registration or re-registration of a provincial or rural innovation-support intervention funded by the DSI:</p> <ul style="list-style-type: none"> • Annual workplan (a workplan can make provision for more than one innovation-support intervention) • Submission requesting formal approval of the workplan and registration of qualifying interventions <p>An optional document for a registration is a signed contract with an implementation agent. A single contract may enable more than one registration.</p> <p>Registrations will be re-validated after the end of the performance year to remove interventions which may not have been implemented. Revalidation will be based on an annual progress report.</p>
Method of calculation/ assessment	<p>$A = B + C$</p> <p>A = total number of innovation-support interventions funded or co-funded</p> <p>B = interventions supported under the Directorate: Sector and Local Innovation</p> <p>C = interventions under the Directorate: Sustainable Livelihoods</p>
Means of verification	<p>Pre-defined Excel spreadsheet pivot-table</p>
Assumption	<p>The information gathered and generated quarterly on innovation-support interventions is registered</p>
Disaggregation of beneficiaries (where applicable)	<p>Target for women: n/a</p>
	<p>Target for youth: n/a</p>
	<p>Target for people with disabilities: n/a</p>
Spatial transformation (where applicable)	<p>The DSI has spatial footprint in most 44 Districts and 8 Metropolitan Municipalities and intend to expand in line with the District Development Model and 2020/21 Presidential nodes.</p>
Calculation type	<p>Cumulative</p>
Reporting cycle	<p>Biannually (Q2, and Q4)</p>

Indicator title 7	Number of innovation-support interventions funded or co-funded that strengthen provincial or rural innovation systems.
Desired performance	Higher performance desirable - At least 14 innovation-support interventions funded or co-funded that strengthen provincial or rural innovation systems
Indicator responsibility	Chief Director: Innovation for Inclusive Development Chief Director: Sector Innovation and Green Economy Deputy Director-General: Socio-economic Innovation Partnerships

Indicator title 8	Number of statistical reports and policy briefs approved by Exco for submission to Cabinet, dissemination to policy audience or for publication
Definition	<p>Count the number of statistical reports and policy briefs produced.</p> <p>A policy briefing refers to a communication tool produced by policy analysts, in the form of either a Cabinet memorandum or evidence-based report or strategy which serves as an impetus for action for the policy audience such as Cabinet, Parliament and Portfolio Committee, the Minister of Science and Technology, provincial government, or another Minister of government department. The briefing or report may also be used to support broader advocacy initiatives targeting a wide but knowledgeable audience, e.g. the Economic Sectors, Investment, Employment and Infrastructure Development Cluster, decision-makers, researchers, and administrators.</p>
Source of data	Register 11: Register on statistical reports and policy briefs
Method of calculation/ assessment	Total number of reports and policy briefs during the reporting period by the end of a financial year or reporting period.
Means of verification	<p>The following documentation will enable a valid registration:</p> <ul style="list-style-type: none"> • Copy of the statistical report or policy brief that is approved by Exco for publishing and/ or submission to Cabinet and or relevant decision-making authority • Extract of the minutes from the Exco meeting approving publication and/ or submission to Cabinet or relevant decision-making authority
Assumption	Statistical reports or policy briefs are registered during the applicable reporting period.
Disaggregation of beneficiaries (where applicable)	Target for women: None
	Target for youth: None
	Target for people with disabilities: None
Spatial transformation (where applicable)	None
Calculation type	Cumulative-Numeric count
Reporting cycle	Quarterly (Q1, Q2, Q3, Q4)
Desired performance	Higher performance desirable - At least 6 statistical reports and policy briefs approved by Exco for publication and/or submitted to Cabinet and/or disseminated to policy audience
Indicator responsibility	Chief Director: Science and Technology Investments
	Deputy Director-General: Socio-economic Innovation Partnership

Indicator title 9	Turnaround time in providing preapproval decisions on applications for the R&D tax incentive
Definition	<p>Turnaround time refers to the number of days from date of receipt of application to the date of providing preapproval decisions on applications for the R&D tax incentive.</p> <p>An efficiency objective, measured at aggregated (total applications for period x) level, is to reduce the average number of days of turnaround compared to previous periods.</p>
Source of data	<p>Register 12: R&D applications management database</p> <p>Important note – section 11D (17) provides for the confidentiality of applicants. Access to the R&D applications management database will need to be limited and guided by a signed oath of secrecy</p>
Method of calculation/ assessment	<p>% of applications that receive a decision within 90 days (in the reporting period). Number of number of days exclude weekends, holidays and the days when DSI awaits additional information from applying companies.</p>
Means of verification	<p>R&D tax incentives applications management</p>
Assumption	<p>The accurate information will be gathered and generated when applications are received and/or finalised.</p>
Disaggregation of beneficiaries (where applicable)	<p>Target for women: n/a</p>
	<p>Target for youth: n/a</p>
	<p>Target for people with disabilities: n/a</p>
Spatial transformation (where applicable)	<p>n/a</p>
Calculation type	<p>Non-Cumulative</p>
Reporting cycle	<p>Quarterly (Q1, Q2, Q3, Q4)</p>
Desired performance	<p>Higher performance desirable - Preapproval decisions provided within 90 days from date of receipt on 80% of applications for the R&D tax incentive received between 1 January 2020 and 31 December 2020</p>
Indicator responsibility	<p>Chief Director: Science and Technology Investment</p>
	<p>Deputy Director-General: Socio-economic Innovation Partnerships</p>

Indicator title 10	Number of Strategic and Technical engagements with CSIR and HRSC to ensure alignment to national priorities
Definition	Budget Programme oversight of CSIR and HSRC
Source of data	Entity technical reports
Method of calculation/ assessment	Total sum of bilateral quarterly reports
Means of verification	DG submission
Assumption	Tactical and strategic engagements with entities are conducted
Disaggregation of beneficiaries (where applicable)	Target for women: n/a
	Target for youth: n/a
	Target for people with disabilities: n/a
Spatial transformation (where applicable)	n/a
Calculation type	Cumulative
Reporting cycle	Quarterly (Q1, Q2, Q3, Q4)
Desired performance	Higher performance desirable - 8 strategic and technical engagements with the CSIR and HSRC to ensure alignment to national priorities
Indicator responsibility	Chief Director: Technology Localisation, Beneficiation and Advanced Manufacturing
	Chief Director: Innovation for Inclusive Development
	Deputy Director-General: Socio-economic Innovation Partnerships

Indicator title 11	Number of Presidential Youth Employment Initiative (PYEI) beneficiaries
Definition	Number of beneficiaries funded through ringfenced employment stimulus funding
Source of data	<ul style="list-style-type: none"> Registers compiled by implementing agencies as per guidelines provided by the DSI A letter from the implementation agent confirming the employment opportunities are being funded through a sign contract with the DSI. Signed Contract between DSI and Implementing agency/ies.
Method of calculation/ assessment	Simple sum of the number of beneficiaries from each of the four initiative supported by the DSI
Means of verification	Review of registers provided by implementing agencies and random checking on the veracity of information provided, should this be required
Assumption	Implementing agencies will implement as per the proposals that they submitted
Disaggregation of beneficiaries (where applicable)	Target Women: yes
	Target Youth: The nature of the KPI is such that most of the employed or placed will fall into youth category
	Target for people with Disabilities: N/A
Spatial transformation (where applicable)	Proposed interventions has a focus on marginalised areas (rural areas and high density urban areas)
Calculation type	Cumulative
Reporting cycle	Bi-annually (Q3, Q4)
Desired performance	High performance as per the proposal submitted.
Indicator responsibility	Deputy Director-General: Socio-economic Innovation Partnerships

List of abbreviations

ABIPP	Agricultural Bioeconomy Innovation Partnership Programme
APP	Annual Performance Plan
AU	African Union
AVN	African Very Long Baseline Interferometry Network
BBBEE	Broad-Based Black Economic Empowerment
CeSTII	Centre for STI Indicators
CSIR	Council for Scientific and Industrial Research
DAFF	Department of Agriculture, Forestry and Fisheries
DBE	Department of Basic Education
DDM	District Development Model
DHET	Department of Higher Education and Training
DSI	Department of Science and Innovation
ECSP	Economic Competitiveness Support Package
Exco	Executive Committee of the DSI
EO	Earth Observation
FCoS	Full Cost of Support
Gbps	gigabits per second
GEO	Group on Earth Observations
GMO	Genetically Modified Organisms
HESTIIL	Higher Education, Science Technology and Innovation Institutional Landscape
HCD	Human Capital Development
HDI	Historically Disadvantage Institutions
HySA	Hydrogen South Africa
ICT	Information and Communication Technology
IKS	Indigenous Knowledge Systems
IP	Intellectual Property
IPAP	Industrial Policy Action Plan
IPR Act	Intellectual Property Rights from Publicly Funded Research and Development Act
ISI	Institute for Scientific Information
Mbps	megabytes per second
MTEF	Medium-Term Expenditure Framework
MTSF	Medium-Term Strategic Framework
MWA	Multiwavelength Astronomy Strategy
NACI	National Advisory Council on Innovation
NDP	National Development Plan
nGAP	New Generation of Academics Programme

NICIS	National Integrated Cyberinfrastructure Systems
NIPMO	National Intellectual Property Management Office
NRDS	National Research and Development Strategy
NRF	National Research Foundation
NSI	National System of Innovation
Opco	Operational Committee of the DSI
PMU	Project Management Unit
PYEI	Presidential Youth Employment Initiative
R&D	Research and Development
RDI	Research, Development And Innovation
ROSS	Research Output Submission System
S&T	Science and Technology
SAASTA	South African Agency for Science and Technology Advancement
SADC	Southern African Development Community
SAEOS	South African Earth Observation Strategy
SANReN	South African National Research Network
SANSA	South African National Space Agency
SARAO	South African Radio Astronomy Observatory
SARChI	South African Research Chairs Initiatives
SARIR	South African Research Infrastructure Roadmap
SET	Science, Engineering and Technology
SETI	Science, Engineering, Technology and Innovation
SIF	Sector Innovation Fund
SKA	Square Kilometre Array
SME	Small Medium Enterprise
STA	Science and Technology Activity
STEM	Science Technology Engineering Mathematics
STEMI	Science Technology Engineering Mathematics and Innovation
STI	Science, Technology and Innovation
STIIL Review	STI Institutional Landscape Review
TIA	Technology Innovation Agency
TLIU	Technology Localisation Implementation Unit
TSP	Technology Stations Programme
TYIP	Ten-Year Innovation Plan
UCDP	University Capacity Development Programme
WACS	West African Cable System

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