

ANNUAL PERFORMANCE PLAN

2022/23- 2024/25



Transforming The Nation Through Sustainable, Collaborative and Impactful Research



science & innovation

Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA



National
Research
Foundation



Dr Nompumelelo Obokoh
Chairperson of the NRF Board

STATEMENT BY THE **CHAIRPERSON OF THE BOARD**

Publicly-funded research remains a critical asset in protecting lives and advancing sustainable development. The experiences of the last two years in fighting and surviving the COVID-19 pandemic provides a clear case for the societal benefits derived from research-led innovation.

The National Research Foundation (NRF) occupies a strategic position in the South African National System of Innovation (NSI) landscape, with sizeable, although not adequate, resources to carve a pathway to the realisation of societal impact from scientific research and innovation. The NRF Vision 2030 and the five-year Strategic Plan map a clear direction centred on four priority areas: transformation, impact, excellence, and sustainability. Since the start of the current Medium-Term Strategic Framework (MTSF) period, the organisation has laid the foundations upon which the requisite capabilities will be built. In this regard, good progress has been achieved in re-imagining and co-creating an innovative and transformative organisational culture, enhancing administrative efficiencies through Enterprise Resource Planning (ERP); implementing the new Postgraduate students Funding Policy; engaging NSI-wide on research impact; using high-end skills in astronomy infrastructure built to lead the National Ventilator Programme; and building a portfolio of new strategic research infrastructure platforms such as the state of the art South African Isotopes Facility (SAIF) and the South African Polar Research Infrastructure (SAPRI).

In alignment with the White Paper on Science, Technology and Innovation (WP STI 2019), the NRF is articulating its value proposition in advancing research for societal benefit. It is anticipated that the research and innovation outcomes will foster valuable partnerships with public and private sectors, which can bring new products, processes and services and yield additional resources for the organisation.

During the 2022/23 financial year, the organisation will engage with the Science, Technology, and Innovation Decadal Plan (STI Decadal Plan) in order to refine its strategic priorities and programmes to align with the plan.

In the Medium-Term Expenditure Framework (MTEF) period, continued focus will be on the following key outcomes that are aligned to the NRF Strategy 2025, the MTSF and the Strategic Plan of the Department of Science and Innovation (DSI) :

- Transformation, expansion, and inclusivity of the research work force, through an outcomes-oriented, competitive and diverse array of grants and Research Infrastructure Platforms (RIPs) for the various needs of students and researchers. The emphasis will be on graduations for funded students and production of research outputs by researchers; and

- Advancement of innovation as the key contribution of research and scientific knowledge in order to realise economic and social development objectives.

The Accounting Authority (the NRF Board) endorses the Annual Performance Plan and is committed to ensuring its implementation.

I would like to thank the Minister of Higher Education, Science and Technology, Dr BE Nzimande, and officials of the DSI for their continued support of the NRF and its work. I would also like to express my gratitude to fellow Board members, Executive Management and all NRF employees for the development of this Annual Performance Plan and their dedication to serving the people of South Africa.



Dr Nompumelelo Obokoh

Chairperson of the Board

National Research Foundation





Dr Fulufhelo Nelwamondo
Chief Executive Officer

STATEMENT BY THE **CHIEF EXECUTIVE OFFICER**

As the organisation that has the broadest interface with the knowledge enterprise actors, the National Research Foundation plays a critical role in the shaping of the NSI and in ensuring effective and efficient delivery of outcomes that impact on the nationally identified triple challenges of poverty, inequality and unemployment. The continuing COVID-19 pandemic is worsening these challenges and, therefore, has necessitated the increasing redirection of public resources. This requires greater emphasis to be placed on re-prioritisation and reallocation of available resources to ensure that research funding is optimised in orientation towards outcomes that contribute to the resolution of national challenges. The new global existential challenges of climate change and the threat of pandemics calls for intensified international collaboration in policy making and the resulting research agenda. The NRF will use its position in the global science networks to support collaborative efforts and to leverage benefits for the local research enterprise. The organisation will continue to support the development of sciences that are associated with South Africa's geographic advantage, societal challenges, and innovation needs.

The core of the NRF's strategic intent is centred around its commitment to a transformation agenda. This commitment aims to both change the demographic representation of the research workforce, as well as to fundamentally change the knowledge enterprise to enable it to make a step change contribution for

the benefit of society. To this end, the NRF Strategy 2025 included two new outcome indicators in terms of the profile of NRF-funded students completing their qualifications and the profile of researchers that produce research outputs. The NRF has as a result, developed policies that specifically align to the national STI policies led by the DSI, in particular: the 2019 White Paper on STI, the Decadal Plan for STI, and the DSI Strategic Plan.

Since the start of the MTSF period, the NRF has prioritised Research Impact, Engaged Research, and support for Leading Research and Scholars (LRS). The development of a NRF Research Impact Framework is at an advanced stage, following NSI-wide engagement. Further consultations with the DSI for the development of the framework will be undertaken to ensure its alignment with the STI Decadal Plan and to secure the required resources for implementation.

During the MTEF period, the organisation will place greater focus on the delivery of the following outputs as detailed under the sections in the respective NRF programmes:

- Funding of postgraduate students and researchers;
- Mathematics, science and technology education and career interventions for learners and graduate students;

- Foreign income earned through activities at National Facilities;
- Increased radioisotopes production;
- Technical and policy briefs by the National Facilities; and
- Intellectual property-type products, processes, and services.

On the strategy implementation front, the organisation will continue to explore appropriate frameworks or mechanisms for the following:

- Advancing innovation;
- Growth and diversification of the research and Human Capital Development (HDC) funding;
- Expediting the development and diversification of leading researchers and scholars;
- Advancing Equality, Diversity, and Inclusivity (with a specific focus on African and Coloured women) in the NSI;
- Elaborating the NRF Research Agenda; and
- Mainstreaming Engaged Research.

To remain sustainable in the face of declining public funding in real terms, the organisation is exploring additional sources of funding through strategic partnerships; increasing production of saleable products such as isotopes; the provision of engineering, consulting, and testing services; the delivery of contracted research services; and the commercialisation of internally developed Intellectual Property (IP).



Dr Fulufhelo Nelwamondo
Chief Executive Officer
National Research Foundation

The NRF will also focus on, and closely manage and monitor, key cost drivers through, among other things, the application of zero-based budgeting principles. The implementation of the Enterprise Resource Planning (ERP) system and improvement in business processes to reduce transactional costs and ensure efficiency improvements.

The focus on research impact, innovation, the research priorities and engaged research will better position the organisation to contribute to national development in line with its legislative mandate and its intent to realise societal impact.

I would like to take this opportunity to acknowledge the support and guidance of the NRF Board, the Department of Science and Innovation and the Ministry of Higher Education, Science and Innovation. Much appreciation for the dedication and commitment of NRF Management and all employees in the implementation of the Annual Performance Plan.

Official Sign-off

It is hereby certified that this Annual Performance Plan:

- Was developed by the Management of the National Research Foundation under the guidance of NRF Board;
- Takes into account all relevant policies, legislation and other mandates for which the National Research Foundation is responsible; and
- Accurately reflects the impact and outcomes which the National Research Foundation will endeavour to achieve over the period 2022-2025.



Mr Bishen Singh
Chief Financial Officer



Dr Fulufhelo Nelwamondo
Chief Executive Officer



Dr Nompumelelo Obokoh
Chairperson of the Board
(Accounting Authority)

APPROVED BY:



Dr Bonginkosi Emmanuel Nzimande, MP
Minister of Higher Education, Science and Innovation
(Executive Authority)

List of Acronyms

AI	Artificial Intelligence
AOSP	African Open Science Platform
ACEP	African Coelacanth Ecosystem Programme
BAAP	Black Academics Advancement Programme
BRICS	Brazil, Russia, India, China, South Africa
CoEs	Centres of Excellence
CSIR	Council for Scientific and Industrial Research
DCEO	Deputy Chief Executive Officer
DHET	Department of Higher Education and Training
DSI	Department of Science and Innovation
dtic	Department of Trade, Industry and Competition
ECR	Early Career Researchers
ERRP	Economic Recovery and Reconstruction Plan
ERP	Enterprise Resource Planning
FBS	Finance and Business Systems
FCS	Full Cost of Study
GMSA	Grants Management and Systems Administration
HCD	Human Capital Development
HEI	Higher Education Institution
HEMIS	Higher Education Management Information System
HIRAX	Hydrogen Intensity and Real-time Analysis eXperiment
HR&LS	Human Resources and Legal Services
HRS	High Resolution Spectrograph
HSRC	Human Sciences Research Council
ICT	Information Communication Technology
IDRC	International Development Research Centre
IP	Intellectual Property

ISFAP	Ikusasa Student Financial Aid Programme
iThemba LABS	iThemba Laboratory for Accelerator-based Sciences
JINR	Joint Institute for Nuclear Research
MINDS	Mandela Institute for Development Studies
MPG	Max-Planck-Gesellschaft
MTEF	Mid-Term Expenditure Framework
MTSF	Medium-Term Strategic Framework
NASSP	National Astrophysics and Space Science Programme
NDP	National Development Plan
NEP	National Equipment Programme
nGAP	New Generation of Academics Programme
NNEP	National Nanotechnology Equipment Programme
NRIPs	National Research Infrastructure Platforms
NSI	National System of Innovation
NSO	National Science Olympiad
PDP	Professional Development Programme
PFMA	Public Finance Management Act
PG	Parliamentary Grant
R&D	Research and Development
RDIP	Research Development Information Portal
RIP	Research Infrastructure Platform
RISA	Research and Innovation Support and Advancement
RRI	Responsible Research & Innovation
RSS	Robert Stobie Spectrograph
SAAO	South African Astronomical Observatory
SAASTA	South African Agency for Science and Technology Advancement
SADC	Southern African Development Community
SAEON	South African Environmental Observation Network
SAIAB	South African Institute for Aquatic Biodiversity

SAICA	South African Institute of Chartered Accountants
SAIF	South African Isotope Facility
SAINTS	Southern African Institute for Nuclear Technology and Sciences
SALT	Southern African Large Telescope
SAPRI	South African Polar Research Infrastructure
SARAO	South African Radio-Astronomy Observatory
SARCHI	South African Research Chairs Initiative
SARIR	South African Research Infrastructure Roadmap
SCM	Supply Chain Management
SETI	Science, Engineering, Technology and Innovation
SES	Science Engagement Strategy
SKA	Square Kilometre Array
SKAO	Square Kilometre Array Organisation
SOAR	Strengths, Opportunities, Aspirations and Results
SPP	Strategy, Planning and Partnerships
SRE	Strategic Research Equipment
STEMI	Science, Technology, Engineering, Mathematics and Innovation
STI	Science, Technology and Innovation
STISA	Science, Technology and Innovation Strategy for Africa
THRIP	Technology and Human Resources for Industry Programme
TID	Technical Indicator Description
TVET	Technical and Vocational Educational and Training
SSC	Separated Sector Cyclotron
WP STI	White Paper on Science, Technology and Innovation



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PART A



OUR MANDATE

1. Updates to the Relevant Legislative and Policy Mandates

The work of the NRF is influenced and guided by national strategic frameworks, legislation, policies and plans that outline developmental priorities for the nation and for the higher education and science, technology and innovation sectors in the medium to long term. The objectives and priorities relevant to the NRF's mandate, planning and priorities are discussed below.

Founding Legislation

The National Research Foundation Act 23 of 1998 (as amended) established the NRF, and outlines the NRF's latest object, prescribing its primary goal as "to contribute to national development by":

- a) Supporting, promoting and advancing research and human capacity development, through funding and the provision of the necessary research infrastructure, in order to facilitate the creation of knowledge, innovation and development in all fields of science and technology, including humanities, social sciences and indigenous knowledge;
- b) Developing, supporting and maintaining national research facilities;
- c) Supporting and promoting public awareness of, and engagement with, science; and
- d) Promoting the development and maintenance of the national science system and support of government priorities.

National Development Plan: Vision 2030

The central intention of the National Development Plan (NDP) is the achievement of economic well-being for all South Africans. It aims to reduce poverty, unemployment and inequality by 2030 and identifies the knowledge economy and Science, Technology and Innovation (STI) as among the primary drivers of economic growth, job creation and socio-economic

reform. The NDP also outlines the need to improve the relationship between government, industry and the knowledge enterprise. It further sets targets to which the NRF can directly contribute through its programmes, such as:

- a) Increase the percentage of doctoral (PhD) qualified staff in the higher education sector from the current 34% to over 75% by 2030;
- b) Increase the number of students eligible to study towards maths and science-based degrees to 450 000 by 2030; and
- c) Produce more than 100 doctoral graduates per million per year by 2030 – implying an increase from 1 420 in 2 010 to well over 5 000 per year. Through its support of PhD students (2 158 in 2022/23), the NRF will contribute towards the realisation of the NDP goal.

White Paper on Science, Technology and Innovation, 2019

The White Paper on Science Technology and Innovation (WP STI) places STI at the centre of South Africa's development agenda. It recognises rapid technological advances internationally and the need for South Africa to position itself in responding to these developments. It advocates for the adoption of the principles of open science as a means to grow the STI outputs and impact. The White Paper acknowledges the country's achievements over the past decades but notes the need to accelerate transformation of the knowledge enterprise to achieve an inclusive science system that is responsive and innovative. It prioritises the need to increase investment and expansion of the research system and to promote partnerships among universities, society, industry and government to ensure a cohesive National System of Innovation (NSI). It emphasises the need to transform the NSI towards improving its contribution to the realisation of socio-economic benefits through an increased focus on the translation of knowledge outputs into products and services by advancing innovation. Through its programmes, the NRF will advance innovation in the NSI.

White Paper on Post-School Education and Training, 2013

The White Paper on Post-School Education and Training (WP-PSET), 2013 advances priorities in the post-school education sector, including the expansion of the variety and number of post-school opportunities available to the youth. It advances diversity, quality education, expanded access to postgraduate education, and research and researcher advancement. It also aims to rebalance the number of the students between the Technical and Vocational Education and Training (TVET) colleges and Higher Education Institutions (HEIs). Through the DSI-NRF Postgraduate Funding Policy, the NRF will advance access, success and throughput of postgraduate students.

White Paper 3: A programme for the transformation of higher education, 1997

White Paper 3 emphasises a holistic approach to transformation and the need to balance the transformation imperative with the need for expansion and development. It advances a higher education and research sector that is responsive to the needs of a democratic society and an inclusive economy. In addition, White Paper 3 recognises the importance of countering the isolation of the university sector during the apartheid period through international partnerships and internationalisation.

2. Policies and Other Mandates

Macro-policies and strategies of Government developed by sector departments, including those in Higher Education, Science and Innovation, Health, Minerals, Energy, Agriculture, Environment, Water, and Industrial Development, are all crucial to the function and work of the NRF. Specifically, the DHET and DSI have developed and implemented several strategies and policies to guide the development of the science system including:

- The Strategy for Human Capacity Development for Research, Innovation and Scholarships;
- The Staffing South Africa's Universities Framework;
- The Science Engagement Strategy;
- The Research Outputs Policy;

- The South African Research Infrastructure Roadmap (SARIR);
- The Ministerial Guidelines for Improving Equity and the Distribution of DST/NRF Bursaries and Fellowships; and
- Discipline-specific strategies and plans that include Astronomy, Marine Biology, Biotechnology, Palaeosciences and Nanotechnology.

South Africa is also signatory to several international treaties and, in this regard, there are several international bilateral and multi-lateral agreements that inform the work of the NRF.

South Africa, and hence the NRF, has prioritised its contribution to the development of the African continent and, in this regard, the African Union's Agenda 2063 is key. It is the strategic framework for the socio-economic transformation of the continent and builds on, and seeks to accelerate, the implementation of initiatives for growth and sustainable development. Most important among these is the aligned Science, Technology and Innovation Strategy for Africa, 2024 (STISA-2024) that identifies critical sectors for technology-led development aligned to the priority outcomes of hunger eradication; food security; prevention and control of diseases; communication; and wealth creation. It identifies four pillars for development, namely: building and/or upgrading research infrastructures; enhancing professional and technical competencies; promoting entrepreneurship and innovation; and providing an enabling environment for STI development.

Globally, the United Nations' Sustainable Development Goals (SDGs) outline internationally recognised areas of priority in order to advance a better and more sustainable future for all. It sets targets for 2030 to address multi-disciplinary global challenges such as poverty, inequality, hunger, health, education, equality, environmental concerns, innovation and economic growth. These challenges are considered priority areas in terms of research and innovation investment, aligned with, and informed by, the strategic priorities of each country.

The Presidential Commission on the Fourth Industrial Revolution (PC4IR) Report

The PC4IR report provides a common understanding of key features of the 4IR and their intersections with South Africa's current socio-economic standing and constraints. The 4IR is recognised as a developmental pathway towards alleviating the current socio-economic challenges of unemployment, poverty, and inequality. The report also alludes to the impact of 4IR on the shifts in the demand for high-end skills which will require the adaptation of the current human capacity development programmes. The commercialisation of these technologies requires some degree of Government coordination to develop regulations that ensure ethical conduct of 4IR actors in order to protect the public and build confidence in the rapid and sustained adoption thereof.

Updates to Institutional Policies and Strategies

Transformation of the science system continues to be a national priority. To this end, the NRF has developed a transformation framework to guide its contribution to system transformation.

In giving effect to the framework, the NRF has implemented a new Postgraduate Funding Policy. A total of 7 397 of the awards were taken up by the third quarter of 2021/22 across all study levels. To date, 46% and 12% of the awards were taken up at Full Cost of Study (FCS) and Partial Cost of Study (PCS), respectively.

Updates to Relevant Court Rulings

None.

PART B



Our Strategic Focus

1. Updated Situational Analysis

The NRF functions within a national and international science system, with the key objective of developing, advancing and promoting the national research environment in support of national development. The central focus in South Africa is to reduce poverty, unemployment and inequality through sustainable development, i.e., “...development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. The knowledge enterprise contributes to national development through the impact (societal or knowledge) of the research it carries out. The NRF’s Strategic Plan and Annual Performance Plan are informed by this key objective of national development, which is central to its amended mandate.

In the South African context, the NDP states that ‘Science and technology continue to revolutionise the way goods and services are produced and traded. As a middle-income country, South Africa needs to use its knowledge and innovative products to compete’. It explains further that ‘Innovation is necessary for a middle-income country to develop. Science and technology can also be leveraged to solve some of the biggest challenges in education and health’.

National resources are constrained due to the severe economic impact of the COVID-19 pandemic. This is evident from the significant budget cuts made by National Treasury that will endure for the MTEF period. The limited funding has a bearing on the level of performance for all of the NRF’s mandate areas.

Despite the challenges in the organisation’s service delivery environment, the focus of the NRF over the duration of its Strategy 2025 and Vision 2030 will be on securing sustainable resourcing that allows for long term strategic planning based on predictable income and for it to invest for maximum impact in the research enterprise. It will also prioritise the adoption of efficient and effective stewardship of the resources made available to it in order to sustain itself, the system it supports and the endeavours and initiatives it implements over the long haul.

1.1 External Environment Analysis

The situational analysis provided below is structured according to the Strategic Outcomes outlined in NRF Strategy 2025 and will have an impact on the organisation’s delivery over the three-year period of the Annual Performance Plan.

Transformed, Internationally Competitive and Sustainable Research Workforce

An inclusive and diverse researcher workforce is essential if research is to be responsive to society. The pipeline for human capacity for the research system begins with postgraduate students. Therefore, the analysis of the demographics relating to the transformation of the equity profile of the research workforce needs to begin with the analysis of the postgraduate students in the country.

In terms of race, the number of Black students funded by the NRF increased from 68% in 2016 to 79% in 2020. The representation of Female students increased from 53% in 2016 to 58% in 2020. Overall, over the period 2016 to 2020, the nationality of NRF-funded postgraduate students exceeded the Ministerial Guideline’s target with 93% of funded students being South African or permanent residents. The remaining 7% comprised: 6% rest of Africa and 1% rest of the world. The challenge, however, has been that this pattern has been inconsistent at the higher postgraduate level with a higher percentage of non-South African funded students, and with 83% of funded doctoral students being South African or permanent residents. Despite the race and gender composition of NRF-funded honours students, this has not translated into representative support at master’s and doctoral levels and has not led to the transformation of the researcher cohort in the way that was anticipated. On identifying this ongoing challenge, the NRF carried out an analysis that revealed the following:

- Of concern is that from 14 885 students funded at honours level between 2005 and 2015, 9 426 (63%) progressed to master’s level and 2 375 (16% of those enrolled at honours level) progressed to doctoral level; and
- On average, the completion of postgraduate degrees takes longer than it should, resulting in advanced age at time of degree completion. Noteworthy, however, is that the average age at completion for NRF-funded students is consistently lower than the national average.

The principal core of the research workforce is the research and instructional staff, primarily at higher education institutions. In 2019, the NRF supported 3 976 researchers out of a potential pool of 9 458 permanent instruction and research staff with doctoral degrees employed by South African public universities [Higher Education Management Information System (HEMIS, 2019)]. Of these, 4 444 (47%) were Black and 4 103 (43%) were women in 2019. Over the past five years (2016 to 2020) the number of researchers funded by the NRF increased from 5 474 in 2016 to a peak of 5 649 in 2017, followed by a decline to 2 972 in 2020. This decline is largely the result of changes in the incentive funding scheme resulting in a significant reduction in the number of rated researchers receiving funding from the NRF on an annual basis. Despite the decline in the latter years, there has been a consistent increase over the five-year period in the proportion of Black and women researchers funded by the NRF. The Black proportion moved from 31% in 2016 to 49% in 2020 and that of women from 36% in 2016 to 44% in 2020.

In alignment with the NRF's mandate and the first outcome of the NRF Strategy 2025 (the development of a transformed, internationally competitive and sustainable research workforce) the organisation is committed to ensuring the achievement of a sustainable human capacity development and knowledge production for societal benefit growth. This commitment must be balanced with the available operational and financial resources. For instance, growth in postgraduate enrolment must be balanced with undergraduate enrolment and must take cognisance of the available supervisory capacity and institutional capacity and infrastructure. Similarly, growth in the researcher cohort must also be commensurate with the expectations of the country to become a knowledge-led economy.

Impact of Research

Research impact is about *'the demonstrable contribution that excellent research makes to society and the economy. Economic and societal impacts embrace all the extremely diverse ways in which research-related knowledge and skills benefit individuals, organisations and nations.'* The societal impact of research includes impact in the social and environmental realms. Examples include environmental security, impact on policy development, technological advancement and innovations. In brief, it is about the direct or indirect causal relationship between knowledge production and improvement in the quality of people's lives.

There is widespread consensus, nationally and internationally, that investment in research is a necessary prerequisite for economic, social and cultural development. Based on this, countries invest public funds in the development of their knowledge economy. Growing investment has led to an increased demand for evidence of the relationship (direct or indirect) between knowledge production and improvement in the quality of people's lives. Impact has, therefore, been adopted as an element of research assessment in many countries in order to incentivise researchers to plan for impact and to gather a series of impact stories for public consumption. Related to this, countries and international organisations have embarked on exercises to determine key developmental challenges.

Key challenges related to the impact agenda facing the South African higher education, science and research sectors are to create a culture where researchers consider and plan for impact before embarking on a research project; to encourage researchers to engage with communities and industry before and during their research; to ensure a coherent National System of Innovation (NSI) that will enable and maximise research impact; and to provide evidence to the Government and to the public of the societal benefit that their investment in the research sector accrues. Together, this will ensure that the impact of knowledge advancement in overcoming the developmental challenges outlined in the NDP, as well as the triple challenges of poverty, unemployment and inequality, will be both maximised and more clearly articulated. Over time this will lead to a more universal understanding of the developmental role of science and research; increase accountability with regards to spending public money; and lead to greater investment in the sector.

The South African knowledge enterprise delivers both knowledge and societal impact, but the indirect relationship between research and national development means that societal impacts are often overlooked. Furthermore, the nature of impact (often delivered over the longer term) means that the attribution of impact to a specific portfolio of research (or research entity) is not simple. The structure of the South African knowledge chain (or pathway to impact) across a variety of entities ranging from universities, research funders and national research facilities, through to science councils, technology transfer entities and industry, means that partnerships and cooperation are required. In order to advance an impact agenda across the knowledge enterprise

it is, therefore, necessary for the various players to develop a mutual understanding of impact (and research impact) and to work together to advance it. This is not the case currently. Many organisations are only now beginning to think about impact, its assessment, and the interventions required to increase it. Mobilisation and information sharing across the knowledge enterprise is, therefore, required.

Within the NRF, an impact agenda will require changes across all facets of the organisation, from the funding of research projects and researcher ratings to science engagement activities and the research undertaken at national facilities. For example, new assessment methodologies will need to be developed and adopted *ex ante* and *ex post*; buy-in from universities and other partners will need to be established; and engaged research and interdisciplinary research will need to be strengthened.

Over the period of this Annual Performance Plan, the NRF will endeavour to support research that generates societal impact while maintaining a balanced approach to supporting fundamental and mission-led research. To this end, the organisation is developing a Research Impact Framework which will guide it in the execution of its research priorities. The Framework will also be used to direct discussions and interactions with partners across the research enterprise, and it will be adapted as necessary to ensure a mutual adoption and understanding of impact, impact assessment, and the various interventions necessary to advance impact. Through a national impact agenda, the South African higher education, science and research sector will be able to develop a research culture where researchers consider and plan for impact (knowledge and societal) before embarking on a research project and where they engage with communities and industry before and during their research so as to align their research with the needs of communities and industries, taking into account specific local and national contexts.

In pursuit of its contribution to National Development, the overarching purpose of promoting the benefit of the knowledge enterprise for societal development demands a much more coordinated and cohesive strategic plan and policy development with the rest of the NSI. The merged administration that resulted in the combined Ministry of Higher Education, Science and Technology enables more coherent and cohesive strategic planning and policy development.

Impact of Science Engagement

At the national level, efforts to advance the science engagement system have started to move towards a focus on creating an enabling environment; setting up more sustainable funding mechanisms; enlisting the participation of sectoral and institutional role players; and ensuring that the country's science engagement system is better coordinated and able to assess its effectiveness and efficiency. The NRF science engagement operating model thus follows an integrated, interdependent and inclusive approach with due importance given to both the national coordination function and the leadership of the NRF science engagement portfolio. This is in line with the precepts of the DSI Science Engagement Strategy (SES) and the understanding that the South African Agency for Science and Technology Advancement (SAASTA), as a business unit of the NRF, is designated to play a key role in the effective coordination of science engagement across the DSI science councils in the immediate future. Efforts to create a fit-for-purpose NRF science engagement business unit that can deliver on this enhanced engagement mandate are at advanced stage.

It is important to continue to raise science awareness among all citizens of the country and to provide access to an increasingly diverse range of public science events and infrastructure. Approximately 5.5 million people accessed the NRF National Facilities between March 2015/16 and March 2019/20. An innovative programme mix for science engagement, that is also attuned and responsive to the changing needs of societies, will drive enhanced public engagement with science. Engagement through relevant media platforms is a key enabler of public dialogue and thus it is also important to drive the growth of science communication content and frequency in order to increase the NRF's influence and impact in the area of science communication. The value of scientists engaging with policy makers and the broader public through a range of communication media platforms has been demonstrated very clearly during the global COVID-19 pandemic, and specifically visible and generally effective within the South African context.

With respect to Science, Technology, Engineering, Mathematics and Innovation (STEMI) education support, science engagement activities over the period from 2015/16 to 2019/20 reached approximately 1.3 million learners. The interventions aimed to supplement the academic curriculum

through exposure to career opportunities in Science, Engineering, Technology and Innovation (SETI), as well as identifying and nurturing talent through a range of SETI National Science Olympiads (NSOs). However, the popularisation of science on its own will not increase the number of students enrolling in undergraduate science degrees, and hence many of the current interventions at school level are affected by the limits of the support mandate and available resources. The introduction of more focused interventions going forward will allow for the tracking of impact (participation, performance and careers in science) in specific projects over periods of three to five years.

The NRF's vision of a transformed relationship between science and society is one in which knowledge is created, used, challenged, valued and shared by all in the interest of addressing the needs and demands of society. It is a multifaceted model for the co-creation of knowledge, rather than a linear model of information flow. It is, therefore, the NRF's intent, while continuing to grow the broad science promotion and awareness portfolio in line with the Science Engagement Strategy, to adopt a deliberate strategic focus on positioning engaged research as a valued and esteemed practice for research that is funded by the NRF; facilitating access to research and science engagement infrastructure; building excellence in science engagement capacity and capability; and facilitating public-private sector relationships in science engagement. This represents a renewed strategic commitment to public engagement from the NRF through its Vision 2030, and a progression towards its long-recognised objective of a scientifically-engaged society.

The availability of well understood, widely acceptable and meaningful indicators that can measure whether communication and the engagement programme overall are having the desired impact has long been a particular challenge both nationally and globally. To this end, the development of a centralised Science Engagement Information Management System (SEIMS), in response to the operationalisation of the core impact categories of the SES, is in the planning phase with eventual implementation of the system to be managed by NRF-SAASTA. Organisationally, the metrics are likely to include contributions by NRF-funded researchers and those based at National Facilities to national scientific and technical reports; development and management of decision support systems; and direct advice to policy as examples.

1.2 Internal Environment Analysis

In order to deliver on its mandate and support the knowledge enterprise in line with the three outcomes identified in the external analysis, the NRF requires a fit-for-purpose organisation and appropriate resourcing. Both the NRF and the knowledge enterprise cannot function effectively without the provision of resources and the NRF cannot function optimally, or support the knowledge enterprise effectively, if it is not appropriately organised and fit-for-purpose.

A Transformed Organisation that Lives its Culture and Values

A transformed and transforming NRF is an inclusive and diverse organisation that supports and promotes the simultaneous eradication of all aspects of unfair discrimination, recognises and respects diverse cultures and knowledge systems, and supports a research and higher education sector that gives full expression to opportunities for all, in line with the ambitions of national education, science and technology policy. The NRF aims to achieve a diverse workforce; an equitable and accessible work environment; an inclusive environment where all employees are valued; a work environment free from discrimination; and a level playing field for employee success as these aspects are instrumental to the organisation's sustainability.

Market challenges are experienced in attracting and retaining skilled human resources due to the national war for talent. As a result of the reduced budget, remuneration strategies that could be employed to attract and retain skilled human resources are not possible to deploy. The impact of COVID-19 on implementing planned training interventions led to the postponement of Management Development Programmes (MDP) and a restriction on rolling out other learning interventions due to their significant dependence on the face-to-face delivery method. Challenges in meeting transformation targets and ensuring that succession pools are sufficiently diverse to ensure sustainability of diversity and inclusion remain a major concern. This is partly due to the inability to fill scarce skills vacancies and continue to replace exits in such a manner as to achieve demographic representivity.

The increased central coordination of the operationally autonomous Business Units in the pursuit of the OneNRF goal requires to be approached with care to avoid unintended negative consequences.

Management of the Remuneration Bill

The NRF Board has put in place a 22% threshold for remuneration costs as a proportion of the NRF's budget. The percentage remuneration for the past several years has hovered between 18% and 19% until the recent budget cuts occasioned by the COVID-19 pandemic, which raised the percentage to 20.6%. The NRF continues to manage the Remuneration Bill prudently by jointly sharing with and engaging organised labour in an inclusive manner, on the state of NRF remuneration affordability. The NRF continues to consult on factors that will ensure organisational sustainability with little to no need for a headcount review. This joint understanding features prominently in the manner in which, as partners with organised labour, the NRF approaches salary and conditions of service improvement discussions. The understanding also includes ensuring that the NRF, as an employer, does not lag behind its market cohorts in remuneration to ensure the ongoing retention of talent. In addition to the above, an NRF-wide establishment management is continually conducted to ensure rigour in the management and allocation of human resources across the organisation.

Resourcing

Due to redirection of resources caused by the national response to COVID-19 and its impact on the economy, the NRF anticipates that its funding allocation from Government will remain well below the inflation rate over the MTEF period. This will require tough choices to be made in ensuring sustainability, particularly at the National Research Facilities, as they are largely funded through the Parliamentary Grant.

In pursuing the optimal deployment of resources, the organisation will invest in areas of maximum impact to increase societal and knowledge impact. To this end, the NRF will continue to work towards predictable and dynamic resourcing in collaboration with the Department of Science and Innovation (DSI) in order to ensure the greater efficacy of the organisation in achieving its mandate and strategy against performance objectives. In addition, the organisation will continue to practice good governance and efficiency; report on and show accountability for resource utilisation; and seek to demonstrate the societal and knowledge impact of its investment.

The NRF will explore the diversification of income sources within the scope of its mandate by leveraging its current network of partners; expansion of production of saleable outputs such as medical

isotopes; delivery of contracted engineering and research services; as well as possible cost recovery fees for access to NRF research databases, while remaining free for public research and innovation.

Creating a Fit-for-Purpose Organisation that Leads the Science Engagement Mandate Across the Science Sector

The many changes in the science engagement arena have ushered in a new era of strategic leadership for legally mandated, holistically integrated and coordinated science engagement in South Africa across research institutions, DHET/DSI entities and Government departments. Therefore, it remains essential that a fit-for-purpose SAASTA, as a business unit of the NRF, is adequately structured and capacitated to deliver much broader roles and responsibilities nationally and globally. An NRF-SAASTA business review and organisational development project was initiated in 2020 with the aim of ensuring that the NRF, and SAASTA in particular, becomes a fit-for-purpose organisation that can give effect to this science engagement mandate.

Organisationally, although some level of science engagement success has been achieved, internal NRF science engagement is not yet optimally integrated to ensure a seamless and coordinated approach. In the same vein, while NRF-SAASTA has coordinated some engagements across some stakeholders through the provision of funding, this has been largely very limited, *ad hoc*, and not fully coordinated within the DSI entities and across the NSI. To date, the engagement programme has largely been based on short term, *ad hoc* activities with a stronger emphasis on reaching school-going youth and promotion campaigns for Government science priority areas.

Hence, in a new era of strategic leadership of a legally mandated, holistically integrated and coordinated science engagement in South Africa across the NSI, NRF-SAASTA, as the business unit tasked with leading the full spectrum of the NRF science engagement mandate and coordinating science engagement role players and their contributions beyond the NRF, in line with the SES, will, in a phased approach, undergo a number of shifts from:

- a) An *ad hoc* project implementer to take up an effective strategic leadership role;
- b) A short-term, activity-based operational context to a business model with clear foci and smarter optimisation; and

- c) Playing the role of a (partial) internal coordinator within the NRF to facilitating national coordination and coherence (beyond reporting and reliance on quantitative reach).

Strengths, Opportunities, Aspirations and Results (SOAR) Analysis

In order to assess the NRF's high-level strengths, and to consider the opportunities it has in the changing national and international context, a SOAR analysis was undertaken. This analysis not only allowed the organisation to consider its current position, but also its vision for the knowledge enterprise, and how this can be attained. Below is an overview of the NRF's SOAR analysis. This analysis informed the situational analysis and the identification of ambitions for the next decade as depicted in both NRF Strategy 2025 and the Annual Performance Plan.

SOAR Analysis

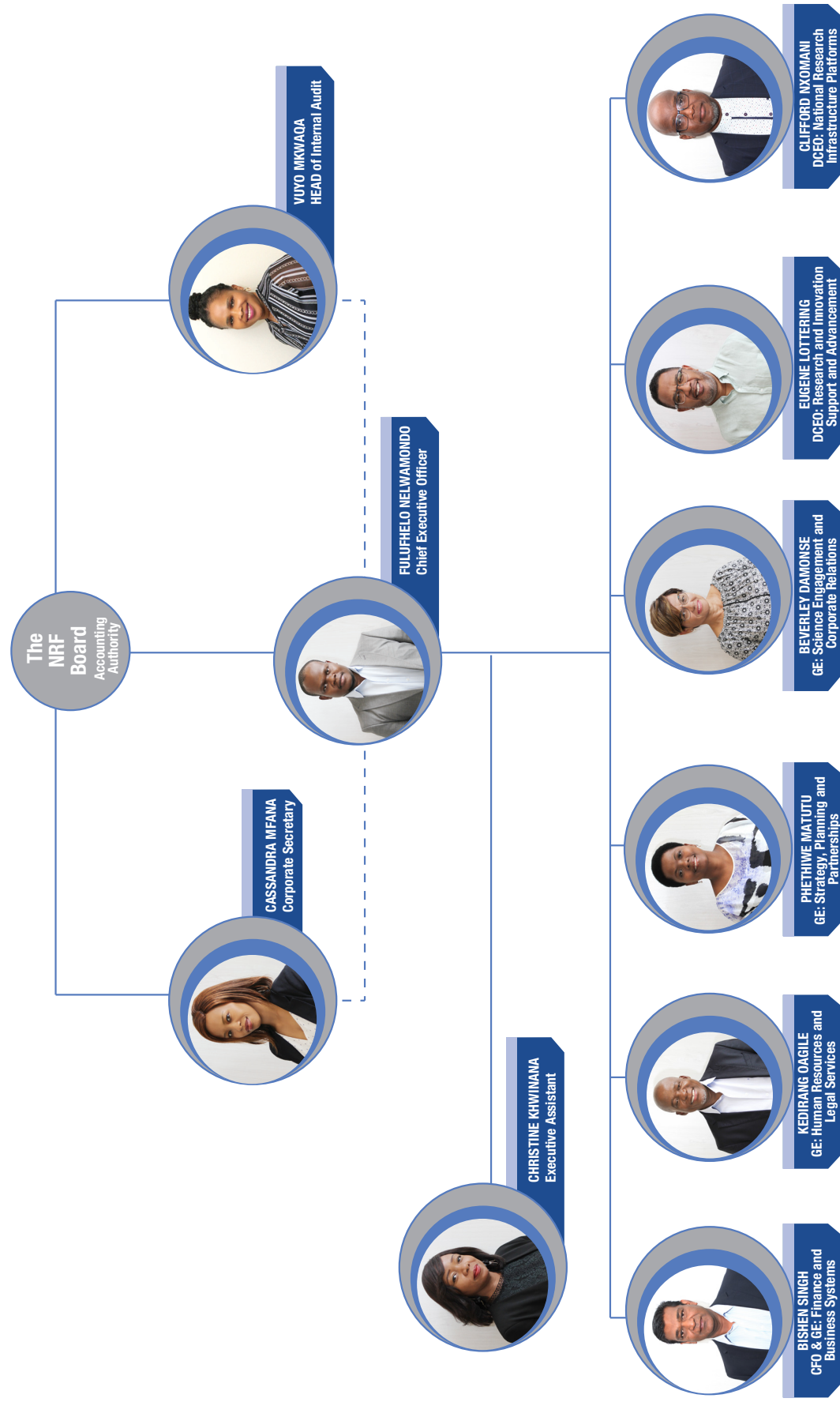
<p><u>Strengths:</u></p> <ul style="list-style-type: none"> • Highly networked within the knowledge system, nationally and internationally. • Well-developed, best practice research evaluation and support systems. • Talented and highly knowledgeable, committed and diverse leadership and staff cohort. • Unique position of influence across the national science system. • World-class National Research Facilities. • Good governance and accountability systems in place. 	<p><u>Opportunities:</u></p> <ul style="list-style-type: none"> • Restructured administration and synergies (combined Ministry for DHE and DSI). • Amended mandate that provides a clearer and expanded scope for the organisation. • Digital technological advancements and 4IR. • Promote the benefit of the knowledge enterprise for societal development. • Make science accessible through a variety of media platforms (including social media).
<p><u>Aspirations:</u></p> <ul style="list-style-type: none"> • To position the NRF to impact, shape and influence all aspects of the knowledge enterprise. • To maximise the impact of NRF investment through strategic decision making that will benefit society. • To demonstrate the impact of the NRF, and the research it performs and funds, on society, the economy, the environment and the knowledge enterprise. • To fundamentally change and strengthen the resourcing of NRF mandate. • To create an inclusive and diverse knowledge enterprise. • To influence the national science agenda and decision making in the science system. • To be a transformed, coherent, learning organisation that strives for excellence. 	<p><u>Results:</u></p> <ul style="list-style-type: none"> • A diverse, inclusive and transformed knowledge enterprise and research workforce. • Excellent research with impact, that contributes to national development. • A sustainable knowledge enterprise, delivering sustainable solutions to global challenges. • An NRF that is the nexus of information on the science system, which provides research and analysis for informed decision making. • An indispensable, agile, responsive and relevant NRF. • Additional sources of income through commercial partnerships with public and private sector entities.

Both the Aspirations and the Results identified through the SOAR Analysis by the organisation lay the framework for the derivation of strategic intents. These are reflected as the desired Outcomes and Outputs which, themselves, provide a basis for positioning the performance expectations and stating of specific medium-term targets.

Organisational Structure

Figure 1 is a representation of the NRF's organisational structure, which also reflects the leadership and governance structures responsible for the accountability and integrity of the organisation. The structure of the organisation ensures optimal coordination of functions across specialist operational business units and corporate functions. Corporate level Executives are assigned to exercise oversight of delivery on Strategic Plan outcomes and performance of critical support functions. The structure will be adapted when the organisation adjusts its strategic focus and make changes to aspects of its operating model.

Figure 1: High-level organisational structure of the NRF



2. Alignment with the MTSF, the DSI Strategy and ERRP

2.1 NRF Role in the Post-Lockdown Economic Recovery and Reconstruction Plan (ERRP)

The NRF Strategy 2025 came into effect during the 2020/21 financial year. One of the features that characterises this Strategic Plan is a shift in focus towards outcomes and impact of the NRF's interventions. In line with this, one of the four outcomes adopted in the Strategic Plan is *“enhanced impact of the research enterprise”*, with the outcome indicator being the *“entrenchment of knowledge and societal impacts in excellent research supported by the NRF”*. Whereas thus far the focus on knowledge impact assessment has been ex ante and not necessarily adequately rigorous, moving forward, research funded by the NRF will be justified through rigorous ex ante as well as ex post knowledge and societal/economic impact.

The 4IR, grounded on artificial intelligence (AI), has currently captured the attention of the world and is already, and will continue to be, a key distinguisher between those who drive, lead and benefit from the knowledge economy on the one hand, and those who struggle to be part of it on the other. The primary centres for the generation of the enabling knowledge are undoubtedly the research institutions of the country. Given the NRF's unique position and focus on enabling research, the NRF is one of the institutions of the country best positioned to facilitate identification of research with the potential to be taken to market and ultimately deliver socio-economic benefit. The Technology and Human Resources for Industry Programme (THRIP) was a key instrument funded by the Department of Trade Industry and Competition (*dtic*) and managed by the NRF, which achieved this with the Research and Technology Fund continuing this mission, though confined to a sector and on a much more modest scale. It is important to note that the most significant remodelling of the relocated (to the *dtic*) THRIP is that the financial incentive is provided to the industry partner as opposed to the research institution. This new arrangement is inclined to favour a technology/knowledge pull effect as opposed to the technology/knowledge push effect. Both approaches matter for positive socio-economic impact of research and it means that the demise of the “old THRIP” has left a

gap in the interventions for knowledge generation for impact, which warrants investigation and resolution. The NRF plans to initiate such an investigation.

Some specifics which the NRF will explore together with the DSI, include the following:

- Advance the notion that the COVID-19 recovery must be informed by the best available research:
 - * For example, institute more rapid response funding instruments that accelerate, or jumpstart, novel research designed to better understand, mitigate, or reverse the economic impact of COVID-19 on multiple facets of life;
 - * Investigate the creation of a research platform that allows for seamless sharing of research data; and
 - * Facilitate/enable international scientific collaboration.

2.2 MTSF 2019-2024 and DSI Outcomes

The NRF's strategic direction and medium-term implementation plans are designed to ensure that the organisation contributes to Government's national development priorities and outcomes as outlined in the NDP 2030, MTSF 2019-2024, the DSI Strategic Plan as well as the WP STI 2019, and its implementation plan, the STI Decadal Plan. The MTSF sets out seven priorities and 81 Outcomes for the sixth democratic administration. The seven priorities are as follows:

- **Priority 1:** A capable, ethical and developmental State
- **Priority 2:** Economic transformation and job creation
- **Priority 3:** Education, skills and health
- **Priority 4:** Consolidating the social wage through reliable and quality basic services
- **Priority 5:** Spatial integration, human settlements and local government
- **Priority 6:** Social cohesion and safe communities
- **Priority 7:** A better Africa and world

As an entity of the DSI, the NRF aligns with the commitments by the Department towards the achievement of MTSF priorities and targets as well as the Department's outcomes. To this extent, the

NRF's contribution is outlined in the tables below and as reflected in the organisation's performance targets for each of its budget programmes.

In implementing the intents of the WP-STI 2019 as well as the NRF vision and mandate, the NRF is establishing a Research and Development Information Platform (RDIP) as a single point of entry to obtain comprehensive research and development (R&D) data and analysis that can service the bigger

National System of Innovation (NSI) as well as the NRF. The RDIP will focus more on the research and development-related data and information. The data provided through the platform will be pitched, and address effectiveness at, a national level inclusive of the NSI, the NRF and research performing institution level. The data and analysis will inform policies as well as strategic and operational planning.

Table 1: Contribution of the NRF to MTSF outcomes

MTSF Outcome	Interventions	NRF contribution
Improve competitiveness through Information Communication and Technology (ICT)-(Linked to Priority 2: Economic transformation and job creation).	Increase investment in gross expenditure on research and development.	The establishment of a South African Square Kilometre Array (SKA) Regional Centre, as part of the global SKA Regional Centre network, for SKA data science processing, will create a new High-Performance Computing (HPC) research infrastructure platform and competency within the existing South African HPC landscape.
	Strengthen the National System of Innovation.	Develop a Research Impact Framework for NRF-led publicly funded research.
		Fund researchers through the various programmes of the NRF, including specifically research projects focused on improving South Africa's ICT infrastructure capacity and competitiveness.
Expand access to post-school education and training opportunities (Linked to Priority 3: Education, skills and health).	Increased number of Black lecturers supported through the New Generation Academics Programme (nGAP).	Grow the knowledge production in this area and its impact, which should be evident through an increase in the number of research articles by the funded researchers and citations in patents cited in the Web of Science database.
		Enable and facilitate appropriate applications for nGAP Research Development Grants, Thuthuka and the Black Academics Advancement Programme (BAAP), effectively increasing the number of successful applicants. Such intervention should assist them to develop a strong research grant application that can successfully compete for the Thuthuka and other research grants.
Improved quality of post-school education and training provision (Linked to Priority 3: Education, skills and health).	Implement the nGAP.	With and through the nGAP and other relevant support, increase the number of pipeline post graduate students who are awarded bursaries through the NRF.
	Proportion of university lecturers who hold doctoral degrees.	Increase the number of nGAP-funded academics who, with the help of the nGAP grant, graduate to PhD-holding emerging researchers.

Table 2: Contribution of the NRF to the DSI outcomes

DSI outcomes	Indicators	NRF contribution
A transformed, inclusive and responsive NSI.	Increase NSI contribution to socio-economic development by putting in place measures to accelerate the conversion of ideas and knowledge to products and services.	Develop Research Impact Framework. The key intention through this Framework is to position the NRF to strengthen its ability to identify and fund research for impact and to put measures in place to track impact.
		Set research priorities in line with priorities set in the STI Decadal Plan. The priorities will guide the NRF's investments in research.
Human capabilities and skills for the economy and for development.	Number of DSI funded PhDs graduating annually as a contribution to the NDP target of 100 PhDs/million population by 2030.	Implement a DSI-NRF Postgraduate Student Funding Policy to improve graduation throughput to contribute NDP target of 100 PhDs/million population by 2030. Put measures in place to be able to monitor and report on the graduation of the NRF-funded students.
	Percentage increase of women and black researchers in South African research workforce.	Implement the NRF Transformation Framework.
	Percentage increase in PhD qualified teaching and research staff.	Implement in particular the nGAP, BAAP, and Thuthuka Programme.
	Improved knowledge about science among the general public.	Create a fit-for-purpose science engagement capability in order to fully coordinate and implement the Science Engagement Strategy. This includes engaged research as a pathway to impact.
Increase knowledge generation and innovation outputs.	Increase South Africa's share (percentage) of global publication outputs.	Support, promote and advance high quality and high impact research and innovation.
	Percentage increase in patent applications from publicly financed Research and Development (R&D).	Promote, track trends and impact thereof of patent applications from NRF financed Research and Development. Conduct IP awareness sessions for NRF funded researchers.



3. Implementation of NRF Vision 2030 and Strategy 2025

The discussion on the planned interventions to achieve outcomes and the progress since 2020/21 is structured according to the outcomes in Strategy 2025.

The Development of a Transformed, Internationally Competitive and Sustainable Research Workforce

In 2020/21 the NRF commenced with the implementation of a new Postgraduate Student Funding Policy that makes provision for postgraduate funding allocations to be underpinned by the principles of equity of opportunity and representivity prioritisation, and seeks to achieve enhanced access, success and throughput by the system through a different application process. Financial need is, for the first time, included as a funding criterion. To attract and retain a diverse range of students, bursary values will be increased to cover both the Full Cost of Study and Partial Cost of Study (FCS and PCS).

Scientific discovery and innovation are increasingly driven by research infrastructure, platforms and big data. The effective use of advanced infrastructure and platforms requires specialised and advanced expertise. To ensure that this specialised technical expertise is available to manage and operate research infrastructure, a programme will be developed to train future instrument scientists and technical professionals in the natural science domains and in the humanities and social sciences.

The NRF is developing a sustainable intervention that accelerates the career progression of early, mid – and advanced career researchers and scholars to become leading researchers and scholars in all fields of research and disciplines.

The Development of an Enhanced Impact of the Research Enterprise

In advancing the NRF's research impact agenda, a project to develop, explore and understand research impact, which will define and position the organisation to implement a research impact agenda, was initiated. This is the first milestone in the process towards reaching one of the targets for Outcome 2: Entrenchment of knowledge and

societal impacts in excellent research supported by the NRF. The review of the NRF's internal processes and operations will identify the necessary changes to implement the research impact agenda and prepare the various sections for future impact assessment.

This will support the NRF towards reaching the five-year Strategy 2025 target of Portfolio of Excellent Research supported by the NRF and justified with sound ex-ante and ex-post assessment: Knowledge and Societal Impact.

During 2020/21, key strategy and guiding documents were developed to advance the NRF mandate through strategic partnerships. For local partnerships, existing partnerships will be strengthened, and pertinent new ones will be established with Government and its entities, industry, and civil society towards addressing the NRF's mandate.

Following the roll-out of a significant and high-level agreement with the Canadian industry MITACS, to bolster the industry placement strategies for post-graduate students and early career researchers in 2021/22. An Africa industry programme will be developed during 2022/23, in collaboration with the Canadian International Development Research Centre (IDRC). In 2023/24, there will be a demonstration of a significant increase in participation of both the emerging and established cohort of researchers in industry programmes. In 2024/25 the NRF in partnership with the DSI and DHET, will advance the uptake and effectiveness of international scholarships and bursaries in South Africa, in pursuit of the enhancement of the Global Knowledge Partnerships (GKP) Programme.

Regarding the provision of (science) domain-balanced, globally competitive research infrastructure platforms for the research enterprise, the focus will be to explore the feasibility of recognition and/or establishment of Research Infrastructure Platforms (RIPs) in the Social Sciences and Humanities. This will be developed further in line with direction set in the STI Decadal Plan.

Development of an Enhanced Impact of Science Engagement

The NRF has long recognised the importance of a scientifically literate and critically engaged society as an essential requirement of the transition towards a knowledge economy and has, over the past 21-years, played a pivotal role in fostering

this relationship through an ever expanding and increasingly significant portfolio of science engagement. The Science Engagement Strategy of the DSI, the amendments to the NRF Act (Act No 23 of 1998) and the WP-STI 2019 have also heralded key changes in the science engagement role of the NRF, particularly its business unit NRF-SAASTA, in terms of delivering on the national science engagement programme. NRF-SAASTA is responsible for the provision of science engagement programme implementation, leadership and oversight through stakeholder engagement and collaboration across the Science Engagement landscape in order to meet the overall goal of system-wide integrated science engagement.

The NRF is also currently in the process of implementing the NRF Strategy 2025 with a key focus on extending the science engagement portfolio to include the support and promotion of engaged research for greater societal impact. NRF-SAASTA is thus responsible for the leadership and coordination of the NRF Science Engagement agenda across all business units through what can be called a “*whole of NRF approach*”. The NRF National Research Facilities provide highly diverse, scientific infrastructure platforms that, together with the scientists and researchers based at these facilities, serve a critical role in advancing science engagement. Researchers and postgraduate students supported by the NRF also undertake a broad spectrum of science engagement initiatives, with a renewed emphasis being placed on a more engaged research approach

This requires an ongoing process of embedding science engagement more holistically within NRF research support and implementation programmes and enabling engaged scholarship which produces co-created, self-reflective knowledge and new formations of community in the process. This is in line with the emphasis of advancing programmes that are impactful to influence societal behaviour that will ultimately minimise the gap between science and society. It also forms part of the commitment to reimagine the NRF science engagement portfolio in order to ensure that science is able to critically engage with society.

Over the next three-year period the NRF will realise the above science engagement vision by:

- **Creating a fit-for-purpose South African Agency for Science and Technology Advancement (NRF-SAASTA)**, as a business unit of the NRF, that is adequately structured and capacitated to deliver on the NRF’s broader

science engagement roles and responsibilities nationally and globally. This will also include enhanced business processes and systems, especially for information management as well as capacity and capability that will ensure more effective coordination of science engagement across the DSI entities and in collaboration with a network of STEMI partners, an extended responsibility assigned to NRF-SAASTA. An NRF-SAASTA business review and organisational development project was initiated in 2020 with the aim of ensuring that the NRF, and NRF-SAASTA in particular, becomes a fit-for-purpose organisation that can lead and coordinate the science engagement mandate. This is in progress.

- **Embedding engaged research within the research enterprise.** In line with the overall intent to build a more critically science aware and engaging society and influence the relationship between science and society (Science Engagement Strategy; NRF Vision 2030) some changes to be effected include the formulation of an acceptable engaged research design; the identification of new and innovative public engagement research support programmes that will assist the drive towards systemic change; the establishment of a portfolio of science engagement training and skills development to enable the delivery of high quality engaged research; and a review of current evaluation approaches in research support programmes – especially expanding the use of qualitative information and case studies. The long-term outcomes that the NRF is aiming for are research that is increasingly responsive to societal needs and demands; wider acceptance of the practice of sound, evidence-informed policy and decision-making; and increased dialogue on critical science-related issues which is more firmly embedded in the public discourse.
- **Being networked as a significant player in the international engagement and impact discourse.** There has been an increase in the internationalisation of science engagement over the past years with a growing network of international partners and increasing participation in international science engagement events. This continues to provide ongoing opportunities to profile South African science, scientists and researchers to influence international conversations on public engagement with science from a developing

country perspective. This global connection will continue through the support and promotion of the two current South African Research Chairs in Science Communication which will continue to promote the growth of academic partnerships in the science communication and engagement discourse. The engaged research approach will promote deeper engagements with both higher education and civic society partners on the shared understandings of community and research engagement, as are joint international project partnerships built on the ethos of Responsible Research and Innovation (RRI), currently largely through European Union (EU) partnerships, Brazil, Russia, India, China, South Africa (BRICS) Forum platforms, and broader science awareness on global science issues.

A Transformed Organisation that Lives its Culture and Values

Over the next three years the demographic profile of the NRF staff will be addressed in line with employment equity targets and affirmative action measures. An organisational culture which supports the delivery of NRF strategic direction and high performance will be co-created by formally assessing the manifest organisational culture and starting the process of building the desired culture that will underpin and sustain the delivery of the NRF's Strategy 2025 and Vision 2030. There will be continued execution of training as per the Work Skills Plan to ensure supportive opportunities to employees to develop and meet the organisation's talent requirements by reviewed Executive and Management Development Programmes and coaching of employees at senior levels. Human capacity development support will be provided to produce technical skills linked to the requirements of the research infrastructure and implementation of interventions tailored to attract and retain the critical skills required for the sustainability of the organisation.

4. Global Engagement and Partnerships

Following the migration of the National Skills Fund (NSF) to the DHET in 2009, the NRF has received postgraduate student funding from the NSF through the submission of annual proposals to the DHET. In 2016, an amount of R304 230 627 was allocated to the NRF for new and continuing students. This

included the South African Institute of Chartered Accountants (SAICA) – Certificate in the Theory of Accounting which was allocated R59 242 500. In 2017 this allocation was reduced by 25% and further reduced in subsequent years. The provisional allocation for 2021/22 including the SAICA allocation was R151 299 823. The reduced allocation from the NSF for postgraduate students is in part due to the increased demand for undergraduate student funding from the NSF and a depletion of the accrued funds in the NSF. The NRF supports the formation of a DSI-DHET-NRF working group to collectively develop strategies for sustainable postgraduate student funding.

The NRF entered into a strategic partnership with the Ikusasa Student Financial Aid Programme (ISFAP) in 2019 for the implementation of the DSI-NRF Postgraduate Student Funding Policy. Through this partnership, the NRF and ISFAP agreed to support full-time study for postgraduate students at the honours, master's, and doctoral levels on a 50:50 percent cost sharing model towards the FCS or PCS of qualifying students. ISFAP, in partnership with the NRF, will raise funding for postgraduate students and the NRF will match this funding on a 50:50 percent cost sharing thereby leveraging the funding from Government.

In addition, ISFAP has partnered with the NRF to facilitate a Household Means Test for applicants who require financial assistance to identify qualifying students for FCS. The first cohort of applicants in 2020 for funding in 2021 have undergone the Household Means Test facilitated by ISFAP. The NRF and ISFAP have also agreed to share data and information for advancing postgraduate training and for monitoring and evaluation.

The NRF has developed a Framework for Global Knowledge Partnerships for facilitating international training opportunities with international partner countries. These include Nuffic, DAAD, the British Council, the French South Africa Technology Institute (FSAT'I), and the Fulbright Programme. The NRF will soon conclude an agreement with the Institute of International Education (IIE) in the United States of America to provide and administer co-funding from the NRF for South African doctoral candidates selected to participate in the South Africa Fulbright Foreign Student Program as visiting research students for a period of twelve months.

BRICS Research Collaboration – NRF

In recognising the strategic importance of the partnerships among the BRICS countries, in March 2016 eight different funding agencies within the five BRICS countries signed the BRICS Science, Technology and Innovation (STI) Framework for the launching of annual multilateral calls to support research and innovation joint projects among the researchers of the BRICS countries. For the past five years the NRF has been participating in the BRICS STI Framework Programme (BRICS STI-FP) and is party to the annual joint multilateral calls for research proposals. A total of 93 joint projects (a third (31)) for NRF, have been supported through this partnership.

To further strengthen these strategic partnerships, a BRICS call was launched in 2020 to support joint projects starting from 2021 to 2023. This call was launched in partnership with the Medical Research Council (MRC) from the South African side since the call focused exclusively on health, in particular the COVID-19 pandemic in the following areas:

- Research and development of new technologies/ tools for diagnosing COVID-19;

- Research and development of COVID-19 vaccines and drugs, including repurposing of available drugs;
- Genomic sequencing of SARS-CoV-2 and studies on the epidemiology and mathematical modelling of the COVID-19 pandemic;
- Artificial Intelligence (AI), ICT and High Performance Computing (HPC) oriented research for COVID-19 drugs design, vaccine development, treatment, clinical trials and public health infrastructures and systems; and
- Epidemiological studies and clinical trials to evaluate the overlap of SARS-CoV-2 and comorbidities, especially tuberculosis.

To deepen these partnerships, during 2021 to 2025 all of the BRICS countries have approved the second phase of the BRICS STI FP. The NRF forms part of this second phase and will continue to serve as the main funder from the South African side. This second phase will be implemented in accordance with the revised BRICS STI FP.



5. Financial Overview

The NRF is primarily funded by a Parliamentary Grant (PG) (20%) and contract funding received from the DSI (70%). The balance of funds relates to contract funds from other Government departments, entities and private institutions (7%) as well as income generated through sales and interest income (3%).

The NRF's PG (baseline income) has been historically underfunded and has not kept up with real inflation. The projections based on the current letter for the next two years are projected to increase well below Consumer Price Index (CPI) at 2.4% in 2022/23 and by 0.4% in 2023/24. The total NRF funding levels comprising the PG and contract funding is unstable with an overall 1.8% budget cut in 2022/23 and thereafter a 5.5% increase in 2023/24 due to the National Equipment Programme which is funded every alternate year causing fluctuations year-on-year. This funding trend will require focused management effort to ensure sustainability. The final year of the MTEF assumes an inflationary increase of 4.5% based on National Treasury indicative CPI per the MTEC guidelines.

All NRF business units are under severe strain in the context of the broader Government-wide fiscal challenges with no panacea in sight over the medium term. Hence, while the NRF has endured many austerity measures and absorbed several funding cuts resulting in a very lean entity, it is forced to manage within the envelope of the allocation through continued stringent measures. Prudent decisions will need to be taken to ensure that general annual increases on cost-of-living adjustments and goods and services are contained through zero-based budgeting initiatives, making tough decisions and choices including reprioritisation or alternatively through forced balanced budgets.

The NRF requires consistent funding to be innovative and agile, to be competitive and at the leading edge of technological development but is, however, constrained by a lack of perpetual, meaningful funding while the demand for research and postgraduate student funds continues to increase.

Table 3: Financial status of the NRF

STATEMENT OF FINANCIAL PERFORMANCE					
CATEGORY	2020/2021 Actual R'000	2021/2022 Projected R'000	2022/23 Projected R'000	2023/24 Projected R'000	2024/25 Projected R'000
MTEF allocation - Parliamentary grant	859,469	962,587	997,408	1,001,295	1,046,051
MTEF allocation - DSI contract income*	2,297,584	3,594,897	3,299,698	2,957,115	2,984,933
Other contract income*	292,618	409,365	365,771	373,321	356,584
Interest received	35,399	19,214	17,005	17,007	17,007
Other income	79,494	112,254	126,760	162,131	234,764
Total income	3,564,564	5,098,317	4,806,642	4,510,869	4,639,339
Grants and bursaries	2,127,196	2,802,927	2,385,881	2,495,915	2,466,186
Operating expenditure	710,611	1,110,214	867,623	989,450	1,054,472
Salaries	822,664	909,529	1,026,304	1,101,808	1,152,394
Total expenditure	3,660,471	4,822,670	4,279,808	4,587,173	4,673,052
Net income before capital acquisitions	(95,907)	275,647	526,834	(76,304)	(33,713)
Less: Net capital expenditure and transfers	99,068	(275,647)	(526,834)	76,304	33,713
Net budgeted unspent funds	3,161	-	-	-	-

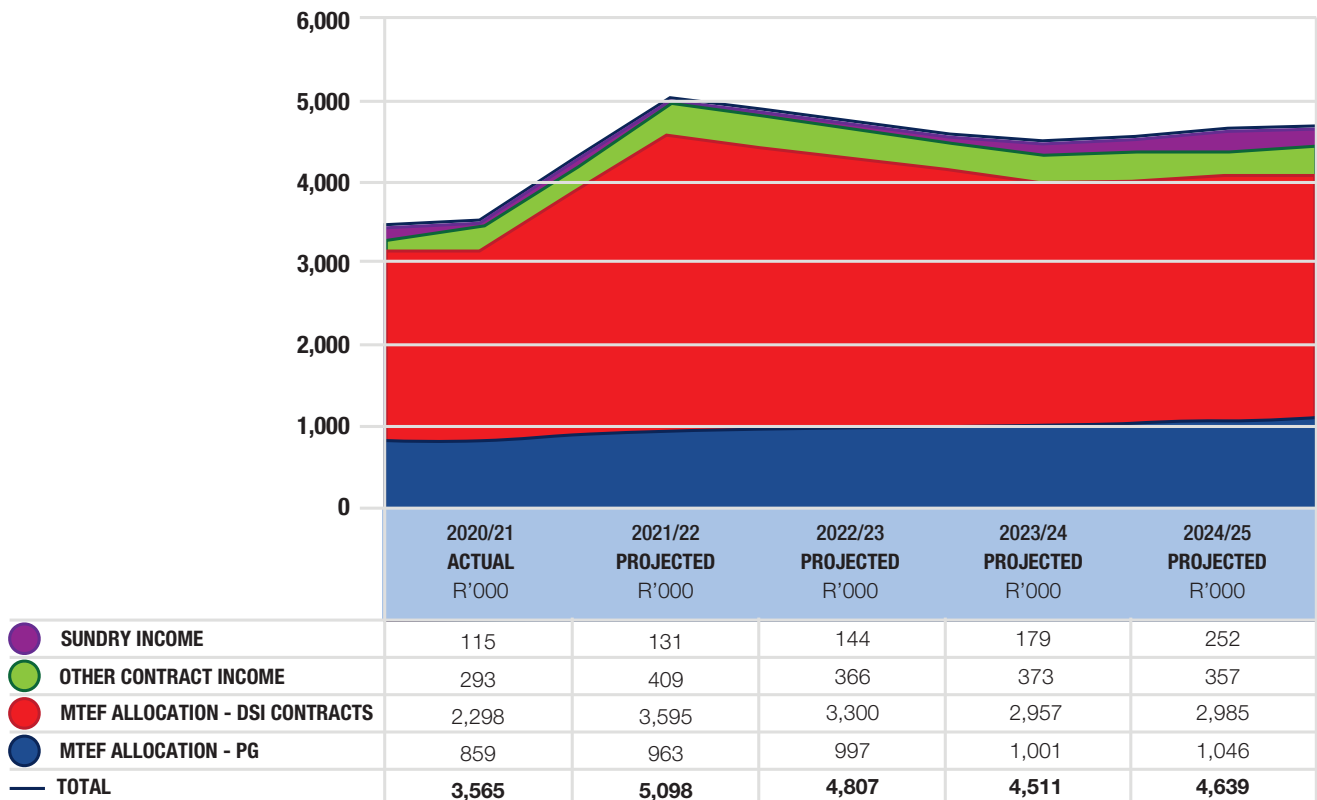
*Carry forward funding included

The budget provides for no new funding for new initiatives stipulated in NRF Strategy 2025 which will have to be sourced through internal reprioritisations while very limited provision is made for new capital expenditure from the PG (largely office and computer equipment).

Income

Income in most areas reflects a fairly stagnant trend over the MTEF period (refer to Figure 2). The decline in DSI contract funding in 2022/23 and 2023/24 relates to the projected depletion of NRF-SARAO funds for the MeerKAT Extension Project and accelerated spending on grant carry forwards in 2022/23 as the spending lag attributed to the pandemic and the lockdown recovers.

Figure 2 Comparison of Sources of Funding 2020/21–2024/25



The PG (baseline allocation) received by the NRF is utilised primarily to fund the programmes of the NRF and its related operational activities. The continuing effective drop in the PG impacts on the financial sustainability of the organisation as this source of funding supports the core foundational structure, operations, and mandate of the NRF. This will require ongoing focus and close monitoring of the key cost drivers without prejudicing the scientific and platform operations.

Considering that the National Research Facilities are largely funded from the PG, the impact is likely to affect their performance and sustainability which will have to be carefully managed over this difficult period. The real risk posed will be to ensure the upkeep and access to facilities. The fluctuation and volatility of the Rand against major foreign currencies further exacerbates the challenge as the maintenance and upkeep costs of scientific infrastructure far outpaces inflation as specialised materials and equipment are imported. The increased trajectory of sundry income is attributed to the projected growth in radio-isotope sales.

Expenditure

In light of the NRF MTEF allocation not mirroring projected inflationary levels, the NRF must ensure that it remains sustainable over the medium term with particular focus on carefully managing:

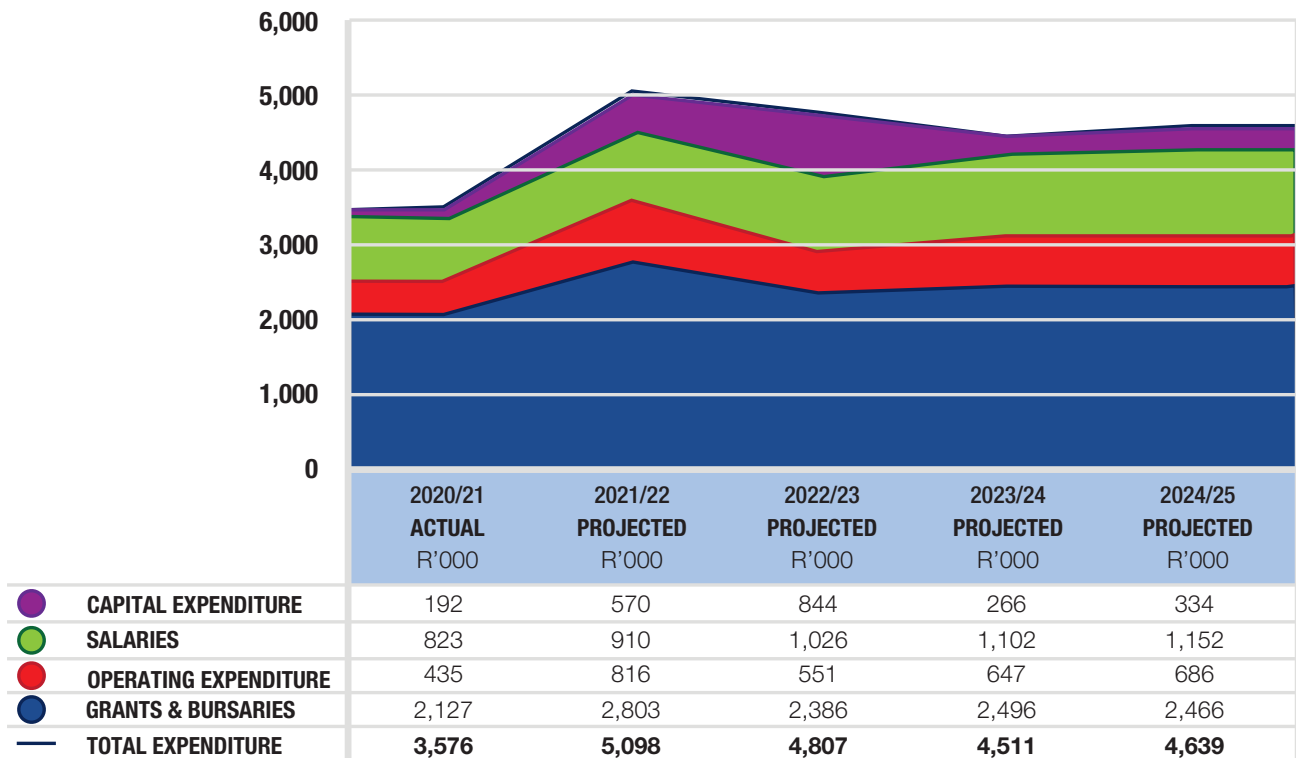
- The movement in the overall salary bill and staffing requirements (based on Government's stance on minimising the public sector wage bill).
- The operational costs which generally exceed inflation such as utilities and maintenance.
- The impact of foreign exchange volatility.
- The lack of flexibility in initiating necessary bold new initiatives and its impact on targets.

The cost of delivering on the mandate of the NRF and systemic demands coupled with inflationary pressures and price increases are significantly outpacing the PG allocation. These include, but are not limited to, over subscription of applications for postgraduate student bursaries, which have not kept up with real inflation. Similarly, the value and reach of grants to researchers have not increased, and in some instances have been reduced. In addition, maintenance, renewal, and acquisition of necessary research infrastructure platforms and related equipment have been significantly compromised.

Expenditure Trends

Per the Statement of Income and Expenditure above and Figure 3 below, the expenditure trends variations are attributed to the following explanations:

Figure 3 Comparison of expenditure 2020/21–2024/25



Capital expenditure is provided at a bare minimum in order to maintain the operations based on the limited resources – mostly office and computer equipment. Ordinary capital expenditure requirements will be funded from any savings made in the particular year. The exception is the continuing capital expenditure at NRF-SARAO for the MeerKAT Extension and preparatory costs for the SKA1 build and as funding is received for the South African Isotope Facility (SAIF) cyclotron based at NRF-iThemba LABS.

Grants and bursaries are directly linked to the movement in funding and subsequently to movements in performance targets. Research grants and bursaries account for 57% of the total NRF expenditure, which is invested through research grants, scholarships and bursaries at universities through various funding instruments.

Operating expenditure will remain constant across the business units except for NRF-South African Radio Astronomy Observatory (SARAO) with a

shift in its expenditure pattern as it transitions into operations following the commissioning of MeerKAT. The increase in 2021/22 is due to South Africa's membership fees of €8.14 million paid to the SKA Organisation.

Employee's remuneration is forecasted to increase in line with a cost-of-living adjustment as per National Treasury guidelines. The prior year wage freeze for senior officials has been factored in and will impact on the budgets going forward. The budget includes vacancies and staff requirements for the SARIR (NRF-SAEON) and SKA1 (NRF-SARAO) projects, otherwise the staffing levels have remained stable in all other business units.

The primary changes and challenges per the programme below, mainly addresses the key mitigation interventions and context.

RISA

RISA's main business activity is grant funding which comprises 93% of RISA expenditure. This expenditure is characterised by investments in research grant funding, bursaries and scholarships and research equipment grants.

Over the medium-term period, no funding growth is allocated, hence grant funding follows the same trend. In the event of further budget cuts, it is likely that the size and number of grants will be reduced which could have systemic repercussions with negative reputational implications.

National Research Facilities

The primary cost drivers at the National Research Facilities are associated with maintaining their massive suites of research infrastructure with their unique capabilities to contribute to relevant research capacity, human capital development and the advancement of science. The primary source of funding at the facilities is limited to the PG (baseline funds) and the negative income trend leaves no room for any replacements, while costs for maintenance and upkeep remain stringent.

Science Engagement

The re-organisation of NRF-SAASTA in gearing towards the implementation of the Science Engagement Strategy will require focused attention. Key business interventions have already been initiated in line with the proposed top slicing of funding towards the shift to invest at least 4% of funding in science engagement. This level of investment has not yet been factored into the above figures due to the reduced allocation in view of the pandemic. It is likely that the current level of investment will be in the region of 2%-3% based on the MTEF figures.

PART C



MEASURING OUR PERFORMANCE

1. Institutional Programme Performance Information

The scope of work of the NRF is organised into budget programmes, where three of the programmes are designed to cover the delivery by the organisation on its legislative mandate. The four programmes are:

Programme 1: Administration

Programme 2: Science Engagement

Programme 3: Research and Innovation Support and Advancement

Programme 4: National Research Infrastructure Platforms

1.1 Programme 1: Administration

Purpose

Programme 1 comprises of shared services functions and systemic enterprise-wide coordination capabilities to achieve synergies, shared systems and economies of scale, and to provide strategic direction. The frugal yet optimal and efficient design of this programme is necessary especially in this phase of the national economic cycle, where resources are scarce, and the needs are too numerous for the available resources. Programme 1 comprises of the following functions or sub-programmes:

- Strategy, Planning and Partnerships;
- Corporate Relations and Communication;
- Finance and Business Systems; and
- Human Resources and Legal Services.

Strategy, Planning and Partnerships (SPP)

The purpose of Strategy, Planning and Partnerships (SPP) is to inform and lead the development of organisational strategy; leverage additionally to advance the mandate of the organisation; and to be the authoritative source of organisational and system intelligence. The SPP division has three directorates: Planning and Development; Information and Analysis; and Strategic Partnerships.

The **Planning and Development directorate** provides macro-organisation strategic planning, policy development, research, and advice. The directorate carries out quantitative and qualitative analysis of NRF initiatives and performance; develops

frameworks, advice, and concept documents; and contributes to evidence-led policy development and implementation.

The **Information and Analysis directorate** informs internal and external decision-making by providing system intelligence that is produced by mature and integrated business intelligence channels. The directorate fosters a culture of evidence-led decision-making while it supports the organisation in collecting and interpreting organisation-wide data, to assist in demonstrating outputs, outcomes, and impact of the NRF's investment

The **Strategic Partnerships directorate** is the primary custodian through which the NRF identifies, establishes, and monitors its strategic partnerships. The directorate strengthens existing and establishes pertinent new partnerships with Government and its entities, industry, development partners and civil society towards a responsive, coordinated, and relevant NSI. Continentally, the directorate accelerates engagement among African countries to develop expertise, build capacity, and contribute to the local and the continent's development agendas.

Corporate Relations (CR)

The purpose of Corporate Relations and Communication is to manage the public image of the organisation to ensure that it retains its legitimacy as a reliable public entity that delivers on its legislative mandate. The Corporate Relations division strategically and operationally contributes to the achievement of the NRF's strategic objectives through the development and execution of corporate and research communication policies, strategies, and programmes.

Specifically, the unit contributes towards the achievement of two strategic outcomes as per NRF Vision 2030 and Strategy 2025, which are an enhanced impact of science engagement, and a transformed organisation that lives its culture and values.

The cross-cutting functions that constitute the mandate of the division are, broadly, corporate communications (internal communications, social media, and traditional media), branding and marketing, research communication and stakeholder engagement. This scope of work is undertaken by two sub-divisions, i.e., Research Communication and Marketing, and Media Relations and Internal Communications.

Finance and Business System (FBS)

The Finance and Business Systems (FBS) division is a cross-cutting corporate function. The division provides a shared services function across the NRF and largely draws its mandate from the Public Finance Management Act (PFMA, Act 1 of 1999, as amended) by ensuring that the NRF has and maintains effective, efficient, and transparent systems of financial management and proper internal controls that warrant the most economical and transparent use of the resources. It is also responsible for the development and maintenance of organisation-wide management systems for the management of organisational performance, policies, risk, compliance, and accountability. These systems form the critical part of the organisation's governance infrastructure, and they are pivotal to fostering the gradual realisation of the "OneNRF" corporate strategy, while they enable the organisation to meet statutory requirements, deliver on stakeholder expectations and facilitate top management decision making and oversight by the Board. The key area of focus of the sub-programme includes Governance, Corporate Finance, Supply Chain Management and Information Technology and Knowledge Resources.

The Governance directorate develops and maintains effective and efficient governance infrastructure that facilitates management and governing body (Board) decision-making and oversight and enables the organisation to deliver against its mandate and communicate its value to stakeholders in order to enable the organisation to achieve good performance; organisational effectiveness; transparency; and an ethical culture. The directorate executes its role through three units, namely: Performance Planning and Reporting; Risk Management; and Ethics and Compliance.

The Corporate Finance sub-division provides shared services within the NRF by promoting accountability and transparency in the NRF in the form of annual financial statements, financial management, treasury function, internal management reporting, cash flow management, statutory reporting, PFMA compliance and other key finance-related legislation.

Corporate SCM's role is to provide fit-for-purpose policies, capacity building, reporting, legislatively mandated governance structures and guidance and to facilitate the procurement and disposal of goods and services supply chain management through a legislatively compliant and ethical systems and transformation. This sub-division executes its role through units focused on Business Support and Transformation; Systems, Policies and Specifications; and Compliance and Reporting.

The Corporate ICT and Knowledge Resources directorate aims to facilitate the management of information through a legislatively compliant governance framework, and an Information Management Charter that gives rise to a suite of enabling policies and procedures that recognise the necessity of managing and protecting information as an NRF asset. The information creation and management value chain of the NRF is underpinned by fit-for-purpose technical infrastructures, flexible architectures, streamlined services and compliant processes. The directorate executes its role through three units, namely: ICT Governance and Support Service; ICT Integration of Systems and Platforms; and Information Management.

Human Resources and Legal Services (HR&LS)

The purpose of this sub-programme is to facilitate a conducive, attractive, inclusive, and integrated transformed work environment where employees thrive and achieve not only excellence in their performance outputs but also a sense of career fulfilment, engagement, and total quality of work life. The division aims to facilitate the NRF's progression towards a transformed, coherent organisation that strives for excellence through its lived organisational culture with the goal to be a high-performance, supportive, and inclusive learning organisation. The HR&LS functions provide the NRF with comprehensive human resource and legal services and give policy direction and strategy execution guidelines in these areas. The key focus areas of this sub-programme include Talent Sourcing, HR Systems and Process, Training, Organisational Development and Wellness as well as Legal and Employee Relations Services.

Table 4: Outcomes, outputs, performance indicators and annual MTEF targets for Programme 1

Strategic Outcome	Output	Indicator Number	Output Indicators	Audited Performance		Estimated Performance	MTEF Period		
				2019/20	2020/21	2021/22	2022/23	2023/24	2024/25
A transformed organisation that lives its culture and values	A transformed leadership and management cohort	1	Proportion of employees from designated groups at Peromnes levels 1-7	51.8%	53.3%	60.6%	63.7%	65.3%	66.9%
	Predictable and sustainable resourcing of the NRF mandate	2	Organisation overheads as a proportion of total expenditure	7.5%	7.7%	<10%	<10%	<10%	<10%

Table 5: Output indicators, annual and quarterly targets for Programme 1

Indicator Number	Output Indicators	2022/23 Annual Target	Q1	Q2	Q3	Q4
1	Proportion of employees from designated groups at Peromnes levels 1-7	63.7%	-	-	-	63.7%
2	Organisation overheads as a proportion of total expenditure	<10%	-	-	-	<10%

Explanation of Programme 1: Planned Performance over the Medium-Term Period

A transformed and transforming NRF is an inclusive and diverse organisation that supports and promotes the simultaneous eradication of all aspects of unfair discrimination, recognises and respects diverse cultures and knowledge systems, and supports a research and higher education sector that gives full expression to opportunities for all, in line with the ambitions of national education, science and technology policy.

Strategy, Planning and Partnerships (SPP)

Key activities and deliverables for the medium-term will include:

Advancing equality, diversity and inclusivity in the research enterprise (with a specific focus on African and Coloured women, and Persons with Disabilities): In 2022/23, SPP will work with other NRF business units in implementing measures

to address the underrepresentation of African, Coloured Women and People living with disabilities, at postgraduate and researcher levels.

Research Impact Agenda: SPP has led the development of an NRF Framework to Advance the Societal and Knowledge Impact of Research, that defines and positions the organisation to implement a research impact agenda. In 2022/23, the organisation will continue to engage key stakeholders and review internal processes to implement the research impact agenda.

Future Earth: Establish the Future Earth Global Secretariat Hub for Africa at the NRF.

African Open Science Platform (AOSP): Strategic operationalising of the platform and exploring provision of value-added services.

Finance and Business Systems (FBS)

Key activities and deliverables for the MTEF period will include:

- **The Enterprise Resource Planning (ERP) system** – Through the ICT Governance and Support Services unit, establish and co-ordinate the envisioned ERP Centre of Expertise, i.e. the ERP Management Office (EMO).
- **NRF Corporate Governance Operating Model:** Revise the corporate governance framework to optimise the effectiveness and efficiency of governance and achievement of performance objectives.
- **Unqualified Audit Opinion** – The NRF has always achieved unqualified audits endorsed by a Clean Audit award in the prior year. In continuing this endeavour, and due to extensive interest in the public sector's irregular, fruitless and wasteful expenditure, the division will continue to place emphasis on monitoring transactions to detect and ensure PFMA compliance and, where necessary, take appropriate corrective action and consequence management.
- **NRF Monitoring and Evaluation:** Develop and implement a Planning, Monitoring and Reporting Policies and Procedure Manual as part of the NRF Policy Framework during the medium-term. This will allow the achievement of integrated thinking, facilitate effective steering and oversight by the governing body and executive management, as well as enable the achievement of alignment of the organisation's plans and reports with requirements set at national level.
- **Procurement and Supply Chain Management (SCM):** Focus on assisting business units in meeting their procurement plan targets and the implementation of the NRF SCM Transformation Strategy towards improving the NRF's Broad-Based Black Economic Empowerment (B-BBEE) level and ensuring compliance to SCM standards and regulations.
- The NRF is committed to ethics in all of its business activities and has established ethics governance and management capacity to lead the design and implementation of an organisation-wide ethics programme. This capability aims to develop and manage ethical culture in order to mitigate risks of loss of reputation and support from stakeholders.

Human Resources and Legal Services (HR&LS)

Key activities and deliverables for the MTEF period will include:

- **NRF Culture:** Review of the organisational culture to ensure that a desired culture compatible with the strategic direction and reflective of the NRF values becomes the lived culture among all employees.
- **Management and Leadership Development Programmes:** Update and implement the Strategic Management Development Programmes, New Managers Development Programme and Future Managers Development Programme to ensure their effectiveness and impact on achievement of succession planning and organisational performance objectives.
- **Organisational Climate:** Improve the organisational climate and create a 'happy' work environment and nurture a harmonious and positive management and labour relations environment.
- **NRF Diversity Management Programme:** Drive internal organisational transformation through continued and focussed implementation of the recommendations derived from the diversity assessment.
- **Skills Development and Staff Retention:** Intensify efforts to achieve the desired transformation objectives.
- **Human Resource Systems:** Adapt and implement functionalities as part of the ERP system to optimise efficiencies for the organisation.
- **Talent Management:** Ensure targeted attraction and retention of particularly scarce and critical skills for the NRF.

Corporate Relations

Key activities and deliverables for the medium-term will include:

- Furthering a unified, coherent NRF communication and marketing approach through the NRF-wide Corporate Communications Forum.
- Finalisation of a new NRF Brand and Communication Strategy.
- A revised marketing approach in line with a focus on advancing innovation.

- A portfolio of research communication activities and products.
- Enhanced internal communications that is

an integral part of building the organisational culture, based on the principle of ONE NRF and in fostering brand ambassadorship.

Table 6: Programme 1 resource considerations

	Budget	Budget	Budget	Budget
	2021/22	2022/23	2023/24	2024/25
	R'000	R'000	R'000	R'000
Parliamentary Grant	109 836	122 110	121 742	126 776
DSI Contracts	15 547	-	-	-
Other Contracts	1 232	3 382	3 418	3 533
Internal Income	45 842	36 403	33 344	35 021
Other Income	14 289	12 070	12 075	12 073
Total Income	186 746	173 965	170 579	177 403
Running Expenses excl. depreciation	79 912	68 578	67 519	70 084
Grants and Bursaries	400	774	746	795
Salaries	87 400	98 415	98 852	102 873
Capital Expenditure	19 034	6 198	3 462	3 651
Total Expenditure	186 746	173 965	170 579	177 403

Income

Programme 1 – Administration (Corporate) is primarily funded from the PG (74%). Income is also received from interest and levies charged to other NRF business units (24%). The balance refers to international contract funding managed by the SPP directorate (2%).

The increase in the PG is mainly attributable to the transfer of the Research and Development Information Platform (RDIP) (previously RIMS) from DSI Contracts to the PG. The PG growth is well below CPI and Corporate is dependent on levy recoveries from business units to fund the administration services delivered to the business.

The decline in the total income mainly relates to a decrease in interest income as reserves are depleted with the completion of the ERP implementation. The PRMB recovery declined as business units move to it being paid in full.

Expenditure

With the PG allocation not matching the projected inflationary levels, projections were forced balanced. Continued stringent measures will be imposed to ensure expenditure is maintained within the allocation which is below projected inflation.

The decrease in expenditure when compared to 2021/22 relates mainly to capital expenditure for the finalisation of the ERP implementation funded from income reserves.

Employee's remuneration includes vacancies and staff requirements as well as a cost-of-living adjustment that is not in line with inflation. The salary bill will have to be well managed through prudent decisions.

1.2 Programme 2: Science Engagement (SE)

Purpose

Science and its benefits are seen as central to national, economic and social prosperity. One of the prerequisites for an effectively functioning NSI is a society that is aware of the value and potential dangers and challenges of science and has the ability to evaluate the products of science; use the processes of science in its daily life (for example, asking questions, collecting and analysing evidence, and evaluating possible results); and engage in debate on science-related matters of public interest (Science, Technology and Innovation White Paper, 2019).

In line with the above intentions, the purpose of Programme 2 is to transform the relationship between science and society through a focus on public awareness of, and engagement with, science. The NRF supports the national imperative of developing a scientifically literate society through the deliberate strategic foci of engaged research; enabling public access to research and science engagement infrastructure; support for the development of science, technology, engineering and mathematics education; building science engagement capacity and capability; and facilitating collaborations through private sector partnerships in science engagement.

Through a 'whole of NRF approach', the National Facilities play a critical role in advancing science engagement. They accomplish this by, among other things, providing platforms for engagement by

society with the science they perform via facility tours, science talks and science communication publications; inspiring an interest among the youth to pursue careers in science, engineering and technology through exposure to the scientific environment and role modelling; contributing to the improvement of the quality of learning and teaching in STEMI subjects through educator and learner development initiatives and activities; and enhancing the profile of South African science through achievement of ground-breaking knowledge advancements and/or technological breakthroughs, as well as international engagement and partnerships.

This requires an ongoing process of embedding science engagement more holistically within NRF programmes including better enabling of engaged research and scholarship. This approach is congruent with the Science Engagement Strategy, which places emphasis on developing critical engagement between the public and science and noting '*...the imperative of empowering the general public to engage critically with science and technology means that it is necessary to empower "science" as a social phenomenon to engage the public (Science Engagement Strategy pg. 17)*'. Beyond the NRF, the broader science engagement programme managed and coordinated by NRF-SAASTA includes collaboration and coordination with both DHET/DSI entities and a wide range of SET network partners. This extended coordination function has been assigned to NRF-SAASTA through the Science Engagement Strategy and all areas of scope outlined will give maximum effect to the overall aims of the strategy.

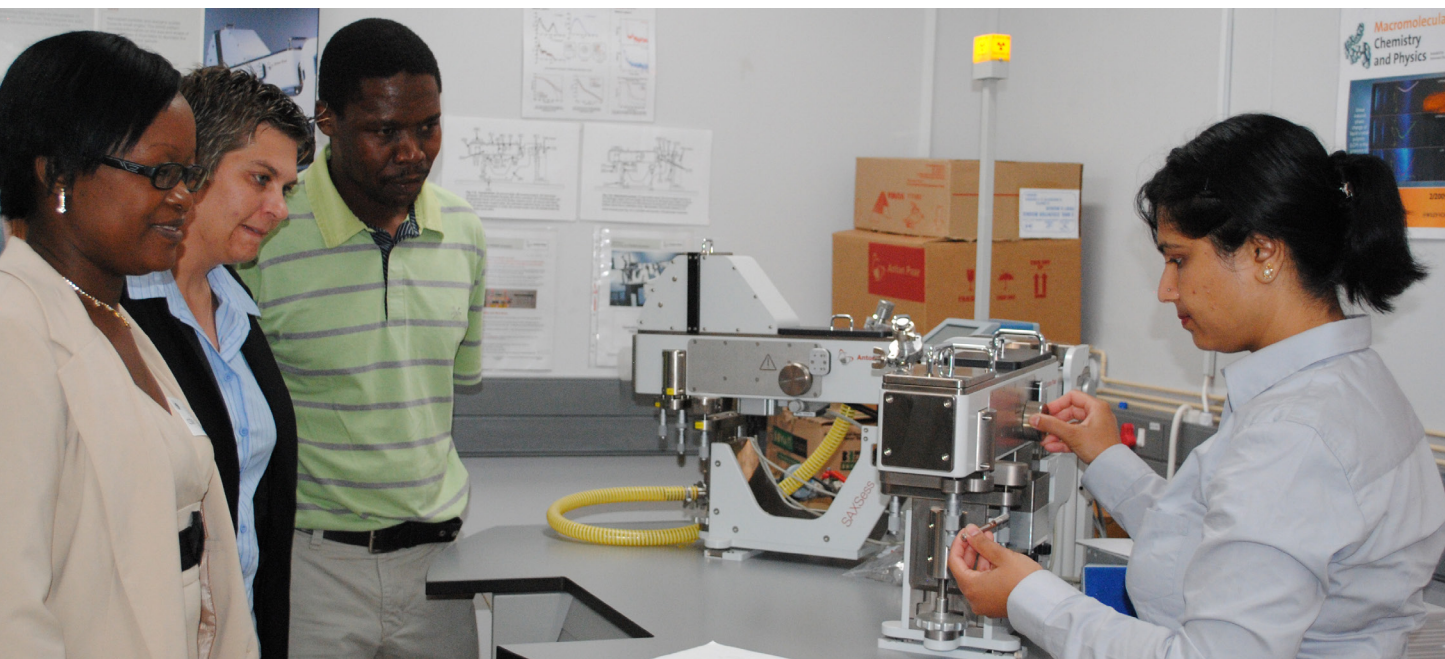


Table 7: Outcomes, outputs, performance indicators and annual MTEF targets for Programme 2

Strategic Outcome	Output	Indicator Number	Output Indicator	Audited/Actual Performance			Estimated Performance	MTEF Targets		
				2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25
Enhanced Impact of Science Engagement (SE)	Science engagement interventions	3	Number of interventions implemented for the general public.	New	New	New	New	12	14	14
		4	Number of interventions for Maths, Science and Technology (MST) support for learners.	New	New	New	New	14	16	16

Table 8: Output indicators, annual and cumulative quarterly targets for Programme 2

Indicator Number	Output Indicators	2022/23 Annual Target	Q1	Q2	Q3	Q4
3	Number of interventions implemented for the general public.	12	4	5	12	12
4	Number of interventions for Maths, Science and Technology (MST) support for learners.	14	5	8	14	14

Explanation of Programme 2: Planned Performance over the Medium-Term Period

Science engagement initiatives across the NRF are carried out in all seven NRF business units including NRF-SAASTA, NFs and RISA. The policy direction and coordination of execution are managed by NRF-SAASTA, which is also the primary NRF business unit solely focused on delivery of the science engagement mandate of the NRF and the assigned role of national coordinator of science engagement by the DSI.

Within the NRF, the execution of the SE implementation plan led by Programme 2 has been realised through an emphasis on science awareness, science communication, and science education, respectively, to support the full science engagement value chain for the development of a scientifically literate society that can critically engage on science matters, especially those affecting the daily lives of the different publics that include the general public and learners. The three areas are interdependent, each enhancing the effectiveness of the other, while

accommodating different target audiences and creating opportunities to work collaboratively with other sectors from both public and private such as Government departments, HEIs, science councils, science centres, industry, and other interest parties in science.

Annually the NRF has been able to implement various interventions across the country reaching over 172 000 learners and one million publics respectively. In line with NRF Strategy 2030 that drives the DSI's national agenda towards contributing to the triple challenges of poverty, inequality and unemployment, transformation remains a key priority for the NRF to reach out to and engage communities, especially those that are historically disadvantaged, through the two identified high-level indicators in the table above. Thus, the need exists for the NRF to collect data that clearly indicates the nature of interactions, the topics covered, the demographics of participants in terms of gender, and provincial reach according to municipalities and metros.

Science Education (Learners and educator support)

Several interventions will be initiated through project implementation to augment learning and teaching in the critical areas of mathematics, sciences, life orientation and technology. This is generally achieved through supplementing the curriculum through career profiling; role modelling; learning and teaching support material; Olympiads and competitions; science camps and workshops; and visits to the various science infrastructure platforms. The ultimate aim is to contribute meaningfully to the much-needed skills and careers in science fields.

The role of an educator is imperative in the nurturing of a learner's evident or latent talent and continuous educator support and development is vital. Through this focus area, partnerships are formed with the Department of Basic Education (through mathematics, science and technology coordinators, curriculum advisers and district managers), professional associations (including the South African Association for Science and Technology Educators and the South African Institute of Physics) and universities to innovate, conceptualise and implement content and methodology workshops and resources development, and for distribution across the country. Some of the key projects include National Science Olympiads Competitions, educator workshops, Techno Youth™, science camps for learners with potential and school-based and supported science clubs.

Science Awareness (Public and science and infrastructure support)

South Africa's research and innovation system is expected to assist in finding solutions to the social and economic challenges of the country. Global competitiveness, shrinking resource availability and the requirements of a skilled labour force mean that broader awareness and understanding are increasingly required to developing a critical knowledge society. With the challenges of the recent COVID-19 global pandemic this becomes even more important for advancing the public awareness of developments in scientific fields and technological know-how. Members of the public are generally engaged through science festivals, exhibitions, and facility tours at the National Facilities. Some of the facilities also offer internships and/or job-shadowing opportunities. It is imperative to ensure that public awareness initiatives extend to rural communities. Some of the initiatives include projects such as the mass events of National Science Week, the science festivals and international days, exhibits, Ministers' Imbizos, and evening public viewings (astronomy).

Other programmes include the Youth Science Journalism Programme, Programmatic Support Grant Intervention (science centres), development of the National Network of Science Centres through science accreditation and science centre capacity building.

Science Communication (scientists and journalist support)

Science communication is a critical component in developing an informed public that actively engages with, and participates in, the national discourse on science and technology. Specialist areas within science communication include media engagement, audience analysis, scientific editing, ICT specialisation and discipline-specific science communication. DSI discipline-specific communication areas currently include biotechnology, nanotechnology, hydrogen fuel cell technology, space science, the palaeosciences and Antarctic research, although these priority areas are under discussion with the DSI for possible change in emphasis and operation. In addition, science communication in scientific disciplines such as astronomy, biodiversity, conservation, and nuclear science is also undertaken by the various National Facilities.

The NRF offers a variety of interventions to improve capacity in quality science communication. Two South African Research Chairs Initiative (SARChI) Chairs in Science Communication are funded and fully active and will provide research leadership in the discipline over the MTEF. Researchers and scientists are encouraged to participate in science engagement and to also involve communities in their research by inculcating a culture of participatory research. Work to develop an NRF Engaged Research Framework is underway. To further engage with society on science related matters, the established Science for Society Lecture Series is held several times each year in collaboration with various universities and researchers, especially those from the Centre of Excellence (CoE) and SARChI programmes. Others include partnerships with community media to promote science in indigenous languages and an increased media placement of science-related material including translation of scientific information into audience-specific resources (this incorporates the science editing, production, and ICT functions), for example, fact sheets, posters, media-friendly articles, communication products, booklets, career brochures and information videos. As a result of collaboration with the Media Development and Diversity Agency (MDDA), in 2020 the NRF managed to ensure that science was communicated in 90% of South Africa's official languages (10 of the 11 official

South African languages) using existing databases of scientists and researchers. High-quality engagement is interpreted as communication which involves mutual, beneficial interactions between researchers and relevant public audiences or participants, and which ultimately shape or enhance the quality or impact of the research.

The long-term results of successful science engagement programmes should, over six to ten years, result in enhancing the scientific literacy in South Africa and in the public's confidence, trust, and attitude towards sciences. Currently the absence of regular periodic, dedicated studies measuring such changes leaves the system without sufficient baseline data to establish, with confidence, the meaningful impact of the investments in science engagement. In recognition of this, the DSI Science Engagement Strategy (SES) and its Monitoring and Evaluation Framework indicate the need for a science engagement and information management system, currently under discussion between DSI, NRF and the Council for Scientific and Industrial Research (CSIR). To this end, the NRF, through NRF-SAASTA, will collect, manage, and analyse science engagement data on an ongoing basis. The long-term impact of the implementation of the science engagement programme of the NRF will be assessed using large-scale surveys to be administered by the Human Sciences Research Council (HSRC).

Alignment with NRF Strategy 2025

Programme 2 contributes to the achievement of NRF Strategy 2025, primarily to the strategy outcome "Enhanced impact of science engagement" through the following Programme 2 strategic key focus areas during the MTEF period:

- **Embedding engaged research:** It intends to achieve the following goals – build trust between publics and scientists; strengthen the interface between science and society; increase public understanding of the process and impact of science; embed high quality and innovative public engagement as an integrated part of research; influence and support public culture and democratic citizenship; and enhance research and its impact.
- **Enabling public access to research and science engagement infrastructure:** The goals are to ensure a greater number of the public have access to science engagement infrastructure; that infrastructure sees the maximum benefit to society through raising awareness of research capabilities and profiling South African science achievements. In this regard the access to

National Research Infrastructure Platforms for science awareness and the science centres enhances the engagement due the tangible and practical experience that is derived from the infrastructure.

- **Support for the development of STEMI education:** This focus area ensures the provision of support to the education sector to improve STEMI participation and performance and human capital development in these critical areas. These will be achieved through the following goals in collaboration with the Department of Basic Education (DBE); Higher Education's Institutions and the business sector – provision of STEMI curriculum support; identifying and nurturing STEMI talent; supporting the professional development of educators and equipping them with knowledge of STEMI fields; inspiring a passion for STEMI fields; enabling the next generation and future researchers to act as informed citizens on scientific issues.
- **Building science engagement capacity and capability:** This focus area ensures the development of science engagement skills and capacity for meaningful and impactful science engagement. Through this focus area, the intention is to achieve the following goals – ensure more impactful science engagement by researchers, media, science communicators and other stakeholders; develop the capability to engage different and varied audiences in research and engagement with current trends and research in science communication; develop high-quality, impactful, and ethical resources that will enhance science engagement for all the public. The number of indigenous languages used in science communications is forecasted to grow from 8 to 11 during the medium-term period.
- **Facilitating public/private sector relations in science engagements for public benefit:** This focus area ensures the strengthening and creation of public-private sector collaborations to promote a more effective interface between science and society. The goals of this focus area are to ensure that the investment in research infrastructure under the control of the business sector sees the maximum benefit to society through raising awareness of research capabilities; greater awareness of existing local technological and innovation skills and capabilities and future technology development; and an investment in science engagement by the private sector in support of all of the focus areas.

Tale 9: Programme 2 resource considerations

	Budget	Budget	Budget	Budget
	2021/22	2022/23	2023/24	2024/25
	R'000	R'000	R'000	R'000
Parliamentary Grant	109 836	122 110	121 742	126 776
DSI Contracts	15 547	-	-	-
Other Contracts	1 232	3 382	3 418	3 533
Internal Income	45 842	36 403	33 344	35 021
Other Income	14 289	12 070	12 075	12 073
Total Income	186 746	173 965	170 579	177 403
Running Expenses excl. depreciation	79 912	68 578	67 519	70 084
Grants and Bursaries	400	774	746	795
Salaries	87 400	98 415	98 852	102 873
Capital Expenditure	19 034	6 198	3 462	3 651
Total Expenditure	186 746	173 965	170 579	177 403

The re-organisation of NRF-SAASTA in gearing towards the implementation of the DSI Science Engagement Strategy will continue to receive focused attention. Key business interventions have already been initiated in line with the DSI proposed top shift for science councils to invest at least 4%

of funding in science engagement. This level of investment has not yet been factored into the above figures due to the reduced allocation in view of the COVID-19 pandemic. It is likely that the current level of investment will be in the region of 2%-3% based on the MTEF figures.



1.3 Programme 3: Research and Innovation Support and Advancement (RISA)

Purpose

The core purpose of Programme 3 of the NRF is to respond to part of the NRF legislative mandate as stated in the following extract from the “Object of the Foundation” per the NRF Act – “supporting, promoting, and advancing research and human capacity development, through funding, ... to facilitate the creation of knowledge, innovation and development in all fields of science and technology, including humanities, social sciences and indigenous knowledge”. Programme 3 has the same name as its leading business unit, namely, Research and Innovation Support and Advancement (RISA), as the NRF business unit that carries the overall responsibility for strategic and policy direction of the programme. The Business Unit will simply be referred to as RISA in this Annual Performance Plan (APP) while Programme 3 will retain the full name. RISA leads and primarily performs the statutory responsibility as stated in Object (a) of the NRF Act. RISA is also expected to coordinate Programme 3’s strategic direction, policy framework, and programme performance.

Programme 3 is organised into four funding domains and two supporting units, respectively, as follows:

- Human and Infrastructure Capacity Development (HICD);
- Knowledge Advancement and Support (KAS);
- Research Chairs and Centres of Excellence (RCCE);
- National Facilities Business Units (NFs BUs);
- Reviews and Evaluations (RE); and
- Grants Management and Systems Administration (GMSA).

The NFs BUs currently use differentiated processes for grants management, with some of it wholly managed by the NFs BUs and others managed through RISA. However, the processes applied by the NFs BUs are aligned to the RISA-based processes. Gradual integration of processes and utilisation of common supporting systems will be realised over the period of NRF Vision 2030 in line with the goal of achieving a “One NRF”.

The key strategic or performance focus areas for this component unit of RISA are outlined in Table 10.

Table 10: Key performance areas of NRF funding domains

Funding Domains	Key strategic or performance focus areas
HICD	<ul style="list-style-type: none"> • Advance equity and transformation of the next generation of researchers in line with the DSI-NRF Postgraduate Funding Policy; • Enhance transformation and equity of the early career/emerging researcher cohort thus increasing the size and composition of emerging researchers in line with the Human Capital Development (HCD) Strategy for Research, Innovation and Scholarship, and the Staffing South African Universities Framework (SSAUF); • Transform, renew and replenish the internationally recognised leading researchers and scholars cohort in order to sustain the academy and the science system; • Advance research excellence through enabling access to international research training opportunities for postgraduate students and researchers; and • Enable state-of-the art research infrastructure and platforms to advance globally competitive research and postgraduate training.
KAS	<ul style="list-style-type: none"> • Facilitate the generation of knowledge; • Support and promote the advancement, development and application of knowledge [including up-take and translation of knowledge]; • Promote and support national and international collaborative knowledge generation and advancement; • Facilitate the development of related human capacity; and • Promote and support interactions between researchers within and across disciplines, and knowledge fields.

Funding Domains	Key strategic or performance focus areas
RCCE	<p>SARChI:</p> <ul style="list-style-type: none"> Strengthen the scientific research and innovation capacity of South Africa; Attract and retain excellent researchers and scientists to public universities; Strengthen and improve quality and quantity of research and innovation outputs in research areas of national importance; Create research career pathways for highly skilled, excellent young and mid-career researchers; and Strengthen and improve research and innovation capacity of universities for producing high quality postgraduate students, research, and innovation outputs. <p>CoE:</p> <ul style="list-style-type: none"> Ensure the integration of several smaller and related research initiatives into large science programmes; Exploit the competitive advantage vested in outstanding researchers; Raise the quality, international competitiveness, visibility and esteem of South African science, for example by an increase in global share of research outputs; Achieve economies of scale through the optimisation of resources and effort through sharing personnel, equipment, data, ideas, etc.; Ensure secure and stable funding for research and dissemination; and Allow for planned, strategic, long-term research.
NFs BUs	<ul style="list-style-type: none"> By offering competitive scholarships, establish a transformed and sustainable radio astronomy community that is capable of exploiting the scientific return of research platforms, as well as research and development in related engineering disciplines; Through ACEP-Phuhlisa programme equip the next generation of scientists and research platform-managers with tools to research, analyse, understand and manage environmental change; Continue as strategic participants in the DSI-NRF-funded National Astrophysics & Space Science Programme (NASSP), a multi-institutional initiative to train South African students in Astrophysics and Space Science at honours and master's levels and to provide a pipeline to doctoral studies in these and related areas; and Participate in other human capacity development programmes supported by the DSI/NRF, such as the Professional Development Programme.

Table 11: Outcomes, outputs, performance indicators and annual MTEF targets for Programme 3

Outcomes	Outputs	Indicator Number	Output Indicators	Audited/ Actual Performance	Estimated Performance	MTEF Period		
				2020/21	2021/22	2022/23	2023/24	2024/25
A transformed, (internationally competitive and sustainable) research workforce.	A transformed profile of NRF funded post-graduate students.	5	Number of NRF funded post-graduate students.	11 093	7 414	6 218	5 463	5 373
	A transformed profile of NRF-funded researchers.	6	Number of NRF funded researchers.	3 000	3 000	3 000	3 000	3 000

Table 12: Output indicators – Annual and cumulative quarterly targets for Programme 3

Indicator Number	Output Indicators	2022/23 Annual Target	Q1	Q2	Q3	Q4
5	Number of NRF funded post-graduate students	6 218	3 759	5 198	6 134	6 218
6	Number of NRF funded researchers	3 000	1 726	2 187	2 569	3 000

Explanation of Programme 3: Planned Performance Over the Medium-Term Period

Performance objectives for the MTEF period

Planned Programme 3 performance for the MTEF period will be executed through the National Facilities and RISA, with RISA accounting for most of the targets. Contribution to the performance targets by RISA funding domains is given in Table 13.

During the 2022/23, the NRF plans to support 6 218 new and continuing students. The approximate distribution of supported students according to the level of studies honours, masters and doctoral levels are 1 858, 2202 and 2 158 respectively. The NRF considers the NDP target of graduating over 5 000 PhDs per annum, available resources, scholarship values including annual inflationary increase and number of continuing students. The proportion of planned funded students at PhD level as a percentage of all funded students at all levels of study for 2022/23 is 35%. The NRF will develop a capability for tracking and reporting on the graduation of NRF-funded postgraduate students on annual basis to keep track of the progress towards achieving the NRF Strategic Plan outcome targets that relate to the demographic profile of funded students that complete studies.

All new students will be funded under the DSI-NRF Postgraduate Funding Policy which takes financial need into consideration and makes provision for

Full Cost of Study and Partial Cost of Study funding. The plan is to have the disaggregation of funded students that is 87% Black, 55% Female and 1% persons with disabilities during 2022/23 and to move towards the DSI-NRF Postgraduate Funding policy of 90% Black students over the MTEF.

The NRF plans to support 3 000 researchers during the 2022/23 financial year. This target considers grantholders that may hold multiple grants across the various investment areas. Researchers supported fall into three broad categories namely: Established Researchers, Emerging Researchers and Postdoctoral Fellows. The support to researchers is provided through dedicated programmes such as support for the acquisition of research equipment and access to national and global research infrastructures; strategic investments such as the SARChI Chairs and CoEs and other categories that are open to all researchers at NRF-recognised institutions.

The projected disaggregation of supported researchers into designated groups in line with South Africa's national developmental priorities are 58% Black, 49% Female and 2% for persons with disabilities. At the Emerging Researcher and Postdoctoral levels 73% and 60% of the researchers to be supported are expected to be Black and Female respectively to contribute to the demographic transformation of the researcher cohort.

Table 13: Contribution of key funding domains to Programme 3 planned performance for funded postgraduate students and researchers, for 2022/23.

Investment Areas	HICD	KAS	RCCE	NRF
Postgraduate Students	5 017	540	661	6 218
Honours	1 698	40	120	1 858
Master's	1 661	220	321	2 202
Doctoral	1 658	280	220	2 158
Research Infrastructures				
Emerging Researchers and Postdoctoral Fellows +	909	1 738	353	3 000

The funding of researchers and postgraduate students is steered by the funding domains managed directly by RISA, namely, HICD, KAS and RCCE and the NFs BUs, where NRF-SARAO accounts for large part of NFs funding of postgraduate students. However, the NFs BU accounts for approximately 1.4% of the total number of funded students which has an insignificant impact on the overall performance of Programme 3.

The downward trend in the targets of the number of funded postgraduate students over the MTEF period is primarily due to the introduction of the DSI-NRF Student Funding Policy which, on average, resulted in increased bursary values for each student, leading to fewer students that could be funded from the available resources. This downward trend is expected to persist until there is an injection of new funding at an amount that is sufficient to match the ever-rising cost of education and demand for full cost funding of students.

The number of researchers that can be funded is also not expected to increase significantly during the MTEF period if the current budgetary constraints remain in place and as the focus on innovation and research impact gets underway. The latter implies some increased concentration of available resources on larger and fewer mission-driven projects with potential to yield innovation and research impacts.

The continued impact of restrictions due to the COVID-19 pandemic may affect these targets as academic and research activities are often disrupted resulting in a high demand for support for extensions of study periods as well as cancelled planned research activities.

The number of peer reviewed publications by NRF-funded researchers is an important outcome indicator that reflects effects of return on the investment made in periods earlier than the current financial year. While there is no management control over the data collection and verification processes undertaken by internationally acclaimed scholarly databases such as Web of Science (WoS), the data provides useful information regarding the productivity of researchers supported by the NRF. These publications are inclusive of those that are produced by the National Equipment Programme (NEP) and Strategic Research Equipment (SRE) grant holders. The number of publications of supported researchers will continue to be tracked and reported on an annual basis to monitor progress towards the achievement of the NRF Strategic Plan outcome for

enhanced impact of the research enterprise. The actual overall number of publications produced by NRF-supported researchers for 2020/21 is reported to be 8 150 and the projections for the MTEF point to a downward trend due to decline in the number of funded researchers and quantum of funding per researcher due to available resources.

Support provided through Programme 3

Programme 3 delivers on the planned performance targets and advance the knowledge enterprise through the following range of outputs:

- **Research grants** are aimed at enhancing the efficiency of the NRF to drive transformation consistently and strategically through the support of research as the foundation of knowledge production. These will include international grants aimed at collaborative research with researchers in other countries that are signatories to bi-, tri – or multi-lateral agreements between the South African Government and/or the NRF and partner agencies in other countries.
- **Bursaries and scholarships** are aimed at developing institutional research capabilities with the appropriate human capital to drive the research and development strategies within the NSI. In view of the new DSI-NRF Postgraduate Student Funding Policy, the grant holder-linked bursaries as awarded in the past will no longer exist. All students applying for bursaries and scholarships will submit their applications through the open process, adjudicated on the same basis and criteria as described in the DSI-NRF Postgraduate Student Funding Policy, and if they satisfy the requirements, will be supported through contract funding and aligned to work with specific researchers. This is part of the NRF's strategy of exposing next generation and emerging researchers to established researchers for the type of guidance and inspiration that will facilitate their growth in becoming established researchers.
- **Infrastructure grants** are aimed at providing cutting edge equipment for research and technology infrastructure at institutions to ensure the competitiveness of the South African research community. This investment in research equipment aims to accelerate innovation and to improve the quality of research conducted; expand on existing institutional capacity and on research and training; and promote national as well as regional collaborations in line with national research priorities.

The National Equipment Programme (NEP) and Strategic Research Equipment (SRE) grants contribute to two of the NRF's pillars for development, which are building and/or upgrading research infrastructures as well as enhancing professional and technical competencies. The NEP is a critical enabler for internationally competitive research in South Africa, as it makes funds available for the acquisition, upgrading, or development of state-of-the-art research equipment to South African public research institutions. The SRE funding instrument is intended to complement the NEP and SARIR in providing appropriate levels of strategic research equipment and infrastructure. This funding instrument supports the acquisition or development of equipment that advances the frontiers of science; addresses the development of scarce skills; attracts industry investment; and drives scientific and technological productivity research in priority areas.

No new equipment grant awards will be funded in 2022/23 due to a zero-budget allocation as this is funded every alternate year. The 2023/24 equipment budget will be deployed to support new NEP grants to be awarded for the 2023 academic year. Procurement and commissioning of continuing grant awards from 2021/22 and the SRE grant for the Hydrogen Intensity and Real-time Analysis eXperiment (HIRAX) telescope to be built at the Square Kilometre Array (SKA) site will take place during 2022/23.

Equipment grantholders report on performance for five years post commissioning of the equipment. The impact of reduced budget allocations in the period of the 2017/18-2022/23 financial years has led to a decline in the overall number of associated publications and users of the NEP equipment. This decline is anticipated

to persist over the MTEF due to the reduced budget allocations and procurement and commissioning delays caused by the national restrictions in response to COVID-19 pandemic.

Access to national research platforms and to global research infrastructure, is necessary to support South African researchers and the training of the next generation of scientists alongside leading researchers and scholars. The COVID-19-related national and international travel restrictions resulted in activities being curtailed or placed on hold.

As restrictions are removed, the NRF will continue to support the provision of, and access to, R&D infrastructure across the NSI, as well as support access to global research infrastructure including those through bilateral programmes such as:

- * The European Synchrotron Radiation Facility (ESRF); and
- * The Joint Institute for Nuclear Research (JINR).

- **Institutional grants** are strategic interventions of the South African Government aimed at increasing scientific research capacity through the production of new knowledge and innovations. These grants are given to pockets of excellence within Higher Education Institutions (HEIs) to enable researchers to collaborate across disciplines and institutions.
- **Travel grants** offer researchers funding for local or international travel; support researchers to host an event such as a conference or symposium; and provide mobility grants to support local or international travel for research or training on specific equipment that is not available in South Africa, thus facilitating access to global research infrastructure.

Alignment to NRF Strategy 2025

Programme 3 contributes to the NRF Vision 2030, and Strategy 2025 by delivery against the elements of the organising framework of the vision and the

associated outcomes in the Strategic Plan. The Programme contributes directly to Strategy 2025 outcomes as depicted in Table 14.

Table 14: Alignment of Programme 3 to Strategy 2025

Organising Framework Elements	Strategic Plan Outcomes	Programme 3 Contributions or Outputs Indicators
People	A transformed (internationally competitive and sustainable) research workforce.	Number of NRF-funded post-graduate students
		Number of NRF-funded researchers

Implementation of the DSI-NRF Postgraduate Funding Policy, which is aimed at enhancing equity of postgraduate student access, success, and throughput, commenced in 2020/21. The first cohort of students was funded under this policy in the 2021 academic year. This policy will enable international competitiveness through the selection of excellent students, a demographically representative cohort of South African doctoral graduates and their expanded opportunities for international research training. To ensure equity of access to postgraduate studies, financially needy students, i.e., those whose combined household income is R350 000 per annum or less; students with a disability; and high academic achievers will be funded at FCS. The implementation of the DSI-NRF Postgraduate Funding Policy will also support the objectives of the NDP to increase the number of PhD graduations to over 5 000 per annum.

The recommendations in the 2019 Report of the Ministerial Task Team (MTT) on the Recruitment, Retention and Progression of Black South African Academics highlight the various challenges faced in expanding and transforming the South African researcher pipeline. The DSI-NRF Postgraduate Funding Policy is one of the mechanisms implemented to alleviate these challenges highlighted in the report. The success of interventions is dependent on sufficient and sustainable resourcing and on coordination among departments, entities, and institutions. Recommendation number 2 of the MTT Report relates to the need to enhance student funding for postgraduate studies in order to attract

high-achieving students to continue to doctoral and postdoctoral programmes and into the academy with fit-for purpose financial packages. The need for increased funding for postgraduate students is fully supported by the NRF and will be addressed through the provision of FCS funding for financially needy students and those with disabilities. In addition, 5% annual inflationary increases will be implemented and students that maintain their level of academic performance will receive uninterrupted funding from honours to master's and doctoral level studies.

The initiatives that are either currently being implemented or explored to improve representation of designated groups in the research workforce and secure the human resources needs for the national research infrastructure platforms are:

- **Sustained support for exceptional early career/emerging and mid-career researchers and scholars**, with an emphasis on Black and Female researchers and scholars, is needed to transform the research workforce leadership. International research exposure for next generation and emerging researchers will be facilitated through international bi-lateral partnerships.
- **Development of a transformed excellent cohort of instrumentation scientists and technicians** arises out of the recognition that a sound sustainable research enterprise requires leading-edge research infrastructure platforms that are maintained by a highly capable and demographically representative cohort.

Table 15: Programme 3 resource considerations

	Budget	Budget	Budget	Budget
	2021/22	2022/23	2023/24	2024/25
	R'000	R'000	R'000	R'000
Parliamentary Grant	491 402	504 528	507 007	529 822
DSI Contracts	2 103 956	1 738 556	1 871 388	1 865 082
Other Contracts	299 881	249 828	219 589	190 711
Internal Income	8 098	8 102	8 102	8 102
Other Income	17	4	6	6
Total Income	2 903 354	2 501 018	2 606 092	2 593 723
Running Expenses excl. depreciation	115 476	115 954	100 307	105 825
Grants and Bursaries	2 643 190	2 242 420	2 357 984	2 334 713
Salaries	132 325	137 164	141 821	147 205
Capital Expenditure	12 363	5 480	5 980	5 980
Total Expenditure	2 903 354	2 501 018	2 606 092	2 593 723

Grants, Administrative and Systems Support covers the total costs of support within grants management, reviews and evaluations, finance, building maintenance, information systems and the office of the DCEO of RISA.

Infrastructure and Mobility are grants for funding instruments for research equipment and infrastructure, including transfers to the National Facilities, and mobility grants, mainly funded from DSI designated income, that fluctuates and reduces widely over the MTEF period.

Institutional Support comprises mostly specific institutional initiatives and include grants for the Centre for Indigenous Knowledge and the French-South African Institute of Technology (F-SATI) initiatives.

Postgraduate Scholarships comprise all honours, masters and doctoral bursary programmes funded from the baseline, DSI-designated income and other contract income, including the DHET National Scarce Skills Bursary Programme.

Postdoctoral and Emerging Researchers includes postdoctoral fellowships funded from baseline, DSI-designated income, the National Skills Fund (NSF)

and other contract income as well as Thuthuka initiatives and support programmes co-funded by the First Rand Foundation (FRF).

Established Researchers comprise all competitive programmes for established researchers, along with strategic science missions funding, including Global Change, Astronomy, Marine and Antarctic research.

Strategic Initiatives are mainly funded from the baseline and DSI funded CoEs and the Research Chairs are mainly funded by the DSI. Increasing co-funded Chairs continues to ensure that the number of Chairs increases through the injection of partner funds.

International is made up of all Science and Technology Agreements Fund (STAF) research grants for initiatives in Africa and across the world.

Travel, Training and Conference support includes the support provided to academics for both travel and conferences. The membership dues paid for South African memberships/contributions to various international councils are also included.

1.4 Programme 4: National Research Infrastructure Platforms (NRIP)

Purpose

The National Research Infrastructure Platforms (NRIP) division of the NRF is the organisational structural home of Programme 4, the purpose of which is to provide leading-edge research infrastructure platforms in support of knowledge generation, innovation, science engagement and human capacity development, and provision of scientific/technological services for societal benefit. This is done in order to ensure that the national research enterprise has the requisite infrastructure to undertake globally competitive discovery science; the next generation of researchers are trained; engagement with science by and with the public is supported; innovation that positively impacts society, the environment, and the economy is promoted; and knowledge generated from research is translated into products and services to address societal challenges and needs.

Programme 4 provides for the integration and the establishment of connectivity between the physical, process, systems, data and intellectual infrastructural capacities for the benefit of the national research enterprise.

The Programme has the following operational objectives:

- Develop, support and maintain National Research Infrastructure Platforms across domains; including e-infrastructures (e-research and data platforms);
- Facilitate researcher mobility to access world-class national and global research infrastructures (in conjunction with Programme 3);
- Lead the NRF's agency role as implementer of the country's participation in inter-governmental and multilateral research infrastructures;
- Promote and support research infrastructure networks and dialogues;
- Benchmark national research infrastructure platforms; and
- Make available competitively accessed grants for the acquisition, upgrade, or development of state-of-the-art research equipment to South African public research institutions, (in conjunction with Programme 3).

Programme 4 effects its mandate largely through the maintenance of National Facilities in the areas of nuclear science; biodiversity and environmental

sciences; and astronomy and geodetic sciences. Provision of access to adequate and relevant research infrastructure is a key enabler of globally competitive research, development and innovation, and Programme 4 supports the optimisation of synergies, collaborations, and shared services, where appropriate, across the various research infrastructure platforms.

National Facilities support the national research and development strategy by exploiting geographic and knowledge advantage areas that are unique to South and Southern Africa. They provide unique and cutting-edge research platforms through a network of distributed institutions. These facilities support research of strategic importance and provide access to 'big science' infrastructure to national and international researchers and postgraduate students, and also contribute to the NRF strategic goal of growing a representative research workforce through focused HCD initiatives. It is through these facilities that South Africa can compete and co-operate effectively with international counterparts in selected strategic research areas.

Business units comprising Programme 4

Programme 4 (NRIP) serves a strategic NRF and system-level advisory and leadership role in research infrastructure platform provision. The Programme also provides an administrative and management support function to the NFs and/or other NRF-supported research platforms or initiatives. At the heart of the NRIP portfolio are the NFs, namely: the iThemba Laboratory for Accelerator-based Sciences (NRF-iThemba LABS); the South African Astronomical Observatory (NRF-SAAO); the South African Radio Astronomy Observatory (NRF-SARAO); the South African Environmental Observation Network (NRF-SAEON); and the South African Institute for Aquatic Biodiversity (NRF-SAIAB). These are national research infrastructure platforms with specialisation in the areas of nuclear science (NRF-iThemba LABS); optical and infrared astronomy (NRF-SAAO); radio astronomy and geodetic sciences (NRF-SARAO); long-term ecological research and environmental observation (NRF-SAEON); and aquatic biodiversity science (NRF-SAIAB). Each one of the NFs boasts a unique portfolio of cutting-edge research infrastructure platforms in support of the research enterprise, helping to drive discovery science. The facilities within the portfolio are described below in Table 16, in terms of their identity, the science domains/disciplines they cover and the clusters according to which they are organised within the NRF system.

Table 16: NRF's Portfolio of National Research Facilities (including NRF-SAEON)

Name of National Research Facility	Science Domain/Discipline	NRF Cluster
iThemba Laboratory for Accelerator-based Sciences (NRF-iThemba LABS)	Nuclear sciences	Nuclear Sciences
South African Astronomical Observatory (NRF-SAAO)	Optical/infra-red astronomy	Astronomy and Geodetic Sciences
South African Environmental Observation Network (NRF-SAEON)*	Long-term ecological monitoring and observation	Biodiversity and Environmental Sciences
South African Institute for Aquatic Biodiversity (NRF-SAIAB)	Aquatic biodiversity science	Biodiversity and Environmental Sciences
South African Radio-Astronomy Observatory (NRF-SARAO)	Radio astronomy	Astronomy and Geodetic Sciences

*SAEON is yet to be officially declared a National Research Facility

Table 17: Outcomes, outputs, performance indicators and annual MTEF targets for Programme 4

Outcomes	Outputs	Indicator number	Output Indicators	Audited/Actual Performance		Estimated Performance	MTEF Targets		
				2019/20	2020/21	2021/22	2022/23	2023/24	2024/25
Enhanced impact of the research enterprise	Socio-Economic contribution of NFs	7	Foreign income (Rand million) derived from NFs activities	New	New	R63	R171	R248	R329
	Knowledge translation for societal benefit	8	Number of patient doses generated from radioisotopes produced by NRF-iThemba LABS	New	New	167 500	225 000	300 000	350 000
		9	Number of technical and policy briefs produced or published by NFs.	New	New	23	28	29	28
		10	Number of active intellectual property products	New	New	5	5	7	4

Table 18: Output indicators – Annual and cumulative quarterly targets for Programme 4

Indicator number	Output Indicators	2022/23 Annual Target	Q1	Q2	Q3	Q4
7	Foreign income (Rand million) derived from NFs activities	R171	R13	R40	R68	R171
8	Number of patient doses generated from radioisotopes produced by NRF-iThemba LABS	225 000	25 000	56 250	81 250	225 000
9	Number of technical and policy briefs produced or published by NFs.	28	6	12	18	28
10	Number of active intellectual property products	5	-	-	-	5

Explanation of programme 4: Planned Performance over the Medium-Term Period

Performance objectives for MTEF period

One of the pathways to impact creation by science is the translation of science into tangible useable products, processes and systems that beneficiaries within society can engage with and apply to improve the quality of their lives. This relates and translates into a socio-economic contribution by science generally, and by the NFs in particular. Through such, a translation of research outputs and outcomes can result in societal impacts such products and services that are utilised to enhance the capacity of the State to perform its statutory functions and provide essential services to the communities; improve the competitiveness of strategic sectors of industry; add value to the lives of people on the ground directly or indirectly in areas such as health and social support; constitute intellectual property which can be commercialised through partnerships with industry.

Among examples of these, are the following, some of which are included in Table 19 and Table 20:

- Foreign income derived from the sale of goods and services produced by the NFs and foreign investment leveraged for the operations and projects of NFs is a source of incremental income for the country and thus contributes to balance of payments for the country.
- The supply of accelerator-based medical isotopes produced by NRF-iThemba LABS enables treatment and diagnosis of cancer in patients locally and internationally. The firm international customer base also signals international confidence in the NRF's facilities

and positively contributes to the country's international reputation.

- The translation of scientific knowledge generated by the NFs into technical or policy briefs contributes to the enhancement of the capacity of the State in the commensurate areas.
- The translation of scientific knowledge generated by the NFs into intellectual property contributes to the enhancement of the technological capacity of the country in the relevant areas. In addition, once commercialised, patent-protected technologies and intellectual property products have the potential to derive an additional income stream for the NFs which will make it possible to finance further technological research and development for the benefit of society, for example:
 - * NRF-SARAO is extending know-how it has developed from the management of radio frequency interference into a potentially commercial application in the aviation industry
 - * NRF-SAIAB's contributions to rural fisheries management, invasive species management and climate change understanding and mitigation, enhance national capabilities in sustainable management of natural resources thus contributing to building resilience at a community and national level.
 - * NRF-SAEON's Risk and Vulnerability Atlas enables risk analysis and modelling at an environmental/ecosystem level as well as at a socio-economic level, for example, in the analysis of COVID-19 risk and vulnerability at a municipal level nationally.

* NRF-SARAO and NRF-SAAO recently led the technical management of the National Ventilator Project, thus providing a critical affordable pandemic disease management tool against COVID-19 for the country's national health system.

research and knowledge. To this effect, NRF-SAIAB's immediate plan for the first MTEF year is the development of an Ecophysiology Lab and Deepwater Lander Development in partnership with Rhodes University, with two more platforms in the pipeline for later years.

Competitiveness, relevance, and availability of Research Infrastructure Platforms (RIPs) remain a key priority for the national facilities. Furthermore, provision of additional research infrastructure platforms provides opportunities for the research community to provide new and improved scientific

Each National Facility contributes to the performance indicators and targets of Programme 4 using their portfolio of the research infrastructure platforms and human capital capabilities. The planned performance for the 2022/23 is split among NFs as depicted in Table 19 below.

Table 19: Contribution of NRF Business Units to Programme 4 planned performance

Ind.#	KPI	MTEF targets			2022/23 Contributions by each Business Unit				
		2022/23	2023/24	2024/25	IThemba LABS	SAEON	SAIAB	SAAO	SARAO
7	Foreign income (millions of Rand) derived from NFs activities	R171	R248	R329	R108	-	-	R3	R60
8	Number of patient doses generated from radioisotopes produced by NRF-iThemba LABS	225 000	300 000	350 000	225 000	-	-	-	-
9	Number of technical and policy briefs produced or published by NFs.	28	29	28	5	16	5	0	2
10	Number of active intellectual property products	New	New	5	3	0	0	0	2

To ensure that the NRF research infrastructure platforms are competitive, relevant, and available, they must be maintained at a level of quality and productivity that enable effective and impactful support to the science system. In order keep track of the operational capability of these platforms and ensure early warning of the effectiveness of the maintenance plans, operational performance standards are set for the flagship research infrastructure platforms of each of the NRF national facilities. During the MTEF period, the uptime availability of the research platform will be tracked as an important trend statistic to provide an indication

of the infrastructure availability to users. When optimised, or even maximised, this contributes positively to the productivity of the research platforms. This indicator is measured differently for each national facility (see Table 20), and it is, therefore, accordingly provided separately for each national facility as per the table below. The research infrastructure platforms whose performance is traced in this way are the availability of the cyclotron-based platforms (NRF-iThemba LABS), the environmental data platforms (NRF-SAEON), the SALT telescope (NRF-SAAO), the marine platforms (NRF-SAIAB) and the MeerKAT telescope (NRF-SARAO).

Table 20: Availability of flagship Research Infrastructure Platforms

National Facility	Availability indicators of Flagship Research Infrastructure Platforms	Actuals Over the Past Three Years			Projected Actuals	MTEF Project Trends		
		2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25
NRF-iThemba LABS	% Operational available beam time for the Separated Sector Cyclotron (SSC)	New	63%	70%	70%	70%	70%	70%
	Minimum number of hours of beamtime available for flagship RIP – SSC	New	5 545	6 150	6 132	6 132	6 132	6 132
	Total available accelerator beamtime (normalised) – number of hours	New	8 760	8 760	8 760	8 760	8 760	8 760
NRF-SAIAB	% Research fleet days at sea (ACEP)/total research fleet days available at sea	New	80%	78%	38%	83%	83%	83%
	Research fleet days at sea (ACEP)	New	84	49	40	100	100	100
	Total research fleet days at sea available	New	105	63	105	120	120	120
NRF-SAEON	% Uptime for data in the NRF-SAEON 's RIPs	New	93%	83%	95%	95%	95%	95%
	Number of hours per year the data centre/ network centre is available	New	8 150	7 270	8 330	8 330	8 330	8 330
	Total number of hours per year	New	8 760	8 760	8 760	8 760	8 760	8 760
NRF-SAAO	% SALT time available	New	95%	94%	94%	94%	94%	94%
	Telescope time used – (Number of hours the telescope is used)	New	3 114	3 061	3 060	3 077	3 077	3 077
	Telescope time available – (Total number of hours the telescope is available)	New	3 283	3 274	3 270	3 273	3 273	3 273
NRF-SARAO	% MeerKAT time available	New	97%	96%	90%	90%	90%	90%
	Number of active receptors available for observations on MeerKAT (not decommissioned due to maintenance)	New	62	62	58	58	58	58
	Total number of receptors installed on MeerKAT	New	64	64	64	64	64	64

Alignment to NRF Strategy 2025

Programme 4 priorities align to NRF Strategy 2025 through their specific outputs that will be pursued during the MTEF period and beyond.

Strategic Outcome: A transformed (internationally competitive and sustainable) research workforce

Over the next decade the NRF intends to drive transformation of the researcher cohort in order to grow a knowledge workforce with a greater diversity of people and ideas to lead the knowledge enterprise. The targeted groups within the researcher cohort are postgraduate students, researchers, and especially early career researchers.

Research infrastructure platforms provide a concentration of expertise and research equipment and infrastructure that has national scale and which cannot be replicated in each higher education institution. Through these platforms, the NRF will seek to realise a transformed postgraduate student cohort via the several postgraduate student training programmes undertaken by the NFs and other research platforms that the organisation supports.

The implementation of a new student funding policy by the NRF will require careful monitoring and management in order not to introduce uncertainty into the system, particularly at the research platforms where many postgraduate students are supported outside of the parliamentary grant. Appropriate alignment of the processes and the decision-making with the research project cycles is essential and will be explored and attended to during the MTEF period. Additionally, some of the NFs have designated student support programmes which require realignment to the new policy and process of a centralised application and funding decision-making. While a special dispensation has been allowed to accommodate these programmes, such as with NASSP and the NRF-SARAO Bursary Programme, ongoing review will need to be undertaken to address the impact of any unintended consequences of the application of the policy.

The postgraduate student development activities of the NFs, with a transformation lens, are delivered through a portfolio of approaches and interventions, elaborated on in Table 21.

Table 21: National Facilities HCD Initiatives

Approaches and interventions	Business Unit/NF	NF specific initiatives
Utilisation of the diversity of flagship research platforms in conjunction with local and international cutting-edge research infrastructure platforms.	NRF-iThemba LABS	<ul style="list-style-type: none"> The gateway to world-class global research infrastructures such as the European Organisation for Nuclear Research (CERN), Joint Institute for Nuclear Research (JINR) in Russia. Dedication of the SSC to research and training upon the acquisition of the new 70 MeV cyclotron
	NRF-SAAO	<ul style="list-style-type: none"> Own successful and rigorous Student Development Programme, which provides wrap around support for postgraduate students using dedicated resources. Uses the extensive portfolio of optical/infrared astronomy telescopes located in Sutherland, the flagship amongst which is the Southern African Large Telescope (SALT) to train students and researchers. Planned resuscitation of the Stobie-SALT Scholarship Programme which places South African postgraduate students at SALT partner institutions.
	NRF-SARAO	<ul style="list-style-type: none"> MeerKAT Karoo Array Telescope, a precursor to the SKA Telescope, combined with geodesy research and applications infrastructure platforms, computing and data science infrastructure provide an ideal training ground for the next generation of radio-astronomers, engineers and digital revolution practitioners. Implementation of the NRF-SARAO HCD Programme to accelerate the development of radio astronomers, engineers and technical support staff.

Approaches and interventions	Business Unit/NF	NF specific initiatives
Utilisation of the diversity of flagship research platforms in conjunction with local and international cutting-edge research infrastructure platforms.	NRF-SAEON	<i>In situ</i> environmental observatories that deliver long-term reliable data for scientific research and postgraduate student training.
	NRF-SAIAB	Focused marine science and aquatic biodiversity training by deploying a comprehensive suite of state-of-the-art research platforms.
Implementation of dedicated human capacity development programmes	NRF-iThemba LABS	NRF-iThemba LABS is developing the South African Institute for Nuclear Technology & Sciences (SAINTS) to accelerate focused knowledge and skills development in nuclear science and technology.
	NRF-SARAO	Implementation of the NRF-SARAO HCD Programme to drive growth of radio astronomers, engineers and technicians to support its mission.
	NRF-SAAO	NRF-SAAO is a strategic participant in the DSI/NRF-funded National Astrophysics and Space Science Programme (NASSP), and will be resuscitating the Stobie-SALT Scholarship Programme to place doctoral and postdoctoral students at SALT partner institutions.
	NRF-SAIAB	Implementation of NRF-SAIAB's flagship Marine Science Transformation Programme, the African Coelacanth Ecosystem Programme-Phuhlisa (ACEP-Phuhlisa).

Strategic Outcome: Enhanced Impact of the Research Enterprise

The NRF aspires to **a transformed research system that advances national development in a global context** and will, over the next decade, invest in strategic areas of national relevance, priority or advantage. This is, with a view to not only mapping, and illuminating pathways to impact, but also to actively design and act for impact through and with the knowledge enterprise.

National Research Infrastructure Platforms, occupy a pivotal position in the knowledge enterprise by providing the advanced research infrastructure base required for the national and international competitiveness of the country in the knowledge arena, as well as serving as platforms for science to engage with society. Both of these are enablers, facilitators and levers for impact creation.

At a systemic and strategic level, it is important to find ways of ensuring the sustainability of the National Research Infrastructure Platforms to ensure stability, consistency, and predictability of the operations, thus enhancing the potential for them to make an appropriate impact in the long term. Some initiatives are underway to explore the mainstreaming of innovation across the NFs as well as the evolution of a framework for an appropriate resourcing mix for the entities.

Equally important to the National Research Infrastructure Platforms achieving the desired impact at a scientific and technological level, is a critical mass of highly capable scientific and technical staff to drive the research and innovation activities that make impact achievable. It is in that context that the NRF intends to refine its existing practices and processes for joint appointments of scientific and academic staff between universities and National Research Infrastructure Platforms. This will allow for the sharing and pooling of resources to recruit and retain the necessary experience and talent amongst participating institutions. The NRIPs will also be partnering with RISA to develop a programme for the focused development of a technical research cohort to underpin the technical operational support at research performing institutions across the country.

In order to establish national and global competitiveness, it is important to identify areas of strategic advantage in terms of the knowledge area in which a NF pursues its research. Thus, each one of the NFs will, in the coming period, focus their research endeavours in areas in which they have identified strategic advantage, based on their research platform capabilities and opportunities emerging in the knowledge spheres in which they operate.

- The unique particle accelerators research infrastructure is the primary means through which NRF-iThemba LABS, as a research platform,

enhances the overall impact of the research enterprise. By vigorously pursuing research projects in the niche field of accelerator-based sciences, NRF-iThemba LABS's contribution is critical towards the NSI. The beam time from the main accelerator separated sector cyclotron, for example, is used for basic nuclear and hadron physics research; radioisotope research and development as well as its supply to the medical sector; radiobiology research related to particle therapy; and applications such as radiation hardness testing of electronic components used in satellites and detector calibrations. The NRF-iThemba LABS research facilities are utilised by national and international researchers for basic science research, and several applied research areas such as ion beam analysis, nanotechnology studies, atomic mass spectroscopy for dating ancient artefacts, radiobiology and nuclear medicine, and environmental studies.

- Over the medium-term, NRF-SAIAB's primary goal is to develop research projects and programmes on African and South African aquatic biodiversity through own initiatives and national and international collaborations. These activities provide platforms for student training and improve our knowledge of aquatic biodiversity on the continent so that Africa's considerable aquatic resources can be sustainably developed and conserved for societal benefit. These projects/programmes are a means through which to achieve world-class standards in scientific output and institutional support systems. Many research projects revolve around fishes in marine, estuarine and freshwater ecosystems, with an increasing emphasis on involvement in multi-disciplinary and multi-institutional research programmes that have a clear downstream social benefit. NRF-SAIAB's planned research and innovation activities are divided into the following categories:

- a) Food security and improving livelihoods/lives;
- b) Inclusive economic sector; and
- c) Efficient decision making to drive socio-economic development.

NRF-SAEON spearheads the national agenda of ensuring that long-term environmental data is collated, archived, and extrapolated for large-scale interpretation, as a national asset for generations to come. NRF-SAEON is well-placed to exploit South Africa's geographical advantage for scientific research by:

- a) Using data to map and understand drivers of ecological change;
- b) Providing knowledge-based decision support for risk management and strategic management of natural resources;
- c) Continuing to lead in earth system science by providing long-term ground-based and oceanographic data as a critical component of the DSI's Global Change Research Programme; and
- d) Initiating and facilitating experimental studies designed to reduce complexity to allow a closer focus on selected causes of eco-system functioning.

The science of NRF-SAAO will focus on three areas:

- a) Galaxy evolution and the Baryon cycle;
- b) Transient science and stellar astrophysics; and
- c) Exoplanets and planetary sciences,

These areas will be supported by a cross-cutting theme of theory and computational astrophysics, and the development of supporting instrumentation capabilities to enable the respective scientific focal areas.

NRF-SAAO is leading significant SALT instrument upgrades, including a high-throughput spectrograph for transient follow-up, and an upgrade of the optics to the RSS to increase throughput. In addition, many significant changes are required to enable SALT, which is a blue-optimised telescope, to support the upcoming near-infrared spectrograph being developed by the SALT partner, the University of Wisconsin. The NRF-SAAO expects to play a central role in defining, designing, building, and supporting all of these instruments, in collaboration with NRF-SAAO's SALT partners. The Intelligent Observatory project will require more automated operations of telescopes, data reductions and intelligent (possibly AI) data interpretation to further characterise the most interesting targets for further observations. Ultimately this could involve telescopes "talking" to each other to maximise efficiency and decision-making processes.

NRF-SARAO ensures that the impact of the research enterprise is enhanced through the provision of world class research instruments, not only through NRF-SARAO-affiliated researchers, but also a global astronomy community. Observing time on MeerKAT for the first few years is open to the international community and is being allocated according to the

following ratios: 70% for large survey projects of 1000 hours or more and 30% for smaller PI driven proposals (of which 5% will be director's discretionary time). The current Large Survey Projects are:

- a) Testing Einstein's theory of gravity and gravitational radiation – Investigating the physics of enigmatic neutron stars through observations of pulsars;
- b) Looking at the Distant Universe with the MeerKAT Array);
- c) MeerKAT Search for Molecules in the Epoch of Re-ionisation;
- d) MeerKAT Absorption Line Survey for atomic hydrogen and OH lines in absorption against distant continuum sources
- e) MeerKAT HI Observations of Nearby Galactic Objects: Observing Southern Emitters);
- f) Transients and Pulsars with MeerKAT;
- g) Galaxy formation and evolution in the cluster environment;
- h) MeerKAT High Frequency Galactic Plane Survey;
- i) MeerKAT International GigaHertz Tiered Extragalactic Exploration Survey; and
- j) The Hunt for Dynamic and Explosive Radio Transients with MeerKAT.

Taken together, the NFs are envisaged to unlock greater potential of the National Research Infrastructure Platforms to advance the cause of impact creation by the National Research Enterprise.

Investment in Research Infrastructure

The then Department of Science and Technology, having recognised the need for investment in research infrastructure to ensure that technological obsolescence does not erode the international competitiveness of the NFs, provided additional funding specifically for infrastructure. This was done in the form of the Strategic Research Infrastructure Grant (SRIG). The current cycle of the SRIG will be completed at the end of the current financial year. There is thus an urgent need for the recapitalisation of the infrastructure at the NFs. The impact of not re-investing differs from platform to platform but, in some cases, e.g. coastal craft safety, legislative concerns will require the withdrawal of the entire platform from the NSI if the requisite investment is not made. A new Recapitalisation Plan has been developed and is currently being engaged on with the DSI on securing appropriate levels of funding for

the medium to long-term.

Current key research infrastructure development activities in progress include:

- a) The extension of the MeerKAT Telescope Array of NRF-SARAO by a further 16 antennae, which will enhance the scientific and technological capabilities of the instrument;
- b) Implementation of the SAIF Project by NRF-iThemba LABS, aimed at achieving manifold increases in its research and innovation as well as training capacity, including new capabilities for production of novel radio isotopes for the national and global market;
- c) The establishment and roll-out of the South African Polar Research Infrastructure (SAPRI) platform by NRF-SAEON,
- d) The implementation by NRF-SAAO of the SALT Gen1.5 projects to enhance the scientific/technical capabilities of SALT; and
- e) Construction, testing and commissioning of an auxiliary water supply to protect the national collection; development of a live animal handling facility to advance aquatic ecophysiology research and the development of an ocean floor lander as an additional to the marine science research platforms of NRF-SAIAB.

All these investments are meant to sustain the competitive edge of the NFs for the short to medium-term.

Innovation and Societal Impact

The WP STI 2019 and the revised MTSF 2019-2024 point to an increase in emphasis on societal impact and realisation innovation of publicly funded programmes and research as pathways to achieving national development priorities. This focus is already beginning to define the nature of decisions that are being made or are to be made in the near future. The NRF generally, and specifically the NFs, have, in response, established specific focus groups in the form of Task Teams, to propose a position for NFs along the innovation value chain wherein the NFs may be able to maximise their contributions to advancing innovation, and to develop a set of indicators by which to measure and track the contributions of the NFs to the advancement of innovation and impact.

Table 22: Programme 4 resource considerations

	Budget	Budget	Budget	Budget
	2021/22	2022/23	2023/24	2024/25
	R'000	R'000	R'000	R'000
Parliamentary Grant	333 120	341 770	343 395	358 848
DSI Contracts	1 379 831	1 501 937	1 025 373	1 056 706
Other Contracts	94 104	109 220	149 945	161 987
Internal Income	95 781	71 281	62 238	51 222
Other Income	115 977	130 225	164 944	237 459
Total Income	2 018 813	2 154 433	1 745 895	1 866 222
Running Expenses excl. depreciation	751 531	477 691	580 252	601 747
Grants and Bursaries	105 235	107 455	104 161	95 392
Salaries	636 710	737 382	805 899	844 779
Capital Expenditure	525 337	831 905	255 583	324 304
Total Expenditure	2 018 813	2 154 433	1 745 895	1 866 222

Key challenges that remain to be noted are as follows:

- Parliamentary Grant (PG) continues to increase at below inflation. As a result, most NFs had to adjust their APP requirements and targets to accommodate below inflation increases in the MTEF allocations.
- Operational expenditure continues to be strained due to allocation of resources to maintain the staffing needs of the facilities. Running expenses are projected to cause budgetary strain especially on major spend categories such as utilities which continue to see double digit increases from high Eskom tariffs.
- Due to limited funding, the filling of some critical positions is being delayed, which will influence some programme deliverables.
- The lack of a core grant allocation to fund capital infrastructure and capital maintenance in 2021/22 and across the MTEF period, poses a huge risk on the continued effectiveness, competitiveness and future safety of research infrastructure platforms. It is envisaged that the discussions with the DSI on the NFs Recapitalisation Plan will have positive results, thus providing a mechanism to address this challenge.
- Huge reliance on contract funding for NFs such as NRF-SAEON and NRF-SAIAB, which is seasonal and not sustainably provided into the longer term.

2. Infrastructure Projects

The following areas are critical for the NFs to implement over the MTEF cycle to secure their operational and financial sustainability, at a minimum:

- NRF-iThemba LABS – The commissioning of the 70MeV cyclotron dedicated to radio-isotope production and R&D facility for radio pharmaceuticals for the experimental physics research in South Africa.
- NRF-SARAO:
 - * MeerKAT +20 project extension in consultation with Max-Planck-Gesellschaft (MPG) which is investing € 26.1 million.

* SKAO founded in 2020 – will issue several Work Packages for SKA 1_MID build and NRF-SARAO has already been allocated certain packages whilst others are still to be allocated.

- NRF-SAEON – Roll-out of SAPRI research platform as an operational node of NRF-SAEON.
- NRF-SAIAB – Construction, testing and commissioning of auxiliary water supply and live animal handling facility.
- NRF-SAAO – Implementation of SALT Gen 1.5 projects to enhance the scientific/technical capabilities of SALT.

Table 23: Infrastructure Projects

No.	National Facility	Project Name	Project Description	Activities / Outputs	2022/23 to 2024/25			
					Project Start date	Project Completion date	Total Estimated cost – Rands	2021/22 Expenditure – Rands
1	iThemba LABS	South African Isotope Facility (SAIF) infrastructure	Building Infrastructure for the radio isotope Facility (RIF)	Construct new infrastructure and services for 70 MeV cyclotron	Dec-20	Sep-22	R250 000 000	R54 600 000
2	iThemba LABS	South African Isotope Facility (SAIF) accelerator equipment	C70 MeV cyclotron facility	Procure new 70 MeV cyclotron and beam line equipment	Nov-18	Sep-22	R200 000 000	R41 900 000
3	iThemba LABS	South African Isotope Facility (SAIF) targetry	Bombardment stations for RIF	Development and manufacturing of new target stations and targetry infrastructure for 70 MeV cyclotron	Dec-20	Sep-22	R100 000 000	R7 700 000
4	iThemba LABS	Technology Innovation Platform (TIP)	Offices and laboratories for the technology and innovation platform facility	Construction of laboratories and offices for TIP	Oct-19	Sep-22	R10 000 000	R140 000
5	SAIAB	1000m ROV	Purchase of a 100m rated ROV	Cutting edge research platforms	Feb-22	Dec-22	R12 000 000	R0

No.	National Facility	Project Name	Project Description	Activities / Outputs	2022/23 to 2024/25			
					Project Start date	Project Completion date	Total Estimated cost – Rands	2021/22 Expenditure – Rands
6	SAEON	Shallow Marine and Coastal Research Infrastructure (SMCRI) – SARIR	SMCRI was established in 2017 to develop an array of cutting-edge instruments, physical research platforms and data at appropriate spatial and temporal scales in all the coastal biogeographic regions from all three oceans to stimulate innovative research and IP generation that is of global relevance.	1. Effective management, governance, and coordination of the SMCRI project. 2. Develop, integrate, commission, manage and maintain 15 coastal research platforms. 3. Encourage, manage, and track stakeholder involvement to ensure use and acknowledgement of RI platforms.	2016/2017	2030/31	R635 500 000	R31 000 000
7	SAEON	Expanded Freshwater and Terrestrial Environmental Observation Network [EFTEON] – South African Research Infrastructure Roadmap [SARIR]	EFTEON is a modular, highly networked infrastructure to support research on coupled ecological-social terrestrial systems in South Africa. It is largely modelled on SAEON's well-established network of terrestrial nodes and LTER sites and seeks to expand that with the addition of six well-instrumented EFTEON nodes.	1. Effective management, governance, and coordination of the EFTEON Project. 2. Develop, integrate, commission, manage and maintain 6 Terrestrial research landscapes with long term sites and infrastructure focusing on biogeochemical exchanges between the land surface and atmosphere, the availability and quality of water in the landscape, long term observations biodiversity and productivity and social ecological interactions, especially those related to the provision, management and use of ecosystem services. 3. Encourage, manage, and track stakeholder involvement to ensure use and acknowledgement of RI platforms.	2016/17	2030/31	R509 500 000	R15 900 000

No.	National Facility	Project Name	Project Description	Activities / Outputs	2022/23 to 2024/25			
					Project Start date	Project Completion date	Total Estimated cost – Rands	2021/22 Expenditure – Rands
8	SAEON	South African Polar Research Infrastructure (SAPRI) – SARIR	The SAPRI is designed as a consortium, hosted at the SAEON) within NRF.	Establish the SAPRI Management system, undertake the setup of collaborative working arrangements and agreements which govern the IF relationships and put into place the necessary oversight committees for the successful running of the SAPRI.	2021/22	2024/25	R75 000 000	R0
9	SARAO	MeerKAT Extension	Extension of MeerKAT through international Investment	20 additional dishes	2020	2023	R545 000 000	R150 000 000
10	SARAO	SKA1_MID Construction	Initiation of SKA1 construction	South African SKA-MID work package contracts placed, and construction activity started.	2022	2027	R10 220 000	Estimate SARAO Cash and in-kind Packages = R65m
11	SARAO	SKA Dark Fibre	Fibre Link from Northern Cape to Cape Town – SKA Science Processing Centre (SPC)	Data Link / CSIR	2022	2024	R128 000 000	R6 000 000

3. Updated Key Risks and Mitigation from the Strategic Plan

In developing the Organisational Strategic Risks, the NRF Board concluded a robust process where both internal and external factors are considered to understand the interconnectedness of risks and appreciate potential adverse impacts. The table below presents several risks that were identified

by the Board as they align to NRF Strategy 2025 outcomes and will be used to guide appropriate mitigation over the course of strategy execution.

Table 24 below maps the ten strategic risks to the NRF Strategy 2025 outcomes and includes a strategy execution risk description and mitigation for additional clarity, where deemed necessary. In the context of the COVID-19 pandemic, as a direct and indirect risk driver for these rated risks, the NRF Board also indicated a preferred prioritisation (ranking) for mitigation efforts.

Table 24: NRF Strategic Risk Register

Outcome	Strategic Risk	Risk Mitigation	Rate	Rank
[1] A transformed (internationally competitive and sustainable) research workforce	Inadequate rate of system-wide transformation.		VH	1
	Inadequately designed funding support to transform the profile of postgraduate students and research-productive researchers.	Undertake periodic reviews of and continuous improvements to funding policies and ensure heightened institutional influence and accountability to increase throughputs for students and researchers.		
[2] Enhanced impact of the research enterprise	Quality and impact of research.		H	7
	Lack of flexibility concerning the resource allocation model to enable re-prioritisation of funds in line with new impact-orientated agreed research priorities.	Build flexibility into the resourcing of the research enterprise to enable management to take accountability for achieving national development outcomes.		
	Research priorities set without evidence about drivers of developmental impact.	Develop capacity and capability to provide organisational and National System of Innovation (NSI) analytics to support strategic decisions.		
	Failure to deliver Infrastructure/large projects.		H	10
	Failure to secure research infrastructure portfolio management capabilities because of talent and funding constraints.	Establish or acquire research infrastructure portfolio management capability to amplify knowledge and societal impacts.		
[3] Enhanced impact of science engagement	Loss of support from critical stakeholders.		H	10
	Failure to secure required funds in support of the Science Engagement Strategy.	Ensure scalable programmes that can be adapted to the amount of secured funds.		
	Limited success and stakeholder acceptance of the required transition from the current capability and operating model.	Ensure fair inclusion of change management and stakeholder engagement components in the design and establishment of the required capability and new operating model for science engagement.		

Outcome	Strategic Risk	Risk Mitigation	Rate	Rank
[4] A transformed organisation that lives its values and organisational culture.	Market challenges to attract and retain research and technical workforce.	Undertake continuous remuneration reviews to ensure market competitiveness and succession and retention interventions.	H	6
	Inadequate rate of organisational transformation.	Implement the Organisational Transformation Framework.	H	4
	Pervasive skills mismatch and/or unavailability.	Undertake succession planning and retention interventions.	H	8
	Absence of articulated employee value proposition and Human Capacity Development (HCD) support that meet the needs of staff from designated groups.	Establish HCD support for the production of technical skills linked to the requirements of the research infrastructure and implement a suite of incentives tailored to attract and retain the critical skills required for the sustainability of the NRF.		
Resourcing (affect all Outcomes)	Lack of financial sustainability.		E	2
	Lack of resiliency and long-term sustainability to deliver on the NRF mandate given insufficient funding levels of the Parliamentary Grant and contract funding as well as growth rate of costs and obligations of the NRF.	Make prudent decisions that ensure general annual increases are contained through zero-based budgeting initiatives, making tough decisions and choices including reprioritisation and implementation of austerity measures. Secure perpetual meaningful funding for research and post graduate students to be innovative and agile, competitive and at the leading edge of technological development.		
	Strategy execution risk or failure to deliver on mandate.		H	3
	Changing national priorities and/or lack of buy-in into the NRF strategy by various stakeholders as well as the appropriate monitoring of implementation progress.	Execute Strategy 2025 implementation plans and monitor. Initiatives stipulated in the NRF Strategy 2025 will have to be sourced through internal reprioritisations. Manage impact of COVID-19 pandemic on business continuity and stakeholders.		
	Threat of cybersecurity breach.		H	5
	Failure to protect information. Inadequate or ineffective data protection against advanced cyber breaches, unauthorised access, or loss of data.	Ensure priority surveillance and action through integration of cyber security monitoring and response into Standard Operating Procedures. Partnerships with dedicated cyber security experts further mitigate breaches or impact should breaches occur. This is augmented with NRF-wide security awareness and threat management.		

E	Extreme	Significantly exceeds the risk tolerance levels – Priority 1
VH	Very High	Exceeds the acceptable risk tolerance levels – Priority 2
H	High	Exceeds the acceptable risk tolerance levels – Priority 3
M	Medium	Acceptable tolerance level
L	Low	Below the acceptable tolerance level

PART D



TECHNICAL INDICATOR DESCRIPTIONS (TIDs)

Programme 1

Indicator Title (Indicator 1)	Proportion of employees from designated groups at Peromnes Levels 1-7
Definition	<ul style="list-style-type: none"> This indicator measures the demographic representation of the NRF leadership, management and supervisory cohort with specific annual MTEF targets set for proportion Black (African, Coloured and Indian) and women employees in the specified Peromnes Levels. Designated groups will be identified in accordance with requirements of the Employment Equity Act (Act No. 55 of 1998).
Source of Data	NRF Human Resources Information Management System – minimum details must be full names of all employees, evidence of what is used for classification into employees into designated groups, job titles, occupation categories and levels.
Method of Calculation / Assessment	Divide the count of employees from designated groups occupying positions that fall in the Peromnes Levels 1-7 by the overall count of all employees in the same levels, expressed as a percentage (%).
Means of Verification	Employment records
Assumptions	An appropriate attrition rate and availability of candidates when positions become available
Disaggregation of Beneficiaries (where applicable)	N/A
Spatial Transformation (where applicable)	N/A
Calculation Type	Based on cumulative numbers over the reporting period
Reporting Cycle	Annually
Desired Performance	Actual performance that is in line with targeted performance is desirable
Indicator Responsibility	Group Executive – Human Resources and Legal Services

Indicator Title (Indicator 2)	Organisational overheads as a proportion of total expenditure
Definition	This indicator measures the efficiency of the organisation in allocating funds towards delivering on its mandate.
Source of Data	Financial Reporting System
Method of Calculation / Assessment	Divide the sum of shared/support services costs and corporate expenses by total NRF expenditure (including capital expenditure but excluding depreciation/amortisation and internal expenditure) incurred by the organisation during the financial year, expressed as a percentage (%).
Means of Verification	All the calculations can be verified from data extracted from the financial system. All amounts are reconciled to the annual financial statements.
Assumptions	<ul style="list-style-type: none"> • Reliability of data extracted from the financial system. • All costs that cannot be directly attributed to an operational activity or project. • The organisational corporate and support structures remain stable.
Disaggregation of Beneficiaries (where applicable)	N/A
Spatial Transformation (where applicable)	N/A
Calculation Type	Based on cumulative expenses within the reporting period
Reporting Cycle	Annually
Desired Performance	<10%
Indicator Responsibility	CFO and Group Executive: Finance and Business Systems

Programme 2

Indicator Title (Indicator 3)	Number of interventions implemented for the general public
Definition	The indicator measures the interventions (such as mass events that includes National Science Week, festivals, public viewing, Ministerial Imbizos, etc.) that are targeted at different publics in order to contribute to public understanding of science in people's lives and the use of scientific knowledge across the NSI.
Source of Data	Monitoring and Evaluation data and records from each Business Unit.
Method of Calculation / Assessment	A simple count of interventions that were implemented or are at an advanced stage of implementation during the reporting period.
Means of Verification	Inspection and examination of the records, such as: approval of interventions, implementation or post implementation status reports and any form of evidence of implementation of intervention. Details in the evidence and reports should cover date, venue, topics, platforms used, estimated and actual count/s of beneficiaries, as well as identity of hosting/participating institutions/entities and a statement by the representative of such entities traceable to them via electronic transfer or signature or official stamp or any combination of these.
Assumptions	Factors that are accepted as true and certain to happen without proof.
Disaggregation of Beneficiaries (where applicable)	N/A
Spatial Transformation (where applicable)	Geographical spread of interventions according to District Municipalities, Metros and Provinces and the amount of investment provided in reports.
Calculation Type	Cumulative – within the reporting year.
Reporting Cycle	Quarterly.
Desired Performance	Performance must meet the identified needs and be within available resources.
Indicator Responsibility	Group Executive: Programmes 2, Corporate Relations and Communications.

Indicator Title (Indicator 4)	Number of interventions for Maths, Science and Technology (MST) support for learners
Definition	The indicator measures number of interventions or activities implemented for learners in order to identify and nurture talent in STEMI fields with aim to expand STEMI education pipeline. The focus should be in following projects: SET Olympiads and Competitions, science camps for learners (minimum of three hours), educator workshops on content and methodology in Science and Technology (minimum of three hours).
Source of Data	Data and records from each Business Unit.
Method of Calculation / Assessment	A count of the number of initiatives of a minimum delivery time of 3 hours that are offered to MST learners or educators to support school curriculum and advancement of STEMI careers.
Means of Verification	<ul style="list-style-type: none"> • Inspection and examination of the records, such as: approval of interventions, implementation or post implementation status reports and any form of evidence of implementation of an intervention. Details in the evidence and reports should cover date, venue, topics, platforms used, estimated and actual count/s of beneficiaries, as well as identity of hosting/participating institutions/entities and a statement by the representative of such entities traceable to them via electronic transfer or signature or official stamp or any combination of these. • When required contact the hosting or participating entities.
Assumptions	Factors that are accepted as true and certain to happen without proof.
Disaggregation of Beneficiaries (where applicable)	Race and gender profile of learners or educators who benefited from interventions provided in reports.
Spatial Transformation (where applicable)	Details of interventions offered to beneficiaries indicating coverage of District Municipalities, Metros and Provinces across the country to be provided in reports.
Calculation Type	Cumulative, within the reporting year
Reporting Cycle	Quarterly
Desired Performance	In line with annual target
Indicator Responsibility	Group Executive: Programmes 2, Corporate Relations and Communications.

Programme 3

Indicator Title (Indicator 5)	Number of NRF funded postgraduate students
Definition	<ul style="list-style-type: none"> The indicator measures the number of NRF funded postgraduate students with specific annually set targets for each year of the MTEF period. Postgraduate students for the purpose of this indicator refers to an NRF funded individual who is registered for a postgraduate qualification with an academic institution at the level of honours, masters, and doctoral studies.
Source of Data	NRF Grants Management and Systems Administration (GMSA) and any other system (manual or IT based) used for managing grants, records of postgraduate students funded by the NRF.
Method of Calculation / Assessment	<ul style="list-style-type: none"> The count of all NRF-funded postgraduate students who have been registered as such on the NRF GMSA system and any other system (manual or IT based) used for managing grants. Students that are funded through funding policies directed at internal NRF employee development initiatives are excluded from the count. A postgraduate student will be recognised as funded when the funding support to the postgraduate student is expensed or in the case of a postgraduate student supported by a Centre of Excellence and operationally similar instruments, the grant to the centre is expensed. In determining the full count of NRF-funded postgraduate students in any one year, each student must only be counted once, regardless of number of sources of funding received from the NRF, except on a few occasions where a postgraduate student completes one qualification and starts another within one academic year. Academic year 2022 performance will be reported in the 2022/23 reporting year.
Means of Verification	Portfolio of Evidence include proof that the student has enrolled at a higher education institution for a postgraduate qualification, demographic information as disclosed by the student or relevant institution, records of expenditure to the benefit of the student.
Assumptions	The gender, race and disabilities are taken as voluntarily disclosed by postgraduate students or Higher Education Institutions through any method, such as: applications for funding, progress reports and copies of personal identity documents.
Disaggregation of Beneficiaries	<p>In determining the disaggregation of funded postgraduate students into designated groups, the profile of postgraduate students who are South African citizens and permanent residents is considered.</p> <p>Target for Women: 55%</p> <p>Target for Black: 87%</p> <p>Target for Persons with Disabilities: 1%</p>
Spatial Transformation	N/A
Calculation Type	Cumulative, within the reporting year.
Reporting Cycle	Quarterly.
Desired Performance	In line with annual target.
Indicator Responsibility	DCEO of Programme 3.

Indicator Title (Indicator 6)	Number of NRF funded researchers.
Definition	<ul style="list-style-type: none"> • This indicator measures the number of NRF funded researchers (including postdoctoral fellows) with specific annual MTEF targets set for this number. • Researchers will be those that are designated as such by research-based institutions and organisations and are eligible to receive research grants or make use of Research Infrastructure Platforms or test results or research information generated or held by the NRF. Researchers also include postdoctoral fellows, staff of research institutions designated as researchers or delegated as users of test results or research information.
Source of Data	Through the NRF Grants Management and Systems Administration and any other system (manual or IT based) used for managing grants, records of researchers funded by the NRF are maintained.
Method of Calculation / Assessment	<ul style="list-style-type: none"> • The count of all NRF funded researchers (including postdoctoral fellows). • A researcher will be counted as funded when the funding support to the researcher is expensed. • In totalling NRF-funded researchers in any one year, each researcher must only be counted once, regardless of the number of grants received. • Academic year 2022 performance will be reported in the 2022/23 reporting year.
Means of Verification	Portfolio of Evidence includes accepted grants that were expensed by the researchers and/or research institutions, demographic information disclosed by the researcher or research institution and a copy of the person's ID or passport.
Assumptions	The gender, race and disabilities are taken as voluntarily disclosed by researchers or research institutions through any method, such as: applications for funding, progress reports and copies of personal identity documents.
Disaggregation of Beneficiaries (where applicable)	<p>In determining the disaggregation of funded researchers into designated groups, the profile of researchers who are South African citizens and permanent residents is considered.</p> <p>Target for Women: 49%</p> <p>Target for Black: 58%</p> <p>Target for Persons with Disabilities: 2%</p>
Spatial Transformation (where applicable)	N/A
Calculation Type	Cumulative within the reporting year.
Reporting Cycle	Quarterly.
Desired Performance	In line with annual target.
Indicator Responsibility	DCEO of Programme 3.

Programme 4

Indicator Title (indicator 7)	Foreign income (Rand million) derived from NFs activities.
Definition	Measures the income derived from the sale of products and/or services to clients abroad and foreign investment leveraged for the operations and projects of NFs. This excludes the in-kind work where there is no direct payment made to the NFs.
Source of Data	Finance and operational records from each business unit
Method of Calculation / Assessment	Sum of all Foreign income reflected in the banking/financial records/statements of the NF
Means of Verification	Primary data, as relevant, in the form of: <ul style="list-style-type: none"> • Financial/banking accounts/statements of the NFs • Engineering reports • Invoices • Work packages signed contracts and cash flows emanating from these contracts • Agreements/contracts – records of relevant transactions
Assumptions	The value and timing of the awards and commencement of contract at annual planning stage is not certain.
Disaggregation of Beneficiaries (where applicable)	N/A
Spatial Transformation (where applicable)	N/A
Calculation Type	Cumulative, within the reporting year
Reporting Cycle	Annually
Desired Performance	In line with annual estimates/targets
Indicator Responsibility	DCEO of Programme 4

Indicator Title (indicator 8)	Number of patient doses generated from radioisotopes produced by iThemba LABS
Definition	<p>Measures the number of patient doses generated from radioisotopes produced by iThemba LABS.</p> <p>The patient dose for each isotope is defined as follows:</p> <ul style="list-style-type: none"> • For 123I, 5 millicurie = 1 patient dose: (A production batch size of 250 millicurie will therefore be administered to 50 patients) • For 18F-FDG: 10 millicurie = 1 patient dose: (A production batch size of 250 mCi dispatched, will be administered to 25 patients) • For the 68Ge/68Ga Generator: A typical 50 mCi generator will be administered to 300 patients during a 9-month shelf-life • For the 82Sr/82Rb Generator: A typical 100 mCi generator will be administered to 300 patients during a 4-week shelf-life (12 patients x 5 days x 4 weeks)
Source of Data	Production and delivery records in database of information from Radioisotopes Department of iThemba LABS
Method of Calculation / Assessment	Sum of the number of patient doses for each isotope (as per definition), from radioisotopes produced by iThemba LABS, and delivered to be administered to patients.
Means of Verification	<ul style="list-style-type: none"> • Examination of iThemba LABS production and sales records of radioisotopes • Approved acceptance reports, payment or similar
Assumptions	Assumes that the doses delivered to clients will be administered to patients
Disaggregation of Beneficiaries (where applicable)	N/A
Spatial Transformation (where applicable)	N/A
Calculation Type	Cumulative, within the reporting year
Reporting Cycle	Quarterly
Desired Performance	In line with annual target
Indicator Responsibility	DCEO of Programme 4

Indicator Title (indicator 9)	Number of technical and policy briefs produced by NFs
Definition	The number of technical and policy briefs produced or published by RIPs in the reporting period. A technical brief is a publication or official document providing scientific/technical synthesis on a specified topic which provides advice or recommendations about the positioning of a knowledge area or technical application either locally, national, or globally. A policy brief is a formal document or publication that provides specific advice or recommendations to policy/decision-makers at an institutional, local/provincial/national government level based on the synthesis and analysis of the latest science/technological applications.
Source of Data	Document management systems of the business units.
Method of Calculation / Assessment	A count of stand-alone copies of technical and policy briefs
Means of Verification	The actual stand-alone copies of the technical or policy briefs and the proof that the copy was shared (via email or any other means) with the relevant stakeholder or its representative.
Assumptions	A technical or policy brief will be the interpretation of peer viewed academic outputs into a format that will facilitate uptake into planning and policy documents. Authors will declare affiliations with the NF to publishers accurately and consistently.
Disaggregation of Beneficiaries (where applicable)	N/A
Spatial Transformation (where applicable)	N/A
Calculation Type	Cumulative, within the reporting year
Reporting Cycle	Quarterly
Desired Performance	In line with annual target
Indicator Responsibility	DCEO of Programme 4

Indicator Title (indicator 10)	Number of active intellectual property products.
Definition	Intellectual property products such as patents, copyright, protected disclosures, proprietary know-how developed/under development/registered by NFs.
Source of Data	Records in the document management systems/repositories by business units
Method of Calculation / Assessment	Count the number of intellectual property products (physical, electronic, documented), that have been developed/or under development/registered within the reporting period.
Means of Verification	<p>Inspection of records of the primary data, as relevant, in any of the forms listed:</p> <ul style="list-style-type: none"> • Technology register. • Collaboration agreements. • Joint development agreements. • Funding agreements. • Licensing agreements. • Patent applications. • Invention disclosures • Documented proprietary know-how
Assumptions	<ul style="list-style-type: none"> • Technologies have been developed. • Internal resources and/or external partners are available for technology development, customisation and/or optimisation. • Funding is available for preliminary technology development, customisation and/or optimisation.
Disaggregation of Beneficiaries (where applicable)	N/A
Spatial Transformation (where applicable)	N/A
Calculation Type	Cumulative, within the reporting year
Reporting Cycle	Quarterly
Desired Performance	In line with annual target
Indicator Responsibility	DCEO of Programme 4

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