NRF ANNUAL PERFORMANCE PLAN

2021 to 2023

Table of Contents

Statement by the Chairperson of the Board

The Annual Performance Plan is prepared under conditions of uncertainty and anxiety wrought by the destructive impact of the COVID-19 pandemic on the lives and livelihoods of people in our country and across the globe. The spinoff from the devastation and disruption to the architecture and modes of development and living are in acceleration in harnessing digital technologies that enhance remote collaboration and execution of tasks. The pandemic has resulted in budget cuts as the government reprioritises spending to fund interventions to respond to the virus and its secondary effects on loss of income and social dislocation. Parts of the National Research Foundation (NRF) supported the national research system, such as the Centres of Excellence, SARChI and funded researchers have risen to the challenge of providing direction and driving efforts to find effective therapeutics and vaccines. The NRF successfully coordinated the National Ventilator Programme, to facilitate the development of national capability to manufacture ventilators that are critical in the treatment of severe cases of COVID-19.

Due to the COVID-19-related disruptions that began in early 2020/21, some of the organisation's interventions that involve gatherings of people and ones that require physical presence at the place of work had to be reduced and redesigned with the aid of internet based technologies. The NRF systems were agile and ready to take on this challenge. The 2021/22 financial year will more likely be difficult dependent on the successful rollout of vaccination and achievement of herd immunity for the country.

This APP is the second formulation of an implementation plan for the new NRF Strategic Plan 2020 to 2024, also called NRF Strategy 2025, which is itself an implementation plan for the NRF Vision 2030. NRF Vision 2030 outlines a ten-year strategic direction for the organisation in line with the Medium Term Strategic Framework (MTSF) 2019 to 2024 and the National Development Plan. The key attributes of the new strategic direction are the paradigm shift towards a gradual realisation of positive impact of research and innovation on national development – "*Research for a better society*". The specific interventions and research assets at the disposal of the NRF are continuously redesigned to ensure that the organisation is able to contribute to national Science, Technology and Innovation (STI) Policy priorities set out in the 2019 White Paper on STI. The new national policy emphasises the need to derive socio-economic development value from publicly funded research that should lead to innovative solutions in the form of new technologies, innovation on products and services, and enhance the effectiveness of public and private sectors.

As part of its function to provide advice to the Minister of Higher Education, Science and Innovation, the NRF provided comments and inputs to the panel established to conduct a review of the Higher Education, Science, Technology and Innovation Institutional Landscape [HESTIIL] titled "*Proposals on strengthening the HESTIIL and potential synergies*". The NRF is looking forward to the recommendations articulated in the landscape review report, as they will further shape and inform the prioritisation of the research and innovation investment in the country and strengthen the coordination efforts of government entities.

During the MTEF period the organisation will focus on the following key outcomes that are aligned to the NRF Strategy 2025, the MTSF and the DSI Strategic Plan:

- Transform, expand and ensure inclusivity of the research work force, through appropriately designed and executed array of grants for different needs of students and researchers.

- Advance research and scientific knowledge as the most effective means for achieving national development objectives and a better quality of life for everyone.
- Enhance the competitiveness of Research Infrastructure Platforms to deliver cutting edge research and Intellectual Property outputs to benefit society.
- Re-engineer the *ex-ante* and *ex-post* grants evaluations and decision criteria to institutionalise the research impact and engaged research as pathways to foster higher contribution of research to national development.

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

I would like to acknowledge the management of the NRF and all NRF employees for the development of this Annual Performance Plan and their dedication to serving the people of South Africa. I also thank the Minister for his continued support, and fellow Board members for providing direction and oversight over the planning process.

Dr N Obokoh
Chairperson of the Board

Statement by the Chief Executive Officer

The NRF plays a critical role in expanding and enabling the National System of Innovation (NSI) to become efficient and effective in delivering outputs that contribute to the socio-economic development of our country. We at the NRF fully recognise the urgency of resolving the national identified triple challenges of poverty, inequality and unemployment that continue to frustrate many in our country. It is also clear to us that these challenges continue to mirror the effects of many years of racialised disadvantage driven by the pre-1994 administrations.

The core of the NRF strategic intent is its unflinching commitment to a transformation agenda which is not only focused on mere change in the demographic representation, but on fundamentally changing the knowledge enterprise to make a step change contribution to the benefit of society. The NRF recognises that in order for it to contribute to national development, as enjoined to do so in the latest amended NRF Act (Act No. 19 of 2019), it will need to find bold and innovative strategies that would enable it to make granting decisions, monitoring, and evaluations that increase the likelihood of realising societal benefits. To this end, the NRF Strategy 2025 included two new outcomes areas, viz., enhanced research enterprise and enhanced science engagement. The NRF develops and implements policies and the interventions guided by the national STI policies led by the DSI, such as the 2019 White Paper on STI, the Decadal Plan for STI and the DSI Strategic Plan. In order for the NRF to make a contribution to the delivery of outcomes in respect of DSI-led national priorities and related outcomes in the National Development Plan, the organisation will focus on the following strategic interventions during the 2021/22 financial year, some of which were started in the 2020/21 financial year:

- Research Impact Framework;
- Engaged Research Framework;
- Fit-for-purpose science engagement capacity;
- Implementation of a new DSI-NRF Postgraduate Student Funding Policy;
- Leading Researchers and Scholars Programme (LRSP); and
- NRF Framework on Equality, Diversity and Inclusivity (with a specific focus on African and Coloured women).

Starting in 2021/22 financial year, NRF commits to delivery of specific innovation and Intellectual Property outputs, which align with the DSI strategic plan and the 2019 White Paper on STI. This area of performance will expand during the MTEF period and is expected to yield solutions to enable public policy effectiveness and lead to development of new innovation-led industries.

The NRF has been historically underfunded in relation to service delivery demands which places the organisation under severe strain from past reductions due to fiscal constraints, ongoing austerity measures and the recent 2020 MTEF reduction of R763 million due to the impact of the COVID-19 pandemic. Looking forward, the NRF funding comprising of the Parliamentary Grant and Contract funding is unstable with an overall 1.7% increase in 2021/22 (based on the pre-COVID-19 allocation), a 1% budget cut in 2022/23 and a 7.2% increase in 2023/24, against the prior year's MTEF allocation. These shifts are largely due to certain types of funding being received in alternate years, e.g., the National Equipment Programme.

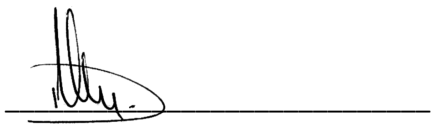
Alternative sources of funding through strategic partnerships will be strengthened and/or explored to augment the organisation's resource base for advancing its mandate and to leverage additionality. A strategy for strategic partnerships has been developed. For this APP period the organisation will further implement this strategy to leverage additional resources to drive the system, forge strategic networks and partnerships with government, the private sector, research performing institutions, development partners and other stakeholders, and support and facilitate South Africa's engagement in the global science system. The organisation will also accelerate engagement among African countries to develop expertise, build capacity, and contribute to local and continental development agendas.

Additional revenues from the production of radio-isotopes will be maximised by increasing the beam intensity of the cyclotron at iThemba LABS. Going forward, additional revenues earned from the implementation of the new cyclotron through the SAIF Project will enable the NRF to invest in a new radio-isotope research infrastructure and secure resources towards continued facility upgrade and maintenance.

An ongoing focus and close monitoring of the key cost drivers within the organisation will continue through the application of the principles of zero-based budgeting to ensure cost drivers are managed effectively with impactful value creation. In order to manage the salary bill, the temporary moratorium on the filling of vacancies which was implemented during 2020 will be reviewed to align this recurring cost to ensure financial stability.

The effective use of available resources and technology within the organisation also forms the cornerstone of sustainability. To this end, lessons learnt in ensuring business continuity during the lockdown is being enhanced through greater use of virtual platforms, innovation and technology including the rollout of the new Enterprise Resource Planning (ERP) system in reducing transactional costs and improving efficiencies.

I would like to take this opportunity to acknowledge the support and guidance of the NRF Board, the DSI, the DHEST Ministry and the dedication and commitment of NRF Management and all NRF employees in the implementation of the Annual Performance Plan.



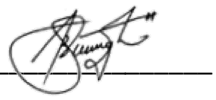
Dr D Pillay
Chief Executive Officer (Acting**)**

Official Sign-Off

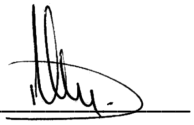
It is hereby certified that this Annual Performance Plan:

- Was developed by the management of the National Research Foundation (NRF) under the guidance of the NRF Board;
- Considers all relevant policies, legislation and other mandates for which the NRF is responsible; and
- Accurately reflects the outcomes and outputs which the NRF will endeavour to achieve over the period 2021/22 to 2023/24.

Mr B Singh

Chief Financial Officer Signature: 

Dr D Pillay

Chief Executive Officer (Acting) Signature: 

Dr N Obokoh

Chairperson of the Board Signature: 

Approved by:

Dr BE Nzimande, MP

Minister of Higher Education, Science and Technology Signature: 

Part A: Our mandate

1. Relevant Legislative and Policy Mandates

The context within which the NRF functions is informed by various strategic frameworks, legislation, polices and plans. Amongst these are those that outline developmental priorities for the nation and in particular for the higher education and science and technology sector in the medium to long term. The objectives and priorities relevant to the NRF's mandate, planning and priorities, are discussed below.

National Research Foundation Act, 1998 (Act 23 of 2018 as amended)

This Act established the NRF, and provides the object of the NRF, which is 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.

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 of growing the science, technology and innovation 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 expand the research system and to promote partnerships among universities, society, industry and government to ensure a cohesive National System of Innovation (NSI).

White Paper on Post-School Education and Training, 2013

The White Paper on Post-School Education and Training (WP-PSET) advances priorities in the post-school education sector, including the expansion of the variety and number of post-school opportunities available to youth. It advances diversity, quality education, expanded access to postgraduate education, and research and researcher advancement.

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.

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 functioning and work of the NRF. Specifically, the DHET and DSI have developed and implemented several strategies and policies to guide the development of our science system and these include:

- The Strategy for Human Capacity Development for Research, Innovation and Scholarships;
- The Staffing South Africa's Universities Framework;
- The Science Engagement Framework;
- 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 a number of 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 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) outlines 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 strategic priorities of each country.

2. 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 developed a new Postgraduate Funding Policy and is developing a programme to support early career researchers (ECR) and scholars.

3. 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. National development consists of various components, for example, the political, social, economic and environmental. 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"[1]. The knowledge enterprise (researchers, research, research infrastructure and science engagement) 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'.

Funding remains a key constraint overall, with NRF science engagement making up just over an average of 4% of total NRF budget over the decade. There are currently no additional resources available to meet the ever increasing requirements of an innovative engagement programme mix or to adequately fund a fully immersed engaged research agenda. To date, the larger share of the NRF science engagement budget allocation has come from contract funding, mainly from the DSI, with smaller contributions from private sponsors. The NRF`s desired shift towards a more fully engaged research agenda requires that researchers are adequately funded to engage the various publics along the entire research value chain. This has serious implications for the ability of the NRF to give life to the meaning of research for a better society.

The reality is, however, that national resources are limited and public funds have been severely impacted by the economic impact of the COVID-19 pandemic. This is evident from the significant budget cuts imposed in 2020/21 by National Treasury that will endure for the MTEF period. As outlined above, the limited funding has a bearing on all 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 the definition of a sustainable resourcing framework 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

[1] United Nations General Assembly. (1987). Report of the world commission on environment and development: Our common future. Oslo, Norway: United Nations General Assembly, Development and International Co-operation: Environment.

effective stewardship of the resources made available to it to sustain itself, the system it supports and the endeavours and initiatives it implements for the long haul.

1.1 External Environment Analysis

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

1.2 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, black students funded by the NRF increased from 69% in 2015 to 83% in 2019. The representation of female students increased from 54% in 2015 to 59% in 2019. Overall, over the period 2015 to 2019, the nationality of NRF-funded postgraduate students met the Ministerial Guideline's target of 88% of funded students being South African or Permanent Residents. The remaining 12% comprised: 5% SADC; 4% Rest of Africa; 3% Rest of the World. The challenge however has been that this pattern has not been consistent at the higher the postgraduate level, with the higher percentage of non-South African funded students, with 76% 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 masters 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:

- A disturbingly low number of student's progress from honours degrees to masters, and then on to doctoral studies. From 14 885[2] students funded at honours level between 2005 and 2015, 9 426 (63%) progressed to masters Level and 2 375 (16% of those enrolled at honours level) progressed to doctoral level.

- On average, the completion of postgraduate degrees takes disturbingly longer than it should, resulting in advanced age at time of degree completion[3]. Noteworthy though is that the average age at completion for NRF-funded students is consistently lower than the national average. While being a bleak story, this is another indicator of the enhanced efficiencies linked to the NRF interventions.

The principle core of the research workforce are the research and instructional staff, primarily at higher education institutions. In 2018, the NRF supported 4 633 researchers out of a potential pool of 8 486 permanent instruction and research staff with doctoral degrees employed by South African public universities (HEMIS, 2018).[4] Of these, 3 726 (44%) were black and 3 584 (42%) were women in 2018. Over the past five years (2015 to 2019), the number of researchers funded by the NRF increased

[2] HEMIS data.

[3] Cloete, N., Mouton, J., Sheppard, C. (2015). Doctoral Education in South Africa: Policy, Discourse and Data. Cape Town: African Minds.

[4] The latest audited data available from HEMIS is the 2018 data. Using the same statistics for all instruction and research staff with a doctoral degree (i.e. including those on temporary contracts), increases the potential pool to 12 821, of which 43% are black and 41% are women.

from 4 315 in 2015, to a peak of 4, 708 in 2017, followed by a decline to 3, 205 in 2019. 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, though modest 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 2015 to 48% in 2019 and that of women from 37% in 2015 to 45% in 2019.

In alignment with the NRF's mandate and the first outcome of NRF Strategy 2025 and the DSI Strategic Plan, 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 and which 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 to the expectations of the country to become a knowledge-led economy.

1.3 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 economic, 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 a 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 on 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. Overtime, this will lead to a more universal understanding of the developmental role of science and research, will increase accountability with regards to spending public money, and may lead to greater investment in the sector.

The South African knowledge enterprise delivers both knowledge and societal impact, but the often 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 inter-disciplinary 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 develops and implements a Research Impact Framework, which will guide the organisation in the implementation of its Research Agenda. This 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. In this way, NRF will work towards a coherent NSI pathway to enable and maximise research 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.

The Research Impact Framework provides a working definition of impact (knowledge and societal) and proposes impact assessment that is both *ex-ante* and *ex-post*. *Ex-post* research impact assessment will provide the basis for evidence-based impact stories that will clearly communicate the direct and indirect relationship between knowledge advancement and national development. Through the communication of impact, the research sector will be able to provide evidence to the government and to the public of the societal benefit that their investments in the research sector accrues. This will enhance understanding of the developmental role of science and research, will increase accountability with regards to how public money is invested, and may, overtime, lead to greater public investment in research.

In pursuit of 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 planning and policy development with the rest of the NSI. The merged

administration resulting in the combined Ministry of Higher Education Science and Technology, enables this coherent and cohesive strategic planning and policy development.

1.4 Impact of science engagement

It is important to continue to raise science awareness amongst all citizens of the country and to provide access to an increasingly diverse range of public science events and infrastructure. Approximately five and a half million people accessed the NRF National Facilities between 2015/16 and March 2019/2020. An innovative programme mix for science engagement, that is also attuned to 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 the science communication content and frequency and increase NRF 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, but specifically visible and generally effective, within the South African context.

The science engagement activities over the period from 2015/16 to 2019/20 reached approximately 1.3 million learners. The interventions aim 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 (NSO). However, popularisation of science on its own will not increase the number of students enrolling for 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 focussed interventions going forward will allow for tracking of impact (participation, performance and careers in science) in specific projects over 3-5 year periods (rather than once off short term activities).

At a national level, efforts to move the science engagement system along must (and have slowly started to) move towards a focus on creating an enabling environment, setting up of funding mechanisms, enlisting the participation of sectoral and institutional role players, and ensuring that the country's science engagement system is able to assess its effectiveness and efficiency. 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 its enhanced engagement mandate have begun to roll out during 2020.

The NRF's vision of a transformed relationship between science and society is one of a society 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 the NRF's intent therefore – while growing the broad science promotion and awareness portfolio to adopt a deliberate strategic focus on positioning engaged research as a valued and esteemed practice; 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 and a progression in its long-recognised value of a scientifically engaged society.

The availability of well understood, widely acceptable and meaningful indicators that can indicate whether communication and engagement is having an impact has long been a particular challenge both nationally and globally. Indicators for the contribution of knowledge to government decision-making and policymaking will need to be developed. Organisationally, those indicators are likely to include contributions by NRF-funded and NRF NFs researchers to national scientific and technical reports, development and management of decision support systems, and direct advice.

1.5 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

1.6 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 in attracting and retaining skilled human resources are not possible to deploy. COVID-19 impact on implementing planned training interventions lead to the postponement of Management Development Programmes (MDP) and 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, as is intended.

1.7 Management of the Remuneration Bill

The NRF board has put a 22% threshold of remuneration costs as a proportion of the NRF 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%. As part of the management of the Remuneration Bill management has since instituted a moratorium on the filling of non-critical vacancies while still monitoring and evaluating to ensure that the operations of the NRF are not negatively impacted. Further to the moratorium, management 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 and continues to consult on factors that will ensure NRF sustainability with less to no need to do any difficult headcount review to the extent

feasible. This joint understanding features prominently in the manner in which, as partners with organised labour, approach salary and conditions of service improvements discussions. The understanding also includes ensuring that the NRF as an employer does not lag behind its market cohort in remuneration to ensure retention of talent. In addition to the above an NRF-wide establishment management will be introduced to ensure rigour in the management and allocation of human resources across the organisation.

1.8 Resourcing

It is not feasible to advance benefits for society, the economy and the environment without a well-resourced, sustainable and transformed knowledge and research enterprise. It is critical for the NRF to receive adequate resources, with sufficient predictability, to allow for long-term planning to ensure sufficient flexibility in supporting the research endeavour towards maximum impact. The status quo is that government allocations to the NRF have not increased in real terms, and that the majority of the funding allocated to the organisation from government is already earmarked (75%), leaving only 25% for the NRF to invest in a balanced portfolio of strategic priorities. Over the MTEF period the fiscal realities have forced National Treasury to apply only a 1.7% budget increase in 2021/22 with a 1% budget cut in 2022/23. This effectively means that the NRF will be funded well below inflation every year with a continuing effective drop in the parliamentary grant which will impact on the performance organisation wide and 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 resource flexibility, 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 a predictable and flexible resourcing model in collaboration with the Department of Science and Innovation in order to ensure 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 will seek to demonstrate the societal and knowledge impact of its investment.

1.9 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 of 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 South African Agency for Science and Technology Advancement (SAASTA), as a business unit of the NRF, is adequately structured and capacitated to deliver much broader roles and responsibilities nationally and globally. A SAASTA business review and organisational development project was initiated in 2020 with the aim of ensuring that NRF, and its business unit SAASTA in particular, becomes a fit-for-purpose organisation that can lead the science engagement mandate.

Organisationally, although some level of science engagement success has been achieved, internal NRF science engagement is not yet maximally integrated to ensure a seamless and coordinated approach. In the same vein, while 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, SAASTA as the business unit tasked with leading the full spectrum (science engagement and engaged research) of the NRF science engagement mandate will need to 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) from playing the role of a (partial) internal coordinator within NRF to facilitating national coordination and coherence (beyond reporting and reliance on quantitative reach).

SOAR (Strengths, Opportunities, Aspirations and Results) 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 Annual Performance Plan.

SOAR Analysis

Strengths:	**Opportunities:**
• 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.	• 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. • Promote the benefit of the knowledge enterprise for societal development. • Make science accessible through a variety of media platforms (including social media).
Aspirations:	**Results:**
• To position the NRF to impact, shape and influence all aspects of the knowledge enterprise. • To maximise the impact of our 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	• A diverse, inclusive and transformed knowledge enterprise and research workforce. • Excellent research with impact, that contributes to national development.

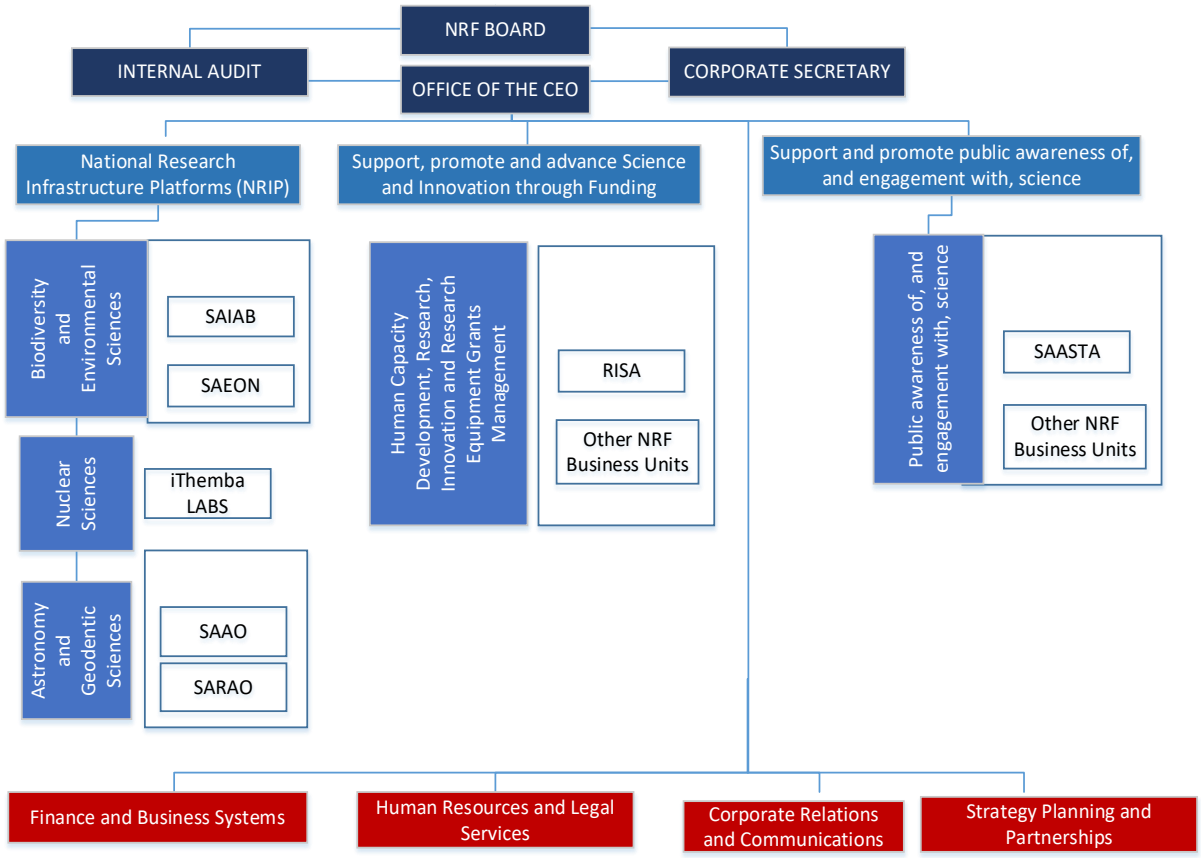
economy, the environment and on the knowledge enterprise. • To fundamentally change and strengthen the resourcing of our mandate. • To create an inclusive and diverse knowledge enterprise. • To influence the national science agenda and decision making in the science system. • To be a transformed, coherent, learning organisation that strives for excellence.	• 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.

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 specific medium-term targets.

1.10 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.

Figure 1: High level organisational structure of the NRF



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 over delivery on strategic plan outcomes and performance of critical support functions.

2. Alignment with the MTSF 2019-2024, the DSI Outcomes, Economic Recovery and Reconstruction Plan

2.1 NRF role in the post-lockdown economic recovery

The NRF has recently adopted its five-year strategic plan (NRF Strategic Plan 2020 – 2025). One of the features that characterises this Strategic Plan is a shift in focus towards outcomes and impact of the NRF interventions. In line with this, one of the 4 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 4th industrial revolution (4IR), grounded on artificial intelligence (AI) has currently captured the attention of the world and already is 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 is 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 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 ***dti*** 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 ***dti***) 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 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 investigation.

Some specifics which the NRF will explore, will include the following:

- Ensure the COVID-19 recovery is informed by the best available research;
    - As an example: Institute more rapid response funding instruments that rapidly 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.
- Facilitate/Enable international scientific collaboration through a unifying global framework.

2.2 MTSF 2019-2024 and DSI Outcomes

The NRF strategic direction and medium term implementation plans are designed to ensure that the organisation contribute to government national development priorities and outcomes as outlined in the NDP 2030, MTSF 2019-2024, DSI Strategic Plan as well as White Paper of Science, Technology and Innovation, and its implementation Plan, the STI Decadal Plan. The MTSF sets out seven priorities and 81 Outcomes for the 6th 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 the 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 performance targets for each of its budget programme.

In implementing the intents of the White Paper on Science, and Technology and Innovation (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 at and address effectiveness at a national level inclusive of the NSI, at the NRF and at research performing institution level. The data and analysis will inform policies as well as strategic and operational planning.

The NRF is also committed to provide support to the proposed new Science and Innovation University in line with its mandate for advancing human capacity development and research.

Table 1: Contribution of the NRF to MTSF outcomes

MTSF Outcome	Interventions	NRF contribution
Improve competitiveness through ICT (Linked to Priority 2 - Economic transformation and job creation)	Increase investment in gross expenditure on research and development	Development of national super-computing and big data analysis capability as a spinoff of the Research Infrastructure Platforms build programme.
	Strengthen the national system of Innovation	Develop and implement 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.
		Grow the knowledge production in this area, which should be evident through an increase in the number of research articles by the funded researchers and cited in the Web of Science Base.
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)	Enable and facilitate appropriate applications for nGAP, 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: NRF contribution to 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 and implement Research Impact Framework. 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 the impact.
		Develop and implement NRF Research Agenda in line with priorities set in the STI Decadal Plan. The Research Agenda 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 Post-graduate 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, and Black Academics Advancement Programme (Thuthuka).
	Improved knowledge about science among the general public	Create a fit-for-purpose science engagement capability in order to fully implement the Science Engagement Strategy and Engaged Research Agenda.
Increase knowledge generation and innovation outputs.	Increase South Africa's share (percentage) of global publication outputs	Conduct IP awareness sessions for NRF funded researchers
	Percentage increase in patent applications from publicly financed R&D	Promote and track trends in patent applications from NRF financed R&D

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 the outcomes in Strategy 2025.

The development of a transformed, internationally competitive and sustainable research workforce

In 2020/21 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 commenced 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 and partial cost of study (FCS and PCS). In 2021/22 the first cohort of honours, masters and doctoral students will be funded either at full or partial cost of study with financial need and academic competence of historically disadvantaged groups prioritising them for support. During the same year bi-annual reporting for improved performance tracking and throughput will be implemented. In 2022/23 the first cohort of graduating students will be funded for uninterrupted postgraduate studies. In 2023/24 online tracking of graduates will commence in partnership with South African Revenue Services.

Scientific discovery and innovation are increasingly driven by research infrastructures, platforms and big data. The effective use of advanced infrastructures and platforms requires specialised and advanced expertise. To ensure that this specialised technical expertise is available to manage and operate research infrastructures, a programme will be implemented to train future instrument scientists and technical professionals in the natural science domains and in the humanities and social sciences. In 2021/22 a new Framework will be defined and developed detailing mechanisms for developing instrument scientists and technical professionals to ensure that they have career opportunities that retain their expertise within the research enterprise. The framework will be informed by engagements with the DSI and DHET and other key stakeholders across the academic and research sectors. In 2022/23 a call for applications will be placed for an expanded Professional Development Programme (PDP) at public research institutions that incorporates instrument scientists and technical professionals. In 2023/24 the first cohort of the PDP that incorporates instrument scientists and technical professionals will be appointed at public research institutions on fixed-term appointments.

The NRF will establish the Leading Researchers and Scholars Programme (LRSP) to create a sustainable intervention that accelerates the career progression of exceptional early, mid- and advanced career researchers and scholars to become LRS in all fields of research and disciplines. In 2020/21 a Framework for the LRSP and engagements with key stakeholders was developed. In 2021/22 the framework will be completed through engagements with the DSI, DHET and the academic and research community. Funding will be secured to fund the first cohort of LRSP awardees requiring R18 million, over a six-year period, per grant award. Individuals entering at the mid-career stage may be considered for a second six-year cycle of funding while those entering as advanced career researchers and scholars will be supported for one six-year funding cycle. In 2021/22 the first call for applications will be made with the aim of making the first round of awards within third quarter of the 2022/23 financial year. In 2023/24 the first cohort of LRSP awardees will commence with their six-year accelerated career advancement programme to transition to become leading researchers and scholars. In 2024/25 annual monitoring of performance of the LRSP will commence and will be undertaken by an LRSP Programme Advisory Committee appointed by the NRF.

From 2020/21, a framework to advance Equity, Diversity and Inclusivity at the NRF (with a heightened focus on African and Coloured women) will be implemented through to the end of 2025. In 2021/22, further specific interventions for change in areas of the NRF's workforce where there is under-representation of designated groups, including people living with disabilities, will be embarked on to ensure increased representation and the necessary support. This will ensure a focus on equity, diversity and inclusivity across the different units of the NRF and will inform the development of section-specific programmes where necessary.

During 2020/21, key strategy and guiding documents have been developed to advance the NRF mandate through Strategic Partnerships. On 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. From 2021/22 there will be implementation of an agreement with the Mandela Institute for Development Studies (MINDS) enhancing HCD through exposure in the rest of the continent, and in support of a concerted focus on Africa. From 2021/23 onwards there will be implementation of the second phase of the Science Granting Council's initiative. From 2021/23 there will be the operationalising of the African Open Science Platform (AOSP). In 2021/22 there will be a hosting of the Annual Meeting of the Global Research Council (GRC). The successful development of knowledge products of the GRC is ongoing.

Following the roll-out of a significant and high-level agreement with the Canadian industry MITACS, to bolster the industry and placement of post-graduate students and early career researchers strategies in 2021/22, in 2022/23, there will be evidence of the establishment of an Africa industry programme, in collaboration with the Canadian International Development Research Centre. 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 2023/24 an advanced uptake and effectiveness of international scholarships and bursaries in South Africa, in partnership with the DHET, and in pursuit of the enhancement of HCD through exposure abroad.

Regarding the provision of (science) domain-balanced, globally competitive research infrastructure platforms for the research enterprise, focus will be placed on recognition and/or establishment of research infrastructure platforms (RIP) in the Social Sciences and Humanities. This process will focus on seeking alignment and integration with the South Africa Research Infrastructure Roadmap regarding already supported potential RIPs, plus the identification of new ones. It will be undertaken in the context of mainstreaming the notion of National Research Infrastructure Platforms (NRIP). An over-arching, national scale strategic framework for research infrastructure provision will be developed as an anchor for all these developments. This will be accompanied by a definition of an appropriate and sustainable resourcing framework for NRIPs as well as the development of meaningful operational performance indicators, including those for socio-economic impact of the NRIPs. In order to ensure global competitiveness of existing RIPs, in particular within the National Research Facilities, various strategic infrastructure development projects will be pursued in line with the strategic plans of the Facilities.

The development of an enhanced impact of the research enterprise

In advancing the NRF's research impact agenda in 2020/21, an NRF impact framework that defines and positions the organisation to implement a research impact agenda was developed. 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. In 2021/22, a review of the NRF's internal processes and operations will be conducted and identification of necessary changes to implement the research impact agenda and prepare the various sections for future impact

assessment. This will include serving on the task team responsible for the NRF's Research Framework, Research Impact Framework and Agenda, which will bring together the NRF's work on research impact, research excellence and engaged research to ensure streamlined implementation. The development of a model to assess research impact will be made. During the same year, the NRF will inform and influence the National System of Innovation (NSI) more broadly regarding developments in terms of research impact and impact assessment. These interactions will be aimed at ensuring both stakeholder buy-in and refinement of NRF processes in line with stakeholder requirements.

In 2022/23 the NRF will be ready to pilot the introduction of the NRF's impact agenda within specific areas of the organisation, with both ex-ante and ex-post assessment where necessary. In 2023/24 the NRF's impact agenda including both ex-ante and ex-post assessment where applicable, will be rolled-out across the organisation. This will ensure that the NRF will reach the 5-year Strategy 2025 target of: Portfolio of excellent research supported by the NRF is justified with sound ex-ante and ex-post assessment: Knowledge and Societal Impact.

In advancing the RDIP in 2020/21, a consolidated dashboard reporting functionality that includes the analysis of DHET data, NRF grant making data is available to the NRF staff. The Microsoft Power Business Intelligence (BI) technology has been licensed and deployed. In 2021/22 the development and implementation of external access to the BI Platform will be completed. Development of a research output harvesting tool will be used by research performing institutions. In 2022/23 the NRF will facilitate the uptake of the research output harvesting tool in the HEI's and Science Councils. The organisation will develop predictive analysis skills. In 2023/24 the NRF will develop predictive analysis functionality and provide related services.

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 NRF is also currently in the process of implementing NRF Strategy 2025 with a key focus on growing the science engagement portfolio to include support and promotion of engaged research for greater societal impact. This requires an ongoing process of embedding science engagement more holistically within NRF programmes and enabling engaged scholarship which produces co-created, self-reflective knowledge and new formations of community in the process. This is a new emphasis of advancing programmes that are impactful to influence societal behaviour that will ultimately minimise the gap between science and society and forms part of our commitment to reimagine the NRF science engagement portfolio in order to align with international best practice 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:

- Embedding engaged research within the research enterprise: Some changes to be effected over the ensuing Vison 2030 include the formulation of an acceptable engaged research design; the identification of new and innovative public engagement research 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 evaluation approaches – especially expanding the use of qualitative information and case studies rather than an emphasis on distinctly quantitative data. The long-term outcomes 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; increasing dialogue on

critical science-related issues which is more firmly embedded in the public discourse; and evidence of a transformed and resilient science, technology, engineering and mathematics workforce.

- 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 global connection will continue through the support and promotion of two South African Research Chairs Initiative in science communication which will continue to promote the growth of academic partnerships in the science communication and engagement discourse. The development of the engaged research framework (in progress) is promoting deeper engagements on the shared understandings of community and research engagement, as are joint project partnerships built on the ethos of Responsible Research and Innovation (RRI) and broader science awareness on global science issues.

- Creating a fit-for-purpose South African Agency for Science and Technology Advancement (SAASTA), as a business unit of the NRF, that is adequately structured and capacitated to deliver much broader roles and responsibilities nationally and globally. This will also include enhanced business processes, 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 SAASTA. A SAASTA business review and organisational development project was initiated in 2020 with the aim of ensuring that NRF, and its business unit SAASTA in particular, becomes a fit-for-purpose organisation that can lead the science engagement mandate.

A transformed organisation that lives its culture and values

Over the next three years the issues highlighted in Strategy 2025 will be addressed through continued transformation efforts with respect to the demographic profile of the NRF staff 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 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 re-introducing Executive and Management Development Programmes and Coaching of employees at senior levels. There will be establishment of the Human Capacity Development support 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.

Other emerging strategic priorities

The organisation will in collaboration with the DSI, the DHET and HEIs explore and support the following priorities for enhance the developmental impact of the science system:

- Establishing Center for the Study of Pandemics,
- Mainstreaming of Social Sciences and Humanities (SSH), and
- Education for the Future and the Future of Society

Center for the Study of Pandemics

A pandemic is an epidemic of an infectious disease that has spread across a large region, for instance multiple continents or worldwide, affecting a substantial number of people. Throughout human

history, there have been a number of pandemics of diseases such as smallpox; tuberculosis; the black death or the plague; measles; malaria; influenza; cholera and more recently HIV/AIDS and COVID-19, which are both still prevalent globally, including in South Africa and on the African continent at large.

In addition to the currently prevalent HIV/AIDS and COVID-19 pandemics, there are growing concerns about new future pandemics. In fact, the World Health Organisation (WHO) cautioned that the current COVID-19 pandemic is "not necessarily the big one" and "the next pandemic may be more severe." Accordingly, WHO called for preparations and challenged the world to tackle the cause of pandemics and not just the health and economic symptoms.

Therefore, the NRF affirms that the envisaged Southern African Centre for the Study of Pandemics (SACSoP) is a much needed proactive outfit in the country that would be part of the preparation to combat future pandemics presciently predicted by WHO. The NRF suggests that the SACSoP should be a multi-disciplinary virtual centre, akin to the DSI-NRF Centres of Excellence (CoEs). That is, the SACSoP should leverage existing capacity and expertise within Southern African Universities and relevant Science Councils. Needless to say, the SACSoP should also have a ring-fenced multi-year budget funded mainly through the public purse with a view to establishing public-private partnership in the fullness of time.

Without being too prescriptive, the NRF suggests that the SACSoP should, in the first instance, focus on studying antibiotic resistant microorganism or “superbugs” that may contribute to the re-emergence of infectious diseases that are currently well controlled. These superbugs, if not controlled, may become “escape mutants” or new variants that evade selection pressures and eventually result in new future pandemics.

The NRF further suggests that the SACSoP should in parallel, through multi-disciplinary research programmes, also focus on the study of human activities that drive climate change; overpopulation; biodiversity loss and wild lands encroachment, which in turn also drive pandemic risks through their impacts on our environment or through zoonotic transmission of novel infectious diseases from animals to humans. Examples of zoonotic transmissions that exploded into pandemics are the Simian Immunodeficiency Virus (SIV) transmitted from chimpanzees and macaques to humans and resulted in the HIV/AIDS pandemic, as well as the COVID-19 pandemic suggested by some scientific literature to have resulted from a zoonotic transmission from bats and pangolins to humans.

To complete the circle and offer a holistic approach to the study of pandemics, the NRF suggests that the SACSoP through its multi-disciplinary approach should also study pathophysiological, socio-economical and psychological consequences of pandemics and how to mitigate such consequences as and when pandemics occur.

Mainstreaming of Social Sciences and Humanities (SSH

Based on the preliminary feedback received on the development of the Decadal Plan it is clear that the government through the DSI will in the future favour support for knowledge production/research and use, through the identified themes and through pluri-disciplinary approaches. The NRF as the principal research funding agency will align a major part of its research support, to the themes that have been identified in the Decadal Plan. Some of these themes will undoubtedly and should be dedicated to the humanities and social sciences. For example, we are aware that the theme: “**Education for the Future and the Future of Society** has received a lot of support and will be part of the Decadal Plan themes. The NRF should implement this theme as part of streamlining the humanities and social sciences. In addition, the NRF may continue with other humanities and social science themes or areas of the Grand Challenges like the current Human and Social Dynamics (HSD) Grand

Challenge as a way to strengthen the mainstreaming of the humanities and social science support. The HSD Grand Challenge that the NRF manages on behalf of the DSI has specific sub themes that had been identified through stakeholder consultations. These sub-themes can be revised in accordance with the new developments and outcomes of the foresight study and prioritisation that have recently been completed. Furthermore, and in line with the provisions of the Decadal Plan, the NRF will continue to encourage, provide for and develop interventions that will facilitate humanities and social science scholars and researchers to participate in pluri-disciplinary projects. Finally, the NRF must continue to provide opportunities for open (non-thematic) research funding opportunities that are not dedicated to themes, similar to the open disciplinary calls that the Competitive Programme for Rated Researchers (CPRR) and Competitive Support for Unrated Researchers (CSUR) have provided. In these open disciplines funding support there will be a need to encourage Humanities and Social Science applicants. For example, a statement similar to the following statement that has accompanied both the CPRR and CSUR calls in the past few years may be used/ considered:

Social Sciences, Law and Humanities applications are encouraged, just like those in the natural sciences, engineering and health science that have traditionally been supported. The NRF continues to support self-initiated bottom-up research ideas and research that address national strategic initiatives as reflected in national strategies like the National Development Plan, the 10-year Innovation Plan and those that are embedded in our geographic advantage areas. In respect to the social sciences and humanities however, the NRF would like to highlight the fact that it is supportive and committed to working closely with the National Institute for the Humanities and Social Sciences (NIHSS) on the advancement of social sciences and the humanities scholarship in South Africa. The Department of Higher Education has appointed NIHSS to drive the humanities and social sciences related BRICS (Brazil, Russia, India, China and South Africa) initiatives on its behalf. The first NIHSS-BRICS workshop identified the following broad areas of common interest and cooperation. These broad themes should be addressed within the specific South African context:

- *The study of violence*
- *Social cohesion*
- *Transformation and decolonisation of knowledge*
- *Poverty*
- *Inequality*

In this way we hope to continue to mainstream the humanities and social sciences in the support provided by the NRF.

4. Local and international partnerships

Following the migration of the 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 SAICA-CTA which was allocated R59 242 500.00. In 2017 this allocation was reduced by 25% and further reduced in subsequent years. The provisional allocation for 2021/22 including the SAICA allocation is R151 299 823.00. 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 Funding Policy. Through this Agreement, the NRF and ISFAP agreed to support full-time study for postgraduate Students at the honours, masters and doctoral levels on a 50:50 percent cost sharing model towards the Full Cost of Study or Partial Cost of Study 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 in order to identify qualifying Students for Full Cost of Study. The first cohort of applicants in 2020 for funding in 2021 have undergone the 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 USA 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 12 months. Herewith the estimated leveraged income for previous MTSF period.

Table 3: Summary of selected leveraged Income: 2015-2020

Organisation/ Partnership	**NRF Contribution (ZAR)**	**Leveraged (ZAR)**
[A] Bilateral agreements	90 000 000	90 000 000
[A] Bi-/trilateral Chairs	15 000 000	15 000 000
International Science Council	15 500 000	50 000 000
First Rand Foundation	82 000 000	82 000 000
Inter-Continental Drilling Programme	100 000	80 000 000
Science Granting Council Initiative (Africa)	5 000 000	100 000 000
Global Knowledge Partnerships	32 000 000	120 000 000
COVID-19 Call	15 000 000	98 000 000
Belmont Forum	0	27 000 000
Tambo Chairs (per annum)	32 000 000	6 000 000
African Open Science Platform (hosted by the NRF)	0	18 000 000
[B] Research Infrastructure	90 000 000	600 000 000

EU Programmes	15 000 000	30 000 000
Total	**391 600 000**	**1 316 000 000**
Leveraged per Rand	**R1**	**R3,36**
Average per year over 5 years	**R78 320 000**	**R263 200 000**
Special Cases, broader socio-economic impact (value for money)		
CoEs and SARChI		1 800 000 000

SA-BRICS Research Collaboration - NRF

In recognising the strategic importance of the partnerships among the Brazil, Russia, India, China, South Africa (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 5-years the NRF has been participating in the BRICS STI Framework Programme (BRICS STI-PF) 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.

In order to further strengthen this strategic partnerships, a BRICS call was launched in 2020 to support joint projects starting from 2021 – 2023. This call was launched in partnership with the Medical Research Council (MRC) from the South African side due to the fact that 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;
- AI, ICT and 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.

In an effort to deepen these partnerships, during 2021-20215 all the BRICS countries have approved the second Phase of the BRICS STI Framework Programme. The NRF forms part of this 2nd Phase and will continue to serve as the main funder from the South African side. This 2nd Phase will be implemented in accordance with the revised BRICS STI FP.

5. Financial Overview

The NRF is primarily funded by a Parliamentary Grant i.e. PG (20%) and contract funding received from the DSI (71%). The balance of funds relates to contract funds from other government departments, entities and private institutions (6%) as well as income generated through sales and interest income (3%).

The NRF's Parliamentary Grant has been historically underfunded and is under severe strain from past reductions due to fiscal constraints, ongoing austerity measures and the recent 2020 MTEF reduction of R763 million due to the impact of the COVID-19 pandemic. Looking forward, the NRF funding levels comprising the Parliamentary Grant and Contract funding is unstable with an overall 1.7% increase in 2021/22 (based on the pre-COVID-19 allocation), a 1% budget cut in 2022/23 and a 7.2% increase in 2023/24, against the prior year's MTEF allocation letter received in February 2020. This shifting trend relates mainly to the National Equipment Programme that is funded every alternate year. In contrast, the Parliamentary Grant decreased by 0.4% in 2021/22, increased by 2.5% in 2022/23 and increased by 0.4% in 2023/24, well below expected inflation, which will require management's ongoing focus to ensure sustainability as this segment of funding provides for the fundamental operations of the organisation.

All NRF business units are under severe strain in the context of the broader government wide fiscal challenges with no form of panacea over the medium term. Hence, while the NRF has endured many austerity measures and absorbed several cuts resulting in a lean entity, it will have to manage within the envelope of the allocation through continued stringent measures. Prudent decisions must 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.

FINANCIAL STATUS OF THE NRF

STATEMENT OF FINANCIAL PERFORMANCE					
CATEGORY	**2019/20 Actual R'000**	**2020/21 Revised R'000**	**2021/22 Projected R'000**	**2022/23 Projected R'000**	**2023/24 Projected R'000**
MTEF allocation - Parliamentary grant	943,385	859,469	962,587	986,202	989,991
MTEF allocation - DSI contract income*	2,553,161	2,663,697	3,400,815	3,169,626	3,108,952
Other contract income*	295,932	331,849	307,603	255,371	239,583
Interest received	58,475	37,361	26,742	32,018	33,619
Other income	93,299	60,274	77,327	78,629	82,741
Total income	**3,944,252**	**3,952,650**	**4,775,074**	**4,521,846**	**4,454,886**
Grants and bursaries	2,398,965	2,432,850	2,547,159	2,440,666	2,659,297
Operating expenditure	827,961	747,762	986,763	837,246	982,315
Salaries	763,262	848,693	936,534	973,350	1,005,118
Total expenditure	**3,990,188**	**4,029,305**	**4,470,456**	**4,251,262**	**4,646,730**
Net income before capital acquisitions	(45,936)	(76,655)	304,618	270,584	(191,844)
Less: Net capital expenditure and transfers	51,501	76,655	(304,618)	(270,584)	191,844
Net budgeted unspent funds	5,565	-	-	-	-
***Carry forward funding included**					

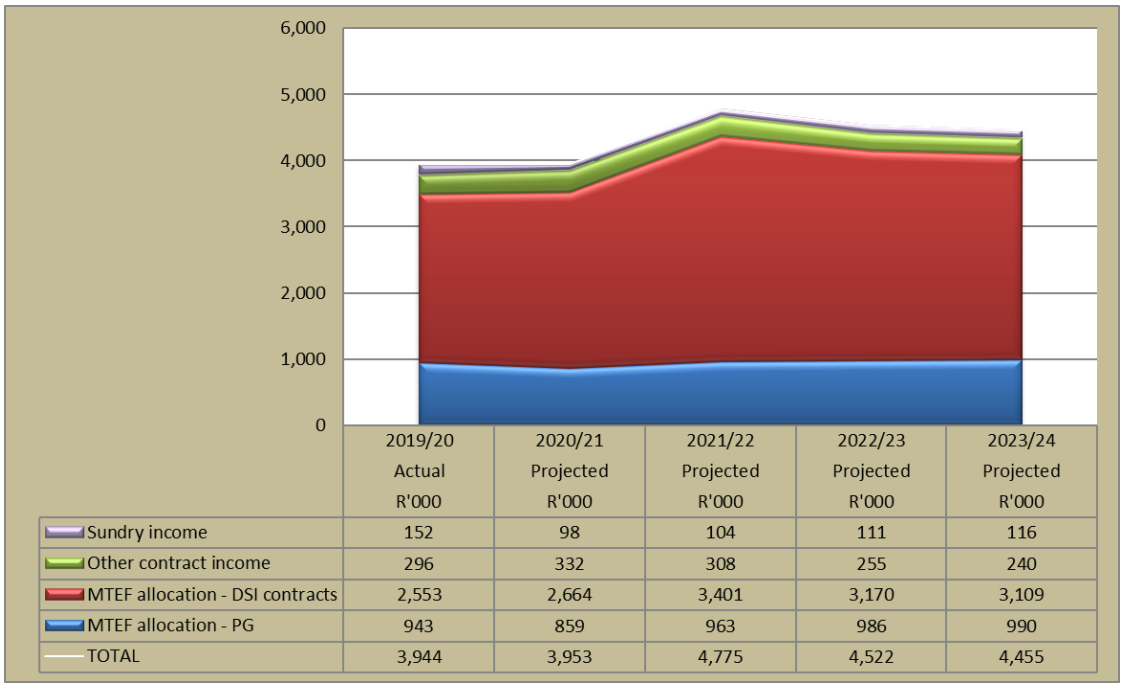
Although the increase in nominal terms from 2020/21 to 2021/22 seems significant, it must be noted that NRF total funding remains under pressure as it is forecasted from a lower base due to the COVID-19 budget cuts of R763 million and also the funding being received in alternate years for the National Equipment Programme, which skews the trend.

Income

The NRF places great effort in stimulating research towards National Development. In this regard various research funding instruments provide for leveraged funding through co-investment in programmes such as SARChI, CoEs, Thuthuka programmes etc. These efforts results in an annual average leveraged funding of approximately R1,4 billion annually being ploughed back into research efforts. Investments in the SKA project through SARAO has also resulted in various Intellectual Property being generated, which is being tracked and in the processes of being interrogated with potential partners to be exploited towards further benefit to the country and the research endeavour. The SKA project will also garner foreign direct investment for South Africa from partner countries. Through government support the NRF through iThemba LABS has embarked on the South African Isotope Facility (SAIF) project which is projected to increase radio-isotope sales from an average of R50 million per annum to in excess of R200 million per annum once fully operational bringing in much needed foreign exchange currency from exports while meeting local medical sector demands. The NRF will continue to leverage additionality through strategic partnerships.

Income in most areas reflect a fairly stagnant trend over the MTEF period *(refer* **Figure 2***)*. The decline in DSI contract funding in 2023/24 relates to the projected depletion of SARAO funds for the MeerKAT extension project in 2022/23 as the spending lag is recovered.

Figure 2: Comparison of sources of funding 2019/20–2023/24



	2019/20 Actual R'000	2020/21 Projected R'000	2021/22 Projected R'000	2022/23 Projected R'000	2023/24 Projected R'000
Sundry income	152	98	104	111	116
Other contract income	296	332	308	255	240
MTEF allocation - DSI contracts	2,553	2,664	3,401	3,170	3,109
MTEF allocation - PG	943	859	963	986	990
TOTAL	3,944	3,953	4,775	4,522	4,455

The parliamentary grant (baseline allocation) received by the NRF is utilised primarily to fund the programmes of the NRF and their related operational activities. The continuing effective drop in the parliamentary grant impacts on the financial sustainability of the organisation. 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 parliamentary grant, 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.

Expenditure

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

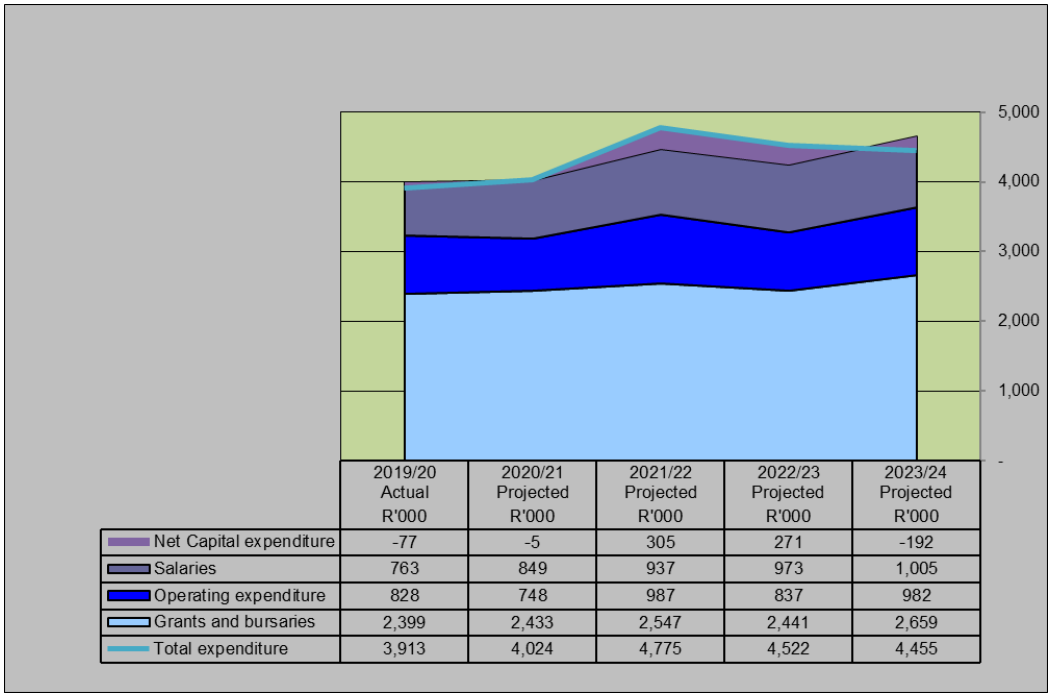
- Movement (if any) in the overall salary bill and staffing requirements.
- Operational cost which generally exceed inflation such as utilities and maintenance.
- Impact of foreign exchange volatility.
- Lack of flexibility in initiating necessary bold new initiatives and its impact on targets.

The cost of delivering on the mandate of the NRF and systemic demands are significantly outpacing the parliamentary grant 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 2019/20–2023/24



	2019/20 Actual R'000	2020/21 Projected R'000	2021/22 Projected R'000	2022/23 Projected R'000	2023/24 Projected R'000
Net Capital expenditure	-77	-5	305	271	-192
Salaries	763	849	937	973	1,005
Operating expenditure	828	748	987	837	982
Grants and bursaries	2,399	2,433	2,547	2,441	2,659
Total expenditure	3,913	4,024	4,775	4,522	4,455

Capital expenditure is provided at a bare minimum in order to maintain the operations based on the limited resources. Ordinary capex requirements will be funded from any savings made in the particular year. The exception is the continuing capital expenditure at 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 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 SARAO with a shift in its expenditure pattern as it transitions into operations following the commissioning of MeerKAT.

Employee's remuneration is forecast 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 (SAEON) and SKA1 (SARAO) projects, otherwise the staffing levels has remained stable in all other business units.

Key focus areas for National Research Facilities over the MTEF period

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

- iThemba LABS – Acquisition of the 70MeV Cyclotron dedicated to radio-isotope production and R&D facility for radio pharmaceuticals is urgent and necessary for the experimental physics research in SA.
- SARAO:
    - MeerKAT +20 project extension in consultation with Max-Planck-Gesellschaft (MPG) who are investing € 26.1 mil
    - SKA IGO launched on 12 March 2019 - Focus on Concept Design Reviews and Work Packages for SKA 1_MID
- SAEON – Roll-out of two (2) major SARIR projects SMCRI & EFTEON
- SAASTA – The re-organisation of SAASTA gearing towards implementation of the Science Engagement Strategy
- SAIAB – Upgrading marine research platforms; Establishing National Biobank Aquatic core facility through SARIR; Developing Pilot scale Mesocosm Facility; and Refurbishment of the Research Vessel *Phakisa.*

Part C: Measuring our performance

1. Institutional programme performance information

1.1. Programme 1: Administration

Programme 1 is comprised of shared services functions and systemic enterprise-wide coordination capabilities in order 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;
- Finance and Business Systems;
- Human Resources and Legal Services; and
- Corporate Relations and Communication.

1.1.1. Overview of Sub-programmes

Sub-Programme 1.1: Strategy, Planning and Partnerships (SPP)

The purpose of Strategy, Planning and Partnerships (SPP) is to use evidence-informed strategic planning, policy experimentation and development, and strategic partnering as levers to advance the objectives of the NRF. The organisation is able to respond to new and emerging challenges, while responding to opportunities through strategic planning and positioning, building strategic partnerships, and building capacity to create a culture of making evidence-informed decision. In this way, SPP contributes to all NRF strategic outcomes and the following objectives: informing and leading the development of organisational strategy; being the authoritative source of organisational and system intelligence; and leveraging additionality to advance the mandate of the organisation –see ***Table 3***. The focus areas of the sub-programme include: Macro-organisational planning and policy direction setting, NSI wide data and intelligence services and International relationships and partnerships

Sub-Programme 1.2: Finance and Business Systems (FBS)

The Finance and Business Systems (FBS) division is a cross-cutting corporate function. The division provides a shared service function across NRF and largely draws its mandate from the PFMA by ensuring 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 towards sustainability of the NRF. Key area of focus of the sub-programme include: Governance, Corporate Finance, Supply Chain Management and Information Technology and Knowledge Resources.

Sub-Programme 1.3: Human Resources and Legal Services (HR&LS)

The purpose of this sub-programme is to facilitate a conducive, attractive, inclusive and integrated transforming 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.

Sub-Programme 1.4: Corporate Relations and Communication

The purpose of Corporate Relations and Communication is to manage the public image of the organisation to ensure that it retains public legitimacy as a reliable public entity that delivers on its legislative mandate. The focus areas of this sub-programme include developing the NRF brand equity, promotion of the organisation's culture among its stakeholders, communication about the research enterprise and its benefits as well as facilitating the management key NRF stakeholder relationships.

The NRF has an entrenched legacy as the premier research funding agency in South Africa, having effective partnerships with many other African countries and an expansive set of international partners across the globe. It thus has existing stakeholders and on-going portfolios of stakeholder interactions. Most of these interactions are embedded in the day-to-day delivery of its respective core mandates and are specific to the mandate of each Business Unit and guided by the principles of the NRF Stakeholder Engagement Framework.

The NRF stakeholder attention over the years has largely focussed on the relationship with higher education institutions. Besides the platforms mentioned already, NRF senior representation on Boards such as Universities South Africa (USAf), National Advisory Council on Innovation (NACI), Council for Higher Education (CHE), individual university councils, COHORT etc. keeps the organisation close to the conversations and interests of the academic community and policy makers. The recently formed NRF Stakeholder Forum is an organisational conversation with Deputy Vice Chancellors, Heads of Science Councils, the Academy of Science of South Africa (ASSAf), CHE and USAf, all amongst our primary stakeholders. Although the NRF has a long history of international relationships through bilateral and multilateral agreements, the introduction in 2017 of the Strategy, Planning and Partnerships (SPP) unit has introduced some changes to the international engagement portfolio and seen the introduction of more regional and local stakeholder relationships. The organisation is also tasked with seeking out more non-traditional partners with whom to collaborate in the interests of the NRF mandate and increase involvement with local and international business.

For the last 15 years the organisation has, at five year intervals that coincide with the NRF Institutional Review, undertaken a system-wide stakeholder survey. The NRF Stakeholder Survey is one of the tools used to understand NRF's stakeholder needs and expectations in order to ensure service excellence, and to build and maintain the support and confidence of our stakeholders in the way in which we deliver on our mandate. The most recent NRF Stakeholder Survey was undertaken in October 2020,

with preliminary results showing stabilisation with regard to positive stakeholder perceptions in respect of the NRF strategic direction, competencies of NRF staff and service standards of the NRF.

In the forthcoming period, in terms of stakeholder engagement, the NRF will focus on: detailed stakeholder mappings at individual business unit level; further unpacking of the outcomes of the 2020 NRF Stakeholder Survey; enhanced internal stakeholder engagements through the Culture Project and the *Reimagining the NRF* Conversations; finalisation of a revamped Intranet platform to support and embed internal staff communications; and attention to a renewed NRF website to promote external stakeholder engagements.

1.1.2. Programme 1 performance over the MTEF period

Table 4: Outcomes, outputs, output indicators and targets for Programme 1

Strategic outcome	Output	Indicator count	Output Indicators	Annual Targets					
				Audited performance		Estimated performance	MTEF Period		
				2018/19	2019/20	2020/21	2021/22	2022/23	2023/24
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	-	46%	48%	49%	51%	53%
	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: Quarterly performance targets for the 2021/22 financial year

Indicator No.	Output Indicators (refer to TID)	Annual Target	Quarterly Targets			
			Qtr 1	Qtr 2	Qtr 3	Qtr 4
		2021/22	2020/21	2020/21	2020/21	2020/21
1	Proportion of employees from designated groups at Peromnes levels 1-7	49%	-	-	-	49%
2	Organisation overheads as a proportion of total expenditure	<10%	-	-	-	<10%

1.1.1. Explanation of 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.

Sub-Programme 1.1: Strategy, Planning and Partnerships (SPP)

Key activities and deliverables for the Medium Term will include:

- **Research and Development Information Platform (RDIP):** Establish RDIP as a single point of entry to obtain comprehensive Research and Development (R&D) data and analysis that can service the bigger NSI as well as the NRF.
- **Research Impact Agenda:** Develop and implement a research impact framework to provide direction on the design and execution of NRF programmes to facilitate the organisation's contribution to national development. During 2021 the focus will be on organisational change requirements for implementation of the research impact agenda and preparation for future impact assessment.
- **Research output harvesting tool:** This will be developed by the NRF to be used by research performing institutions, including Science Councils and HEIs, to collect publicly available meta data on their research outputs from various sources. This project will be run in partnership with the DSI, DHET and an HEI and will be subject to the DHET securing funding for the development and annual operational costs.
- **Agreements with the Canadian industry facilitation organisation, MITACS and the Mandela Institute for Development Studies (MINDS):** Implement both agreements to bolster Industry and GKP Strategies, which include a concerted focus on Africa.
- **Science Granting Council's initiative (SGCI-2**): Implementation of the second prominent phase 2 of the initiative.
- **Global Research Council (GRC):** Hosting the meeting of the GRC and facilitate the development of associated knowledge products.
- Operationalising of the **African Open Science Platform (AOSP)**.

Sub-Programme 1.2: Finance and Business Systems (FBS)

Key activities and deliverables for the MTEF period will include:

- **The Enterprise Resource Planning (ERP) system** - The development of improved and efficient business processes that result in increased sustainability and lower transactional costs across the organisation. With the implementation of an ERP system, current disparate systems will be converged.
- **NRF Corporate Policy Framework:** Optimise the coverage and designs of NRF Corporate Policies to facilitate compliance with legislation and statutory requirements, adoption of best practices and achievement of organisational performance.

- **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.
- **Financial Resourcing:** A resourcing model will be developed in consultation with and approval of the DSI to support and drive the allocation of resources and sustainability of the NRF going forward.
- **NRF Monitoring and Evaluation:** Develop and implement a Monitoring and Evaluation Framework as part of the NRF Corporate Policy Framework during the medium term. This will enable 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.
- **Open Science**: Provide support to NRF engagement on Open Science through Open Access 2020 (OA2020), the African Open Science Platform (AOSP) and the National Site License for Open Access Project (NSLOAP) where the NRF took the lead in developing a national roadmap toward open science and open access for the system.
- **Procurement & Supply Chain Management (SCM)**: Implement the SCM strategy to enable the organisation to have capabilities to better manage its contribution to transformation, secure supplies competitively and optimise asset lifecycle.

Sub-Programme 1.3: Human Resources and Legal Services (HR&LS)

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.

Key activities and deliverables for the MTEF period will include:

- **NRF Culture**: Review of the organisation's culture to ensure that a desired culture that is 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 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 the creation of 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.
- **HR Systems:** Adaptation and Implementation of functionalities as part of the Enterprise Resource Planning (ERP) system to optimise efficiencies for the organisation.
- **Talent Management:** Ensure targeted attraction of particularly scarce and critical skills for the NRF

Sub-Programme 1.4: Corporate Relations and Communication

Key activities and deliverables for the MTEF period will include:

- **Brand visibility:** Build NRF brand equity through a higher level of consistency in how the NRF brand is represented among its publics by all parts of the organisation.
- **Consistent messages:** Communicate across the different components of the organisation to increase impact on communication efforts to build a publicly supported science and research among stakeholders
- **Expand reach (both in absolute numbers, diversity of audiences and geographical footprint) of communication:** Facilitate media exposure to, optimise NRF's use of digital channels such as social media and website platforms, science and society engagements events as key carriers of the NRF brand for an enhanced impact on communication efforts.
- **Organisation's marketing digital assets:** Strengthen and consolidate assets, including redevelopment, face-lifting and technical upgrades of the corporate website with the aim of ensuring a 98% uptime and better ease-of-use.

1.1.2. Programme resource considerations

Table 6: Resource allocation in support of performance indicators and targets

	Budget	Budget	Estimated Budget	MTEF Expenditure Estimates		
	2018/19	**2019/20**	**2020/21**	**2021/22**	**2022/23**	**2023/24**
Total resource allocation - Administration (R'000)	109 147	136 322	140 596	141 594	133 746	134 814

1.2. Programme 2: Science Engagement

The purpose of this programme is to transform the relationship between science and society through leadership public awareness of, and engagement with, science mandate of the NRF. The National Research Platforms, the contribution to the development of the national science system and grants for human capacity development and for research mandate areas of the NRF are critical to the extension of platforms for the promoting and supporting the achievement of objectives of this programme. The areas of focus for the programme include: (a) providing platforms for engagement by society with the science; (b) inspiring an interest amongst the youth to pursue careers in science, engineering and technology; (c) contributing to the improvement of the quality of learning and teaching in STEM subjects (d) international engagement and partnerships; (e) enabling participation of the community in scientific research through implementation of citizen science projects; and (f) evolution and prototyping of the Responsible Research & Innovation (RRI) framework in a South African context.

Science and its benefits are seen as central to national, economic and social prosperity, and one of the prerequisites for an effectively functioning National System of Innovation (NSI) is a society that is aware of the value and potential dangers and challenges of science; is able to evaluate the products of science; uses the processes of science in its daily life (for example, asking questions, collecting and analysing evidence, and evaluating possible results); and engages in debate on science-related matters of public interest (Science, Technology and Innovation White Paper, 2019). The purpose of Programme 2 is to transform the relationship between science and society through leadership of, and engagement with, the science mandate of the NRF. Across the NRF, the National Research Infrastructure Platforms, grants for human capacity development and those for research mandate areas of the NRF are all critical to the extension of platforms for promoting and supporting the achievement of objectives of this programme. This requires an ongoing process of embedding science engagement more holistically within NRF programmes and enabling engaged scholarship. Beyond the NRF, the broader science engagement Programme includes collaboration and coordination with both DHET/DSI Entities and a wide range of SETI Network Partners. This newly extended coordination function has been assigned to the SAASTA.

1.2.1. Programme 2 planned performance over the next MTEF period

Table 7: Outcomes, outputs, output indicators and targets

Strategic outcome	Output	Indicator count	Output Indicators	Audited/Actual performance		Estimated performance	MTEF Targets		
				2018/19	2019/20	2020/21	2021/22	2022/23	2023/24
Enhanced impact of science engagement (SE) (to improve the citizens scientific literacy and build confidence in science and science institutions)	Support of the development of STEMI education	3	Number of learners, educators and students reached through school/HEI based initiatives (in support of the school and HEI curriculum).	174 081	226 813	70 000	31 265	31 265	31 265
	Support for Engaged Research	4	Number of NRF grant holders and National Facility scientists undertaking/supporting science engagement and engaged science.	0	0	0	240	220	250
	Enabling public access to research and science engagement infrastructure	5	Number of NRF supported public Science engagement interventions at research and science engagement infrastructure across the NSI.	15	19	9	10	10	10
	Building science engagement capacity and capability	6	Number of scientist/journalists that use indigenous languages used in science communication	-	-	-	320 scientists /journalists	352 scientists /journalists	387 scientists /journalist

Table 8: Quarterly performance targets for the 2021/22 financial year

Ind. #	Output Indicators (refer to TID)	Annual Target	Quarterly Targets			
			Qtr 1	Qtr 2	Qtr 3	Qtr 4
		2021/22	2020/21	2020/21	2020/21	2020/21
3	Number of learners, educators and students reached through school/HEI based initiatives (in support of the school and HEI curriculum).	31 265	2 000	15 000	20 000	31 265
4	Number of NRF grant holders and National Facility scientists undertaking/supporting science engagement and engaged science.	240	25	25	200	240
5	Number of NRF supported public Science engagement interventions at research and science engagement infrastructure across the NSI	10	3	4	8	10
6	Number of scientist/journalists that use indigenous languages used in science communication	320 scientists /journalists	20	150	280	320

1.2.2. Explanation of Planned Performance Over the Medium-term Period

The long term results of successful science engagement programmes should, over six to ten or more years will result in enhance science engagement which will contribute to the achievement of DSI Science Engagement Strategy outcomes, include changes in citizen's scientific literacy and in their confidence in science and attitude to and/or perceptions of 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. The DSI Science Engagement Strategy and the Monitoring and Evaluation Framework indicate that NRF/SAASTA will be the custodian of science engagement and information management. To this end, NRF/SAASTA will collect, manage and promote science data on an ongoing basis. The long-term impact of science engagement programmes on the NSI will be assessed using large-scale surveys, administered by the Human Sciences Research Council (HSRC).

The planned performance over the medium-term period as stated in **Table 7** above is based on the following assumptions:

- Provision of adequate funding as per the overall projected budget from core, DSI contract and funding by the business sector, in particular Harmony Gold Mining Company Limited and Komatsu Development Foundation.
- Minimal disruption in the school system due to the COVID-19 pandemic to enable adequate time to roll-out activities at schools.

The planned activities over the medium-term period are aligned to the following organisational and governmental policies and strategic frameworks and objectives:

- NRF Vision 2030, Strategy 2025 and the Transformation Framework
- National Development Plan (NDP), White Paper on Science, Technology and Innovation and the DSI Science Engagement Strategy, which is underpinned by four strategic aims.

There are a number of risks identified which may negatively affect performance over the medium-term period, which are as follows: continuous lockdown due to the COVID-19 pandemic and other diseases, budget cuts from DSI and termination of current sponsorships from the business sector and constraints in human capacity due to freezing of current positions and creating of new positions.

In order to contribute the achievement of NRF Strategy 2025, Programme 2 will focus on following key performance areas during the MTEF period:

Embedding engaged research: Through this focus area, the intention is 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: Through this focus area, the goals are to ensure that a greater number of public have access to science engagement

infrastructure; ensure that the investment in research infrastructure sees the maximum benefit to society through raising awareness of research capabilities and also profiling South African science achievements.

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 Basic Department of Education; 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 forecast 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 also an investment in science engagement by the private sector in support of all the focus areas.

Key activities and deliverables for the MTEF period will include:

- Creating a fit-for-purpose SAASTA to fulfil its leadership role of the science engagement mandate of NRF and its role as a National Coordinator of Science Engagement across the NSI;
- Developing and hosting of the new Science Engagement Information Management System (SEIMS) to enable SAASTA to collocate, consolidate, analyse and disseminate information and reports of the performance of the DSI Science Engagement Strategy;
- Maintaining and increasing stakeholder base within the NSI including the business sector nationally, continentally and globally in order to increase engagement partnerships through signing of new Agreements on Science engagement;
- Embedding engaged research within our knowledge enterprise by development and implementation of an engaged framework for the NRF and securing funding for it; and
- Focussing our investment on identifying and nurturing talent in STEMI, thus contributing to human capital development in STEMI through innovative programmes and conducting of impact studies.

1.2.3. Programme resource considerations

Table 9: Resource allocation in support of performance indicators and targets

	Budget	Budget	Estimated Budget	MTEF Expenditure Estimates		
	2018/19	**2019/20**	**2020/21**	**2021/22**	**2022/23**	**2023/24**
Science Communication	17 538	17 331	16 808	17 058	18 020	18 899
Science Education	17 137	16 546	19 498	19 021	18 569	18 951
Science Engagement	53 341	51 808	49 867	38 738	38 254	38 387
Human Capacity Development	13 451	15 427	16 748	16 495	16 820	17 397
Operating expenditure	17 110	19 157	26 367	20 231	21 250	22 168
Total (R'000)	**118 577**	**120 269**	**129 288**	**111 543**	**112 913**	**115 802**

1.3. Programme 3: Research and Innovation Support and Advancement

The core purpose of Programme 3 of the NRF is to respond to the following extract from the "Object of the Foundation" per the NRF Act, viz., "supporting, promoting and advancing research and human capacity development, through funding, 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".

Key areas of delivery are: Human and Infrastructure Capacity Development, Knowledge Advancement and Support, and Research Chairs and Centres of Excellence. In line with the NRF's HCD pipeline, researchers are categorised into the following categories:

- Established researchers;
- Early Career / Emerging researchers;
- Instrument scientists and technical professionals; and
- Next Generation researchers.

These service delivery functions are supported by a robust grants management system and the reviews and evaluations function.

Established Researchers

The NRF will continue to attract, support and retain established researchers to ensure growth in research leadership to drive the NRF knowledge enterprise. This will be achieved through:

- High end research investments in all knowledge domains through competitive processes.
- Investments that will include, *inter alia,* competitive programmers for NRF- rated researchers, support for established unrated researchers, the DSI-NRF South African Research Chairs Initiative (SARChI); the DSI-NRF Centers of Excellence (CoEs), and international collaborative research grants and initiatives.
- Evaluation and rating of individuals will continue to be implemented in order to benchmark our researchers against the best researchers globally.
- Attracting, supporting and retaining established researchers to ensure growth in the research leadership through competitive support of research and evaluation and rating of individuals and research institutions.

Early Career / Emerging Researchers

Emerging researchers consist of postdoctoral fellows as well as early career researchers who occupy research or academic positions. Amongst the early career researchers are knowledge workers that have not yet obtained a doctoral qualification. In the era of an ageing pool of academics, the NRF recognises the need to strategically invest in this cohort of researchers to transform, renew and replenish the research cohort for a sustainable science system. The NRF will achieve this through:

- A transformed, excellent scientific/research cohort through grants towards cost of postdoctoral career development programmes (emerging researchers).
- Developing and implementing a clear funding policy to ensure achievement of equitable support to researchers.

Instrument Scientists and Technical Professionals

Scientific discovery and innovation are increasingly driven by research infrastructures, platforms and big data. The effective use of advanced infrastructures and platforms requires specialised and advanced technical expertise. Therefore, sustainable and effective use thereof depends on the skills and expertise of domain specific instrument scientists and of well-trained technical professionals. Instrument scientists and technical professionals not only manage and operate research infrastructures but are also a source of institutional knowledge and expertise gained over many years. Programmes are therefore also needed to train future instrument scientists and advanced technical professionals in the natural science domains and in the humanities and social sciences. Despite their importance, these professionals often lack clear academic career paths and employment opportunities.

Next Generation Researchers

It is acknowledged that meaningful and fundamental transformation must include and extend beyond demographics of the knowledge workforce and consider other aspects of the knowledge enterprise. However, a current priority of the NRF transformation agenda is to ensure a representative workforce at postgraduate student levels. There is currently significant disparity in the national academic performance of postgraduate students. Some key challenges include inadequate funding, low enrolment rates, low progression rates from honours to masters and doctoral studies, long time to completion and advanced age at completion. These challenges are most pronounced for Black (Africans, Coloureds and Indians), Women, particularly Black Women, and postgraduate students from poor and working-class backgrounds. Failure to address these challenges will result in an exclusion of a wide talent pool and compromise the ability of the NRF to deliver on its mandate of a transformed and representative research workforce.

Bursaries and Scholarships

These are aimed to develop 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 Funding Policy the grant-holder-linked bursaries as were awarded in the past will no longer exist in 2021. This is part of the strategy to expose next generation researchers and emerging researchers to established researchers, for the kind of guidance and inspiration that will facilitate their growth to becoming established researchers.

Research Infrastructure Grants

State-of-the-art research infrastructure, linked to the development of highly skilled knowledge-workers, is a prerequisite for the generation of globally competitive new knowledge, technologies, and innovation for the twenty-first century. Over the past decade, investments in state-of-the-art research equipment has advanced research mainly in the thematic areas spanning communicable diseases; Nanotechnology; Biosciences and environmental management; Global change and energy; Cellular and molecular biology; and the Physical sciences, mining and engineering.

1.3.1. Programme 3 planned performance over the next MTEF period

Table 10: Outcomes, outputs, output indicators and targets

Strategic outcome	Output	Indicator count	Output Indicators	Audited/Actual performance		Estimated	MTEF Targets		
				2018/19	2019/20	2020/21	2021/22	2022/23	2023/24
A transformed, internationally competitive and sustainable research workforce	Funded Postgraduate students	7	Number of NRF funded postgraduate students	12 732	11 167	10 255	7 414	6 476	6 265
	Funded researchers	8	Number of NRF funded researchers	5 441	3 985	4 412	4 521	4 526	4 526
Enhanced impact of the research enterprise	Knowledge produced by NRF supported researchers	9	Number of peer-reviewed publications produced by NRF funded researchers (including from NNEP, NEP and SREP)	9 159	7 255	9 342	9 250	9 300	9 400

The decrease in projected numbers of NRF-funded postgraduate students is because of the implementation of the DSI-NRF Postgraduate Funding Policy as of 2020/21. This policy will enable international competitiveness through the selection of excellent students to enhance a demographically representative cohort of South African doctoral graduates and their expanded opportunities for international research training. Postgraduate students will be funded either at Full Cost of Study (FCS) or Partial Cost of Study (PCS). To ensure equity of access to postgraduate studies, financially needy students, with high academic achievements, will be funded at FCS. The nett effect of this is that fewer students will be funded more comprehensively, facilitating focus on their academic work and reducing dropout.

Table 11: Quarterly performance targets for the 2021/22 financial year

Ind. #	Output Indicators (refer to TID)	Reporting period (Quarterly or Annually)	Annual Target	Quarterly Targets			
				Qtr 1	Qtr 2	Qtr 3	Qtr 4
			2021/22	2020/21	2020/21	2020/21	2020/21
7	Number of NRF funded postgraduate students	Quarterly	7 414	4 689	6 510	7 135	7 414
8	Number of NRF funded researchers	Quarterly	4 521	2 397	3 613	4 049	4 521
9	Number of peer-reviewed publications produced by NRF Funded researchers (including from NNEP, NEP and SRE)	Annual	9 250	-	-	-	9 250

1.3.2. Explanation of Planned Performance Over the Medium-term Period

The NRF will scale-up the development of a research and innovation workforce for renewing, regenerating and replenishing the South African researcher cohort; establish a transformed knowledge workforce, with a greater diversity of people and ideas to lead the knowledge enterprise; and focus on excellence to advance the international competitiveness of the knowledge workforce. SARChI, through the establishment of the OR Tambo Africa Research Chairs (ORTARChI), has prioritised its contribution to the development of the continent and in this regard the African Union's Agenda 2063 and the Science, Technology and Innovation Strategy for Africa, 2024 (STISA-2024). Implementation of the DSI-NRF Postgraduate Funding Policy commenced in 2020/21, will enhance equity of postgraduate student access, success and throughput.

The NRF will establish the Leading Researchers and Scholars Programme (LRSP) to create a sustainable intervention that accelerates the career progression of exceptional early, mid- and advanced career researchers and scholars to become LRS in all fields of research and disciplines. The 2020/21 equipment grant budget will be deployed in support of new NEP grants and the SRE grant for the Hydrogen Intensity and Real-time Analysis eXperiment (HIRAX) Telescope to be built on the Square Kilometre Array (SKA) site over the next two years.

The global pandemic brought into stark reality the ability of institutions to be proactive and insightful in responding to crises and multinational challenges. The NRF will consolidate a range of innovative measures it has implemented, which saw the organisation playing a leading role on the Continent and further afield.

The most prominent initiative is the COVID-19 Africa Rapid Grant Fund, launched in May 2020 with two-year grants in 17 countries, supported by a number of international funders. The outcomes of this research will be applied to further inform future discourse on global responses. It has also redirected the system of the NRF to be agile and innovative in adhering to the rapid nature of unforeseen challenges and research questions.

The NRF will also continue the finalisation of the seminal work with a large number of South African universities, through the Research Chairs and Centres of Excellence (RCCE) programme, of the National Government's official country report assessing the effectiveness of interventions adopted by South Africa to combat the spread and socio-economic impact of the pandemic. A partnership between the Government Technical Advisory (GTAC), the Department of Planning Monitoring and Evaluation (DPME) and the NRF has been formalised to develop the report.

It is estimated that in 2021 there will be a total of two hundred and fifty (250) new and ongoing collaborative research grants. Of these grants approximately fifty (50) will be NRF supported and the balance will be led by DSI initiated bilateral and multilateral partnerships. Additional international grants through Africa partnerships and initiatives like the Belmont Forum's Collaborative Research Actions (CRAs), Future Earth initiatives, etc. will also be supported.

It is also estimated that through these international collaborative grants, forty-six (46) masters and fifty-eight (58) doctoral continuing students will be supported. No new calls have been made and new grants will be awarded to commence in 2021, apart from the continuing grants. Nineteen (19) Community Engagement grants with five (5) honours, thirty (30) masters and twenty (20) doctoral

students are expected to continue in 2021, towards conclusion. Support is also projected to continue for twelve (12) Blue Skies Research and six (6) IKS grant holders for completion in 2021. The knowledge enterprise is supported through a variety of grants. It is estimated that a total of 4 521 researchers will be supported by the NRF in the 2021/22 financial year, of which at least 958 will be emerging researchers. Around 7 414 post graduate students will be supported by the NRF for the 2021/22 financial year. In line with the NRF's HCD pipeline, researchers are categorised into the following categories:

- Established researchers;
- Early Career / Emerging researchers;
- Instrument scientists and technical professionals; and
- Next Generation researchers.

Established Researchers

In awarding grants to the established researchers the NRF will do this guided by, among others, the ministerial targets of recipients of grants being 55% women and 80% Black. It is expected that this in turn should increase the proportion of Black and female researchers in the established researcher cohort.

Early Career / Emerging Researchers

Key to advancing Transformation of the equity profile of the research and instructional staff is the identification and structured support of young, early career and emerging researchers. In this regard, and in addition to already existing initiatives like the Thuthuka Research programme, the Y-Rated Development Grants and others the NRF is developing the Leading Researchers and Scholars Programme (LRSP) to create a sustainable intervention that accelerates the career progression of exceptional early-, mid- and advanced career researchers and scholars to become leaders in all fields of research and disciplines. The overall objective of the programme is to transform the higher education and science system by accelerating career progression and increasing the number and diversity of black and women internationally leading researchers and scholars in the academy, in all disciplines. In light of the above, the specific objectives of the LRSP are to:

- Support South African researchers and scholars, particularly African and Coloured, employed at public universities and research institutions in South Africa to become internationally leading researchers and scholars in their field;

- Promote the holistic career advancement of recipients in knowledge production, engaged research, human capacity development, and leadership;

- Support exceptional early career and experienced mid-career researchers and scholars that are transitioning to become internationally recognised researchers and scholars in their field; and

- Support advanced career researchers and scholars who already have considerable international recognition and are transitioning to become internationally leading researchers and scholars in their field.

The NRF Framework on Equality, Diversity and Inclusivity (with a specific focus on African and Coloured women) is under development. This conceptual Framework will highlight the need for specific interventions to support African and Coloured women researchers in the NSI. In 2021/22, this Framework will be extended to included targeted interventions for change in specific areas of the NRF's work to ensure increased representation and the necessary support for these individuals. This will ensure a focus on equality, diversity and inclusivity across the different units of the NRF and will inform the development of section-specific policies where necessary.

Instrument Scientists and Technical Professionals

Over the next year a new Framework will be defined and developed detailing mechanisms for developing instrument scientists and advanced technical professionals to ensure that they have career opportunities that retain their expertise within the research enterprise.

Next Generation Researchers

Implementation of the DSI-NRF Postgraduate Funding Policy commenced in 2020/21, which is aimed at addressing these challenges by enhancing equity of postgraduate student access, success and throughput. The first cohort of students will be 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. Postgraduate students will be funded either at Full Cost of Study (FCS) or Partial Cost of Study (PCS). 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), and students who are high academic achievers, will be funded at FCS.

On average, the NRF invests 36% of the total HCD pipeline investment in this area, which translates to a total investment of just over R1 billion per annum. This represents a modest increase in nominal terms but actually a decrease in real terms. With the projected MTEF allocation, the target number of students that may be funded will be reduced by 40% relative to 2020/21. Nevertheless, funding postgraduate students at FCS is critical for alignment between funding levels for FCS for undergraduate and postgraduate students. The Ministry for Higher Education, Science and Technology through the National Skills Fund (NSF) is also a key contributor to supporting postgraduate training in scarce skills areas. The minimal increase in the budget allocation from R143m in 2019/20 to R145m in 2020/2021 and the possibility of a decline in the budget allocation in 2021/22, will further reduce the number of postgraduate students that may be supported by the NRF in the 2021/22 financial year.

The NRF is planning to fund an average of 2 437, 2 411 and 1 881 honours, masters and doctoral students respectively, per annum, over the MTEF period. In the case of the honours students, at least 59%% are expected to be women and 89% to be Black. The equivalent figures for masters are expected to be 59% and 83% respectively and for doctoral, 55% and 75% respectively.

International exposure for postgraduate students and early career/emerging researchers is an integral component of the NRF strategic goal to create an internationally competitive, transformed and representative South African research workforce. By using a Global Knowledge Partnerships (GKP) Framework, the NRF intends to source new, and realign existing support programmes to offer new

opportunities for outstanding doctoral students to spend between three (3) to twelve (12) months abroad, while postdoctoral fellows and early career/emerging researchers would spend up to 18 months abroad. The objective of the GKP approach is to accelerate the production of a diverse, globally competitive workforce through the provision of platforms that offer outstanding young researchers' opportunities to enhance international networks, mentorship and access to global research funds and infrastructure.

The NRF will ensure that the support provided to researchers from designated groups in the form of funding improves annually. Research funding instruments, funding programmes and other research support interventions will deliberately reflect and be aligned to improve the number of researchers from designated groups.

Research Infrastructure Grants

New research infrastructures will be created in a way that is research domain-balanced, fit-for-purpose and globally competitive.

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, upgrade or development of state-of-the-art research equipment to South African research institutions. The SRE funding instrument is intended to complement the NEP and South African Research Infrastructure Roadmap (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.

The 2020/21 equipment grant budget is being deployed in support of 21 new NEP grants and the SRE grant for the Hydrogen Intensity and Real-time Analysis eXperiment (HIRAX) Telescope to be built on the Square Kilometre Array (SKA) site over the next two years. Equipment grant holders report on performance for five years post commissioning of the equipment. During this financial year, an estimated 1600 users will access the equipment contributing 370 publications to the total publication output by NRF grantholders.

Access to national research platforms and to Global Research Infrastructure, is necessary to support South African researchers and training of the next generation of scientists alongside leading researchers and scholars. Over the MTEF period, the NRF will continue to support the provision of, and access to, Research and Development 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).

An estimated number of 50 grantholders will be supported during 2021/22 subject to COVID-19 related international travel restrictions being lifted.

Grants through Bilateral and Multilateral Partnerships

It is estimated that in 2021 there will be a total of two hundred and fifty (250) new and ongoing collaborative research grants. Of these grants approximately fifty (50) will be NRF supported and the balance will be led by DSI-initiated bilateral and multilateral partnerships. Additional international grants through Africa partnerships and initiatives like the Belmont Forum's Collaborative Research Actions (CRAs), Future Earth initiatives, etc. will also be supported.

It is also estimated that through these international collaborative grants, forty-six (46) masters and fifty-eight (58) doctoral continuing students will be supported. No new calls have been made and new grants will be awarded to commence in 2021, apart from the continuing grants. Nineteen (19) Community Engagement grants with five (5) honours, thirty (30) masters and twenty (20) doctoral students are expected to continue in 2021, towards conclusion. Support is also projected to continue for twelve (12) Blue Skies Research and six (6) IKS grant holders for completion in 2021. The knowledge enterprise is supported through a variety of grants, such as: research grants, infrastructure grants, travels grants and institutional grants.

1.3.3. Programme resource considerations

Table 12: Resource allocation in support of performance indicators and targets

	Budget	Budget	Estimated Budget	MTEF Expenditure Estimates		
	2018/19	**2019/20**	**2020/21**	**2021/22**	**2022/23**	**2023/24**
Grants, Administrative and Systems Support *	74 908	68 082	96 173	91 243	91 326	91 577
Infrastructure/Mobility *	144 249	222 223	71 151	190 102	44 541	190 102
Institutional Support *	15 764	12 349	17 937	15 230	15 410	15 230
Internships *	47 729	55 508	39 161	43 161	43 161	43 161
Post Graduate Scholarship *	782 008	508 029	645 394	633 510	635 895	632 510
Post-Doctoral & Emerging Researchers *	197 302	149 395	250 276	256 853	254 470	255 853
Established Researchers *	529 764	465 088	484 726	482 708	482 708	482 708
Strategic Initiatives *	656 917	800 626	752 331	731 269	791 919	857 589
International Agreements and Collaboration *	113 371	131 604	109 874	122 462	110 997	112 760
Travel, Training and Conferences *	63 146	40 870	24 721	31 009	31 256	31 131
Total (R'000)	**2 625 158**	**2 453 774**	**2 491 744**	**2 597 547**	**2 501 683**	**2 712 621**

**Includes operating expenditure*

1.4. Programme 4: National Research Infrastructure Platforms (NRIP)

The purpose of National Research Infrastructure Platforms (NRIP), structured administratively in the NRF as Programme 4, is to provide leading-edge research infrastructure platforms (RIPs) to the South African research enterprise in support of knowledge generation, technological innovation, science engagement, human capacity development and the provision of scientific services based on the domain applicable to the RIP. This is done in order to ensure that the national research enterprise has the requisite infrastructure to undertake globally competitive discovery science; to train the next generation of researchers and academics; to support engagement with science by and with society, to promote innovation and provide scientific services that positively impact society, the environment, and the economy. Programme 4 responds to the following extract from the "Object of the Foundation" per the NRF Act, viz., "developing, supporting and maintaining national research facilities".

At the core of the Programme are the National Research Facilities, which cover three broad areas of science, namely: 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. Programme 4 supports the optimisation of synergies, collaborations and shared services, where appropriate, across the various research infrastructure platforms.

These research infrastructure platforms support research of strategic importance and provide access to 'big science' infrastructure to national and international researchers and contribute to the NRF strategic goal of growing a representative research workforce through focussed HCD initiatives. It is through its considerable research infrastructure that South Africa can compete and co-operate effectively with international counterparts in selected strategic research areas.

The NRF will develop and mainstream the notion of National Research Infrastructure Platforms to reflect the integration of, and connectivity between, physical process, systems, data and intellectual 'capacities across scientific disciplines and domains. This will be done in order to develop, establish and maintain domain-balanced state-of-the art research infrastructures across the NSI to advance research and postgraduate training; and to promote outbound and inbound access to global research infrastructures through strategic partnerships.

The Programme, as a central locus for research infrastructure provision for the research enterprise by the NRF has the following operational objectives to:

- Develop, support and maintain National Research Infrastructure Platforms across all science domains; including e-Infrastructures (e-Research & Data Platforms);
- Facilitate researcher access to world-class national and global research infrastructures;
- Coordinate and administer SA's participation in inter-governmental and multilateral research infrastructures;
- Promote and support research infrastructure networks and dialogues at national and global level;
- Develop and maintain frameworks for benchmarking National Research Infrastructure Platforms;

- 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 such a way as to advance the platforms approach;
- Contribute to the growth of a representative research workforce by providing support to students and budding researchers in the form of access to use research infrastructure platforms to conduct research and provision of academic and career supervision by researchers supported with resources allocated to and/or raised by NRIP as well as financial support in the form of scholarships, cost of access to required local and international research platforms and related networks, allowances, etc.; and
- Contribute to a more scientifically literate and engaged society through facilitating access to research and science engagement infrastructure by the public.

Table 13: NRF's Portfolio of Research Infrastructure Platforms and National Facilities

Name of National Research Facility	Science Domain / Discipline	NRF Cluster
iThemba Laboratory for Accelerator-based Sciences (iThemba LABS)	Nuclear Sciences	Nuclear Sciences
South African Environmental Observation Network (SAEON)	Long Term Ecological Monitoring	Biodiversity & Environmental Sciences
South African Institute for Aquatic Biodiversity (SAIAB)	Aquatic Biodiversity Science	Biodiversity & Environmental Sciences
South African Astronomical Observatory (SAAO)	Optical/infra-red Astronomy	Astronomy & Geodetic Sciences
South African Radio-Astronomy Observatory (SARAO)	Radio Astronomy	Astronomy & Geodetic Sciences

1.4.1. Overview of key areas of science

Nuclear Science

A recently developed strategic Long Range Plan (LRP) of iThemba LABS is anchored on four main supporting pillars, namely: (i) the South African Isotope Facility (SAIF); (ii) the Southern African Institute for Nuclear Technology and Sciences (SAINTS); (iii) the Technology and Innovation Platform (TIP); and (iv) the International Research Infrastructure Gateway. These pillars will enable the National Facility to:

- improve on the quality of research conducted at iThemba LABS;
- increase skills development initiatives by training the next generation of nuclear scientists and technologists;
- enhance the means through which iThemba LABS contributes to the overall improvement of the quality of life by delivering increased number of patient doses for nuclear medicine applications; and

- provide a platform for South African researchers to access large scale research infrastructure through our collaboration agreements with international research institutions such as CERN, JINR, GSI/FAIR, BNL, RIKEN etc.

The collaboration with the international laboratories provides an added opportunity for South African based scientists, engineers and technicians to participate in upgrade projects for these international laboratories, which in turn enables them to acquire expertise in new and developing relevant technologies. SA is set in the near future to increase the in-kind contribution to these laboratories through upgrade projects that will be led through the TIP pillar of the Long-Range Plan of iThemba LABS.

Biodiversity and Environmental Sciences

South African Environmental Observation Network (SAEON) and South African Institute for Aquatic Biodiversity (SAIAB) are the only National Research Facilities under the Biodiversity and Environmental sciences cluster, that facilitate research on global change, one of five Grand Challenges of the DSI. SAEON is the only research entity in South Africa that holistically facilitates and integrates such large-scale long-term environmental research at terrestrial and marine sites.

South African Environmental Observation Network (SAEON)

SAEON facilitates and conducts research on global change through platforms managed by staff located at seven nodes, a national office and through collaborations with national and international stakeholders including a wide range of government departments and agencies, universities and other research institutions, schools, companies and NGOs.

The SAEON Open Data Centre is spearheading the development of Information Management Systems to deliver its own data and national environmental data sets. Key areas of focus are:

- Development of a pipeline for data from its production to ingestion in data management systems that allow for appropriate curation to support its discovery, interoperability with other systems and the promotion of reproducible science according to the FAIR principles of open science.
- Developing dynamic data products in collaboration with government departments that present data in multiple formats to support decision making around, among other topics, the Sustainable Development Goals and Climate Change.
- Facilitation of research in collaboration with platform users and through the supervision of postgraduate students. In this way, SAEON contributes directly to the National System of Innovation, contributing to the production of postgraduate researchers and scientific publications (including journal papers, books, field guides, and videos). SAEON provides good value in this regard by producing many publications compared to the other NRF Facilities, relative to the amount of core funding received.

South African Institute for Aquatic Biodiversity (SAIAB)

SAIAB serves as a hub for national and international scientific research within the field of African aquatic biodiversity. The Institute is a National Research Facility for aquatic biodiversity science based

on internationally recognised research expertise and competencies in this field, as well as the provision of unique research platforms to the broader NSI. These platforms include: Aquatic biodiversity collections, associated laboratories and services that integrate modern molecular and bio-banking systems to the physical specimens; A research community-driven marine flagship programme (the African Coelacanth Ecosystem Programme – ACEP), which includes coastal research vessels, in situ instrumentation such as a remotely operated vehicle (ROV); Remote video systems; Marine geophysics mapping equipment; and the Acoustic Telemetry Array Platform (ATAP). Research infrastructure unique to SAIAB includes:

- Several special-purpose laboratories that are available to internal and external research scientists and students for research in molecular science and eco-physiology;
- A wet collections facility including preservation laboratories, glass store, alcohol store, dermestarium and tissue preparation laboratory, as well as storage for the National Fish Collection, the African Amphibian Collection, the Aquatic Biodiversity Tissue Bank and the National Diatom Collection;
- The marine research platform, which includes the Coastal Craft Fleet with vessels based in Durban and Port Elizabeth; ATAP, which has over 100 underwater base stations along the east coast of South Africa; and the Marine Remote Imagery Platform that manages a range of remote visual platforms such as ROVs, which are robots that dive hundreds of metres into the ocean; and
- The largest document collection and resource centre for African aquatic biodiversity research in Africa.

Astronomy & Geodetic Sciences

South African Astronomical Observatory (SAAO)

SAAO is the National Research Facility for optical and infrared astronomy in South Africa. Its primary function is to conduct fundamental research in astronomy and astrophysics. SAAO operates several telescopes, including the Southern African Large Telescope (SALT). The latter is owned by the SALT Foundation formed by an international consortium of institutions, with the NRF as the major shareholder. SAAO delivers on the strategic objectives of the NRF through:

- Actively undertaking research activities resulting in publications, and conference presentations of its scientific and technical staff,
- Training the next generation of astronomical researchers in the techniques of astronomical research and simultaneously equipping them with modern day scientific and 4IR skill sets. This includes a new internal support and mentoring programme for postgraduate students who are co-supervised by SAAO staff, which is designed to provide financial, scientific, and personal support throughout the student's tenure in the programme, and to provide annual assessment of progress to ensure successful completion of their studies. SAAO scientific staff also participate as lecturers and supervisors, in the National Astrophysics and Space Science Programme (NASSP), the DST Internship programme, in-service training of students in collaboration with the SARAO artisan training initiatives, and apprenticeship training in partnership with North Link Technical College.

- Providing a suite of telescopes at the Sutherland observing station, support for guest facilities at Sutherland provided by international partners, and modern computing facilities and state-of-the-art workshops at its Cape Town headquarters.
- Participation in international research collaborations, hosting international facilities at its Sutherland observing station, training students from around the world, organising international scientific conferences, supporting visits by international scientists, and through hosting the Office of Astronomy for Development (OAD), a global development programme of the International Astronomical Union. Proactive engagement with NRF and DSI international programme e.g. bilateral agreements and BRICS.

South African Radio Astronomy Observatory (SARAO)

SARAO is the National Research Facility for radio astronomy and is primarily an enabler of scientific research through the provision of world-class research platforms to an externalised research community - this includes the design, construction and hosting of the MeerKAT, MeerKAT Extension and the Square Kilometre Array radio telescopes. These projects and programmes are delivered by several divisions, and as a result have established a critical mass of engineering research and development expertise. As an organisation that is primarily an enabler of research, SARAO prioritises programmes that ensure high operational availability of cutting-edge research platforms for use by an externalised research community. As a result, a broad range of high impact publications using SARAO-produced data by an international research community is enabled and monitored.

SARAO's mission is to establish South Africa as a global leader in radio astronomy and associated technologies and disciplines by successfully hosting, and participating in the design and construction, of the SKA telescope and other radio astronomy and geodesy facilities. This mission is implemented through programmes and activities that deliver against SARAO's four strategic objectives to:

- Manage and optimise South Africa's contribution to, and benefit from, the international Square Kilometre Array (SKA) Project;
- Establish and sustain globally competitive and transformed radio astronomy and space geodesy research and infrastructure in South Africa and abroad, where appropriate;
- Maximise the associated national socio-economic benefit from radio astronomy and space geodesy activities; and
- Promote radio astronomy and space geodesy capacity in Africa.

1.4.2. Programme 4 planned performance over the next MTEF period

Table 14: Outcomes, outputs, output indicators and targets

Outcomes	Outputs	Indicator count	Output Indicators	Audited/Actual performance		Estimated Performance	MTEF Targets		
				2018/19	2019/20	2020/21	2021/22	2022/23	2023/24
A transformed, internationally competitive and sustainable research workforce (Transformation and Sustainability)	Diversity of student cohorts accessing RIPs	10	Proportion South African postgraduate students from designated groups who are users of NFs.	new	new	76%	76%	80%	81%
	Diversity of researchers accessing RIPs.	11	Proportion South African researchers from designated groups who are users of NFs	new	new	34%	39%	40%	41%
Enhanced impact of the research enterprise (Impact)	Socio-Economic contribution of NFs	12	Foreign income (Rand million) derived from NFs activities or operations *(Note 1)	new	new	R61.8	R63.8	R147.6	R391.4
		13	Number of employees from rural towns adjacent to NFs operating sites that are employed by the NFs	new	new	new	265	266	266
	Knowledge translation for societal benefit	14	Number of patient doses generated from radioisotopes produced by iThemba LABS	new	new	147,000	167,500	171,500	275,000
	Knowledge produced for societal benefit	15	Number of recognised publications by NFs	567	640	557	455	445	445
	Successful establishment of scientific infrastructure by NFs	16	Number of MeerKAT+ antenna foundations, and related Infrastructure completed by SARAO	new	new	New	10 MK+ foundations completed	14 x MK + foundations completed	Nil

		17	Progress on implementation of the SAIF Project by iThemba LABS	new	new	new	75%	95%	100%
		18	Number of SALT Gen 1.5 subprojects being implemented by SAAO	new	new	2 installed	4 installed	1 completed	2 completed

*Note 1: SARAO will measure the value of the foreign investment leveraged for MK+ when dishes are handed over from Max-Planck – Gesellschaft Zur Forderung Der Wissenschaften E.V. (MPG), which is estimated to be over 2022 to 2024.

Table 15: Quarterly performance targets for the 2021/22 financial year

Ind. #	Output Indicators (refer to TID)	Annual Target	Quarterly Targets			
			Qtr 1	Qtr 2	Qtr 3	Qtr 4
		2021/22	2021/22	2021/22	2021/22	2021/22
10	Proportion South African postgraduate students from designated groups who are users of NFs.	76%	73%	67%	70%	76%
11	Proportion South African researchers from designated groups who are users of NFs	39%	35%	40%	39%	39%
12	Foreign income (Rand million) derived from NFs activities or operations	R63.8	R16.9	R32.2	R48.5	R63.8
13	Number of employees from rural towns adjacent to NFs operating sites that are employed by the NFs	135	223	236	249	265
14	Number of patient doses generated from radioisotopes produced by iThemba LABS	167,500	22,500	15,000	55,000	167,500
15	Number of recognised publications by NFs	455	192	284	385	455
16	Number of MeerKAT+ antenna foundations, and related Infrastructure completed by SARAO	10 MK+ foundations completed	-	-	-	10 MK+ foundations completed
17	Progress on implementation of the SAIF Project by iThemba LABS	75%	-	-	-	75%
18	Number of SALT Gen 1.5 subprojects being implemented by SAAO	4 installed	-	-	-	4 installed

1.4.3. Explanation of Planned Performance Over the Medium-term Period

In terms of strategy 2025, P4 has the intent to provide (science) domain-balanced, globally competitive research infrastructure platforms for the research enterprise. With regard to domain balance, focus will be placed on recognition and/or establishment of research infrastructure platforms (RIPs) in the Social Sciences and Humanities. This process will focus on seeking alignment and integration with the SARIR regarding already supported potential RIPs, plus the definition of new ones. It will be undertaken in the context of mainstreaming the notion of National Research Infrastructure Platforms. It is intended that an over-arching, national scale strategic framework for research infrastructure provision will be developed as an anchor for all these developments. This will be accompanied by the evolution of thought processes on the definition of an appropriate and sustainable resourcing framework for NRIPS as well as development of meaningful operational performance indicators, including those for socio-economic impact of the NRIPs. In order to ensure global competitiveness of existing RIPs in particular within the National Research Facilities various strategic infrastructure development projects will be pursued in line with the strategic plans of the Facilities.

These are the South African Isotope Project (SAIF) for iThemba LABS; the MeerKAT Extension Project for SARAO and build up to the initiation of the SKA-MID1 Project; the South African Large Telescope Generation 1.5 Strategic Instrumentation Initiative (SALT Gen 1.5 SII) for the SAAO; the further roll out of the Expanded Freshwater & Terrestrial Observation Network for SAEON; as well as for SAIAB the Refurbishment of the Research Vessel Phakisa and roll out of specialized Marine Science Laboratories at partner HBUs.

Over the medium term the National Research Infrastructure Platforms will focus on enhancing their capabilities to make an impact by (a) prioritising enhancements and optimisations of their scientific productivity; (b) enhancing the quality (as measured by productive availability) of the scientific platforms they provide to the research community; and (c) investing in growing their strategic capability for interfacing with society , the latter being towards the NRF's strategic intent of building a fit-for-purpose capability in science engagement and being the leader nationally and globally in that context.

The indicators that have been included into this APP are still in development as the Programme seeks to refine and mainstream a sensible, strategy-focused set of performance and impact indicators. It is anticipated that baselines will be established in the initial years of the MTEF period, with refinements undertaken by mid-term. However, the performance of the RIPS in the pursuit of the indicators will likely be uncertain at the beginning and to find sound footing as the MTEF period matures.

The indicators speaking to the representation of designated groups within the user base of the RIPs, at researcher (including the specification of targets for early career researchers for the first time) and student level, are meant to drive the NRF's Strategy 2025's and the NRF's Transformation Strategy's intent of transforming the research workforce. Performance in this context across the RIPs will be enabled by various Human Capacity Development (HCD) initiatives aimed at accelerating the growth of the research workforce while simultaneously driving its transformation. Different HCD initiatives are being implemented by the NRIPS, namely SARAO's HCD Programme in Radio Astronomy, Engineering and Data Science; SAIAB's African Coelacanth Programme (ACEP) Phuhlisa Programme

which is a leading transformation programme of the Marine Science Sector; SAAO participation in the NASSP Programme aims grow and diversify capacity in Astrophysics and Space Sciences and iThemba LABS' South African Institute for Nuclear Technology & Science (SAINTS) programme is intended to close the gap in the skills base within the nuclear science environment. Limited and disappearing funding, due to redirection of national resources towards the COVID-19 pandemic is likely to affect the final achievements negatively.

In the pursuit of the NRF's strategic outcome aimed at enhancing the impact of the research enterprise on society, indicators being piloted here seek to reflect the contributions of the NRIPs to society through the generation, sharing, transfer and application of knowledge. Amongst these are availability of the research platforms for users; the value of scientific services provided by the NRIPs to the various sectors of society; translation of knowledge into enablers for enhancing the capability of the state (e.g., policy briefs) as well as technical innovations that can elevate the technological base of both the research platforms themselves and the national technological base.

The NRIPs will also contribute to defined performance indicators relating to advancing the science engagement strategic intents of the NRF, through largely the availing of the research infrastructures as platforms for engaging society on the science they do and the benefit thereof on and for society.

The development of a resourcing framework for enabling the effective pursuit of the NRF's mandate will assist in the formulation of a resourcing framework for the NRIPs that will ensure operational sustainability and global competitiveness of the platforms they hold. It is intended that during the course of 2021/22 financial year an approach to resourcing the research infrastructure development needs of the NRIPs will be developed and agreed with the DSI, for the next decade. Without that the platforms will deteriorate and fold and the NRIPs will become redundant and irrelevant. This is particularly the case in a situation of a national fiscal cliff at the edge of which South Africa seems to be dangling over. At this point the COVID-19 pandemic appears to be the main cause that has pushed the country over and the resourcing of the activities of the NRF's programmes will feel the negative impact occasioned by this situation. It would thus be more prudent to focus on the translation of change into beneficial impact rather than focusing on an upward chase when it comes to performance indicator use and target setting.

The details of priorities for the Programme 4 science areas covered by the current portfolio of national infrastructure platforms are organised under the area of science and the business units.

Nuclear Sciences

Currently the main priority for iThemba LABS is to prepare for the delivery of the 70 MeV cyclotron which, once operational, will unlock the SSC's research potential for subatomic physics experiments while simultaneously boosting sales derived from radioisotope production. As a key priority in preparation for the delivery of the 70 MeV cyclotron, construction of new building infrastructure to service the new cyclotron in the Radioisotope Facility (RIF) is well underway and scheduled for completion within the third quarter of 2022. The bombardment stations for the RIF are also currently undergoing manufacturing and development in a process also scheduled to be finalised in 2022 in time for the 70 MeV to come online.

With the new 70 MeV earmarked to be dedicated fully for radioisotope production activity, we have also added as an emerging strategic priority on our research portfolio a new radioisotope research programme focusing on the development of an alpha emitter, ^{211}Astatine (^{211}At) and the production of ^{82}Strontium (^{82}Sr). To this effect, iThemba LABS is currently collaborating with the University of Washington (UW), Seattle, USA, a facility that has been producing ^{211}At for the past 20 years. In the medium to long term, our research efforts to develop new radioisotopes will broaden the footprint of our radiopharmaceutical products from the current focus on diagnostics to include therapeutics, as well as theranostics.

Other related priorities featuring prominently during the medium to long-term period include the establishment of Technology Infrastructure Platform (TIP) to maximise interaction with industrial and academic partners on technologically intensive and innovation-driven projects and activities. The current collaborative partnership between iThemba LABS and the University of the Witwatersrand, which includes a staff joint appointment, is much in line with our dedicated efforts to establish a Machine Learning program as one of the strategic goals of TIP.

Consolidation of training activities under the umbrella of SAINTS remains one of iThemba LABS' key priorities, not only as a means to improve on the quality of training for post graduate research students, but also as a key intervention offering a feasible mechanism to nurture and safeguard the growth of future scientific leadership to sustain the facility.

The recently imposed budgetary cuts have posed a fundamental challenge, particularly on the filling of key positions required to implement and drive strategic flagship projects. The associated risks arising from the budget cuts will require ongoing mitigating measures and reviews of priorities.
Imposed in the midst of an epidemic, the budgetary cuts have only compounded and exacerbated the ongoing effects triggered by the advent of COVID-19. However, COVID-19 also offered an opportunity for the facility to develop a more comprehensive and robust set of health and safety protocols for employees to observe at the workplace.

The ongoing load shedding challenges will have adverse effects on the research programs as all the accelerators cannot be operated during the load shedding period. This will affect the research output and student training KPIs and the effect cannot be quantified as the load shedding problem is unpredictable. The long-term effect of this problem is that it will also discourage postgraduate students from doing projects that require our accelerator facilities.

Biodiversity & Environmental Sciences

SAEON

The data acquired by SAEON and collaborators is used for analysis of long-term patterns and processes and the creation of models, publications and archived datasets. These research products then form the basis for policy and other decision-making inputs, as well as decision-support tools. Some of the sites and data are also used for the SAEON Environmental Science Education programme, which is one of the few of its kind, and possibly the largest school-based education programme that focuses specifically on environmental science in Africa. The programme's primary objectives are to support

the teaching of environmental science at the secondary school level, and to increase public awareness of environmental change.

The following are main points in the science plan of SAEON over the MTEF period, and through it SAEON intends to maximise its potential to support the national Research enterprise to make an impact as follows:

- Continuing analyses of existing long-term data sets to detect historical trends that have produced our present environmental conditions and are likely to determine our future. Such analyses will promote SAEON as an important source of environmental data, will help guide our data collection by showing, for example, the necessary frequency of monitoring, crucial variables that are needed, and where experimental studies are necessary for untangling possible drivers. Examples of such data sets might include: (a) land-cover change in response to land-use and climatic changes; (b) hydrological changes in response to climatic changes (c) fish stock changes (volume, dispersion) in response to fisheries and oceanographic changes; and (d) estuarine dynamics and biodiversity changes in in response to catchment factors like dams, droughts and floods, and to sea level rise and coastal conservation strategies.
- Developing inter-node research programmes for a national perspective on critical topics. Examples might include: (a) integrated hydrological studies in different climate zones to understand and model the trends in water delivery in a changing climate change by analysing historic and contemporary long-term streamflow and climate data sets; and (b) integrated climate-change studies across altitudinal gradients in different climate zones.
- Continuing the implementation and integration of the SMCRI and EFTEON Research infrastructures funded under the SARIR programme of DSI.
- Expanding SAEON's public value and societal impact by continuing to develop scientific and economic decision systems and tools, e.g., South African Risk and Vulnerability Atlas, Bio-Energy Atlas and Carbon Atlas, and information systems for the Department of Environmental Affairs, Forestry and Fisheries (DEFF), e.g. the Marine Information Management System (MIMS) and the South African National Environmental Information Management System (SANEIM)
- Continuing to lead in Earth system science by using SAEON's competitive advantage, bolstered by the addition of the SMCRI and EFTEON Research Infrastructures, to provide long-term ground-based and oceanographic data as critical component of the DSI's Global Change Research Programme.
- Initiating and facilitating experimental studies designed to reduce complexity to allow a closer focus on selected causes (including management interventions) and consequences of environmental change. Examples are global change experiments manipulating forcing factors such as precipitation, CO2, temperature, disturbance agents.
- Monitoring and researching regional extreme events to elucidate 'tipping points' and/or 'thresholds' in ecosystem functioning. Examples of extreme events are: (a) large-scale fire events and their causes; (b) coastal storms; and (c) droughts/floods.
- Integrating ongoing monitoring activities with predictive models of possible futures. For example, numerical models of future climate, conceptual models of future vegetation, and numerical ocean models of expected futures. SAEON will ensure that its data collection covers expected futures so as to test their validity.

- Integrating SAEON's data collections with remote sensing programmes so that SAEON's largely ground-based studies can be used to calibrate and ground-truth remotely sensed data and assist in developing ways of generalising from our node studies to larger areas.
- Continuing development of collaborations with resource economists and social scientists on societal implications of environmental trends.
- Pursuing the implementation of a first research chair (SARChI) at UFS Phuthaditjhaba Campus,
- Development, implementation and integration of SMCRI and EFTEON coherently under SAEON's strategic outlook and operations in order to maximise the return on the combined investment of resources.
- Plan and implement the Agulhas System Climate Array II in partnership with the DSI, the Department of Environment, Fisheries and Forestry (DEFF) and the national and global research community in order to maximise South Africa's geographical advantage with respect to the globally important Agulhas Current.

SAIAB

SAIAB's priorities over the MTEF period include the following:

- Initial research cruises of the 15m coastal research vessel Observer by SAIAB which is being acquired through funding from SARIR's Shallow Marine & Coastal Research Infrastructure allocation by the DSI. The vessel brings new capabilities in the deployment of heavier moorings in deeper water and will be linking in with the needs of SAEON`s deep water monitoring programme as well as servicing ACEP and ACEP Phuhlisa projects. In particular, it will be supporting the SARChI in Marine Natural product research and the UFH Marine bio-economy laboratory.
- Roll out of specialised Marine Science Laboratories with partner HBUs to entrench and mainstream capacity in a transformation-focused way within the Marine Science context. This is an initiative funded by the DSI as part of the ACEP-Phuhlisa Programme.
- Refurbish the Research Vessel Phakisa and other sea-based research infrastructure.
- Establish a National Bio-banking Core Facility through the support of the SARIR's Natural Science Collections Facility.
- Continue with the conceptual development of a pilot scale Mesocosm Facility.
- Establish a marine engineering innovation programme focussing on biodiversity research applications (AI, Robotics, Telemetry, Communications).

Astronomy and geodetic

SAAO

The priority areas on which the SAAO will be focusing over the MTEF period are the following:

- Work on MaxE, a high-throughput, low-resolution spectrograph for SALT, began in early 2019 as part of the collaboration with SARAO. The instrument concept has been revised in line with scientific objectives, and the team is currently working towards a concept review. Manufacturing is expected to start in 2021.

- The high resolution spectrograph (HRS) is required for studies of planets like our own Earth outside of the solar system. The HRS high stability mode, if feasible, will help identify exo-planets the size of the Earth around other stars. This is a hot topic in astronomy, given the more interesting question of whether life is possible elsewhere, or whether the Earth is such a special place that life, as we know it, is only possible here. The HRS already has this high stability mode, but there is the scope to explore whether the entire system is stable enough to consider pursuing high stability mode, and hence explore earth-size exoplanet research at SAAO/South Africa.
- The Intelligent Observatory project is aimed at turning the whole observing plateau at Sutherland into a giant AI machine, with SALT and other SAAO telescopes autonomously able to determine which telescope(s) and instrument(s) should be triggered to follow which candidate transient sources. This will require extensive machine learning and software engineering efforts to succeed.
- A new infrared spectrograph for SALT is in development at the University of Wisconsin and is expected to be installed in 2021.
- The Robert Stobie Spectrograph (RSS), the workhorse instrument, has been streamlined for a series of relatively short-term, high-impact upgrades over the next two years, with the aim to be ready to take advantage of the multiple high-impact facilities planned to come online in the next few years (such as LSST and SKA).
- The development of a monolithic detector for RSS is progressing well; experience with the pathfinder Inter-University Centre for Astronomy & Astrophysics (IUCAA)'s Charge-coupled Device (CCD) controller being commissioned for Sibonise is guiding the RSS detector development, which is intended to be further replicated for MaxE.
- ATLAS an asteroid survey robotic telescope in collaboration with NASA is expected to be operational in Sutherland in 2021. Part of a network of telescopes to survey and to be an early warning system for detecting smaller near-Earth objects a few weeks or days before they impact Earth. SAAO astronomers already have access to the ATLAS telescopes in Hawaii and in 2020 an SAAO astronomer discovered a new comet which was subsequently named after him.
- The PRIME (Prime-focus Infrared Micro-lensing Experiment) telescope will add strategic capability to the suite of telescopes accessible to the South African astronomy community is currently under construction and is on-track to be operational in 2021.

SARAO

The priority areas on which the SARAO will be focussing over the MTEF period are the following:

- MeerKAT project extension by a further 20 dishes in consultation with Max-Planck-Gesellschaft (MPG) from Germany and the 'Istituto Nazionale di Astrofisica', from Italy, thus enhancing both the international collaboration opportunities for MeerKAT as well as its scientific competitiveness and relevance.
- Following the SKA IGO launch on 12 March 2019 – the focus going forward will be on Concept Design Reviews and Work Packages for SKA 1_MID, and looking to ensure that South Africa derives maximum socio-economic value from its hosting and building of the SKA Telescope.

- Preparation for the establishment of the requisite infrastructure for the elements of SKA Telescope hosting that are the obligations of South Africa, namely: the Science Processing Centre, the Engineering Operations Centre, and the Science Regional Centre.
- Acquisition of scientific and engineering capacity in preparation for the next phase of the SKA Telescope Project, SKA_MID_1.

1.4.4. Programme resource considerations

Table 16: Resource allocation in support of performance indicators and targets

	Budget	Budget	Estimated Budget	MTEF Expenditure Estimates		
	2018/19	**2019/20**	**2020/21**	**2021/22**	**2022/23**	**2023/24**
Nuclear Sciences (iThemba LABS) *	300 575	318 286	381 060	550 687	631 283	313 984
Long Term Ecological Monitoring (SAEON) *	90 861	112 688	89 768	107 291	109 113	107 132
Aquatic Biodiversity Science (SAIAB) *	57 745	75 591	64 247	73 267	59 982	57 738
Optical/Infra-red Astronomy (SAAO) *	114 822	130 813	121 953	132 899	128 919	132 449
Radio Astronomy (SARAO)*	679 463	565 608	605 492	1 060 246	844 207	880 346
Total (R'000)	**1 243 466**	**1 202 986**	**1 262 520**	**1 924 390**	**1 773 504**	**1 491 649**

**Includes operating expenditure*

2. Updated Key Risks and Mitigation

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 Strategy 2025 outcomes and will be used to guide appropriate mitigation over the course of strategy execution.

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

Table 117: NRF 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 Research Agenda.	Build flexibility into the resourcing of the research enterprise to enable management to take accountability for achieving national development outcomes.		
	Inadequately designed Research Agenda because of a lack of robust information and analytics.	Develop capacity and capability to provide organisational and National System of Innovation (NSI) analytics to support strategic decisions.		
	Failure to deliver Infrastructure/large projects		M	10

Outcome	Strategic Risk	Risk Mitigation	Rate	Rank
	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**		M	9
	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.		
[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 un-availability	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 to produce 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 organisation.		
Resourcing (affect all Outcomes)	**Strategy Execution risk or failure to deliver on Mandate**		H	3
	Lack of financial sustainability		VH	2

Outcome	Strategic Risk	Risk Mitigation	Rate	Rank
	Threat of cyber security breach		H	5

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

3. Infrastructure projects

Table 18: Infrastructure Projects

No.	Project Name	Project Description	Outputs	Project Start Date	Project Completion Date	Total Estimated Cost	Current Year Expenditure
1.	ERP	Enterprise Resource Planning System	Functional, fit for purpose ERP solution for the NRF	1 Sept 2019	31 August 2021	R 147,093,561	R 49,768,210
2.	SAIF infrastructure	Building Infrastructure for the for Radioisotope Facility (RIF)	Construct new infrastructure and services for 70 MeV cyclotron	Dec 2020	Sept 2022	R250m	R30m
3.	SAIF accelerator equipment	C70 MeV cyclotron facility	Procure new 70 MeV cyclotron and beam line equipment	Nov 2018	Sept 2022	R200m	R60m (prepay)
4.	SAIF targetry	Bombardment stations for RIF	Development and manufacturing of new target stations and targetry infrastructure for 70 MeV cyclotron	Dec 2020	Sept 2022	R100m	R20m (prepay)
5.	Cleanroom upgrades	Clean rooms for isotope production	Replacement of pass-through boxes and isolator cabinets in cleanrooms for radioisotope production	Jun 2020	Feb 2022	R20m	R10m
6.	Office building refurbishment	Administration building upgrade	Refurbishment of J-block administrative offices	Nov 2020	Jun 2021	R6,6m	R6,6m
7.	Technology Innovation Platform (TIP)	Offices and laboratories for the technology and innovation platform facility	Construction of laboratories and offices for TIP	Oct 2020	Sept 2021	R10m	R10m
8.	Alpha Emitter Lab	Irradiation facilities for the alpha emitter lab	Establish irradiation facilities and processing laboratory for development of alpha emitter radioisotopes	Jun 2019	Dec 2022	R8m	R1m

No.	Project Name	Project Description	Outputs	Project Start Date	Project Completion Date	Total Estimated Cost	Current Year Expenditure
9.	MeerKAT Extension	Extension of MeerKAT through international	20 additional dishes	2020	2023	R485m	R40m to date + (R200m next financial year)
10.	SKA1_MID Construction	Initiation of SKA1 construction	South African SKA-MID work package contracts placed, and construction activity started.	2022	2027	Total SKA1 cost: R7,7billion Total cost of work packages to be delivered by South Africa: R2,5billion	
11.	Northern Cape Science Centre	Building to host visitors and public	In partnership with the Dept of Tourism – infrastructure	2022	2025	R32m (50% SARAO portion)	
12.	EOC	SKA Engineering Operations Centre (Karoo)	Workshops & offices	2022	2025	R142m	
13.	SOC	SKA Science Operating Centre (including SARAO building)	Fit for purpose building and facility	2022	2025	R450m	
14.	SPC	SKA Science Processing Centre	Fit for purpose building and facility	2022	2025	R607m	
15.	National Park game Fence	Provision of a 2.4m high game fence around MeerKAT National Park	Game Fence	2022	2024	R60m	
16.	SRC	Computer equipment to populate the SRC_ZA	Development and Procurement of SRC_ZA computer systems		2027	R40m	
17	SAEON Long-Term Observation Research Platforms SRIG 2020/21 allocation (secured)	SAEON Long-Term Observation Research Platforms	Information management Systems upgrades to meet open data standards.	2020/21	2021/22	R4,9m	-
18	SMCRI	Shallow Marine and Coastal Research Infrastructure (SMCRI) – SARIR	Develop, integrate, commission, manage and maintain 15 coastal research platforms.	2016/2017	2030/31	R635,6m	R11,7m
19	EFTEON - SARIR	EFTEON – SARIR	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,	2016/17	2030/31	R509,5m	R2,8m

Part D Technical Indicator Descriptions (TIDs)

Programme 1

Indicator Title (Indicator 1)	**Proportion of employees from designated groups at Peromnes levels 1-7**
Definition	This indicator measures the demographic representation of the NRF leadership, management and supervisory cohort with specific annual MTEF targets set for proportion Black (Africa, 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
Source of Data	NRF Human Resources Information Management System – minimum details must be: full names of the all employees, evidence used for classification to a designated group, job title, occupation category and level.
Method of Calculation / Assessment	Divide the count of employees from designated groups occupying positions that fall in the peromnes 1-7 levels 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 – this is directly covered in the planned performance table.
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 overhead 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	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
Reporting Cycle	Annually
Desired Performance	<10%
Indicator Responsibility	CFO/Group Executive: Finance and Business Systems

Programme 2

Indicator Title **(Indicator 3)**	**Number of learners, educators and students reached through school/HEI based initiatives (in support of the school and HEI curriculum).**
Definition	The indicator measures the number of recipients of services for identify and nurturing talent aimed at the expansion of STEMI education pipeline. The focus should be in following projects: SET Olympiads and Competitions, Science Camps for learners (minimum of 5 hours), Educator Workshops on content and methodology in Science and Technology (minimum of 5 hours) and Exposure of under and postgraduates to careers in STEMI.
Source of Data	Attendance registers of learners, educators and HEI students that attended/participated in the following projects: SET Olympiads and Competitions, Science Camps for, Educator Workshops and Exposure of under and postgraduates to careers to STEMI. The data captured should include names of participants, careers exposed to, dates, locations of service delivery and name of district/metropolitan area and province when rollout was conducted.
Method of Calculation / Assessment	A simple count of participating learners, educators and HEI students that have received the service.
Means of Verification	Records and details in database/s, registers, reports by external parties covering date, venue, topics, platforms used and hosting/participating institutions/entities and attestation/s of receipt of service/ participation by an individual beneficiary or a specified number of beneficiaries
Assumptions	Factors that are accepted as true and certain to happen without proof
Disaggregation of Beneficiaries	Target for Women: 50%
Spatial Transformation	N/A
Calculation Type	Cumulative, year end
Reporting Cycle	Quarterly
Desired Performance	In line with annual target
Indicator Responsibility	Group Executive: Programme 2, Corporate Relations and Communications

Indicator Title **(Indicator 4)**	**Number of NRF grant holders and National Facilities' scientists undertaking/supporting science engagement and engaged science.**
Definition	The indicator measures the number of NRF grants recipients who engages with the community in their research conducted in science related fields.
Source of Data	Project plans and reports submitted by grant holders and National Facilities' scientists to the NRF.
Method of Calculation / Assessment	Simple count of grantholders that engaged with the community in their research conducted in science related fields.
Means of Verification	The Annual Reports by Grantholders and Scientists at National Facilities together with evidence that support what is reported.
Assumptions	Factors that are accepted as true and certain to happen without proof
Disaggregation of Beneficiaries	N/A
Spatial Transformation	N/A
Calculation Type	Cumulative, year end
Reporting Cycle	Quarterly
Desired Performance	In line with annual target
Indicator Responsibility	Group Executive: Programme 2, Corporate Relations and Communications

Indicator Title **(Indicator 5)**	**Number of NRF supported public Science engagement interventions at research and science engagement infrastructure across the NSI**
Definition	The indicator measures the science engagement interventions (projects) that are designed, planned, approved and implemented for reach of the targeted publics to contribute to the achievement of science engagement objectives
Source of Data	Records of initiatives and/or event/s - detailing plans, approvals, evidence of implementation, details of participating entities, beneficiary group/s, location, dates of activities, details of beneficiaries that actual received the service and evidence that that the service was indeed received by recipients
Method of Calculation / Assessment	A simple count of interventions held at and SE grants allocated to research and science engagement infrastructure that enables the public to gain access in order to advance science across the NSI
Means of Verification	Objective records that provide comprehensive details as credible evidence concerning the purpose of projects/events, completion of activities and the recipients of services/participating beneficiaries.
Assumptions	Factors that are accepted as true and certain to happen without proof
Disaggregation of Beneficiaries	N/A
Spatial Transformation	N/A
Calculation Type	Cumulative, year end
Reporting Cycle	Quarterly
Desired Performance	In line with annual target
Indicator Responsibility	Group Executive: Programme 2, Corporate Relations and Communications

Indicator Title **(Indicator 6)**	**Number of scientist/journalists that use indigenous languages in science communication**
Definition	The indicator measures the extent to which the South African indigenous languages are used to communicate science in by scientists/journalists.
Source of Data	Reports, articles, media monitoring
Method of Calculation / Assessment	A simple count of scientists/journalists (unemployed /employed) who have published article/s in any type of media, in any South African language/s other than English and Afrikaans.
Means of Verification	Copies of published article/s and the corresponding details of the Scientists/Journalist that authored them.
Assumptions	Factors that are accepted as true and certain to happen without proof
Disaggregation of Beneficiaries	The target for Females: 50% The target for Blacks: 65%
Spatial Transformation	N/A
Calculation Type	Cumulative, year end
Reporting Cycle	Quarterly
Desired Performance	In line with annual target
Indicator Responsibility	Group Executive: Programme 2, Corporate Relations and Communications

Programme 3

Indicator Title **(Indicator 7)**	**Number of NRF funded postgraduate students**
Definition	The indicator measures the total number of NRF funded post graduate students with specific annually set targets for each year of the MTEF period. For the purpose of this indicator only South African citizens and permanent residents and such profile information as voluntarily disclosed by the student, will be taken into account.
Source of Data	NRF Grants Management and Systems Administration (GMSA) records of students funded by the NRF.
Method of Calculation / Assessment	The count of all NRF-funded postgraduate students who have been registered as such on the NRF GMSA system. A student will be recognised as funded when the funding support to the student is expensed or in the case of a student supported by a Centre of Excellence, the grant to the centre is expensed. In totalling NRF-funded students in any one year, each student must only be counted once, regardless of number of sources of funding, except on a few occasions where a student completes one qualification and starts another within one academic year. In computing the total number of NRF-funded students over a period of more than one year, each student must only be counted once, regardless of the number of years that the student has been funded. Academic year 2021 performance will be reported in the 2021/22 reporting year.
Means of Verification	Evidence to prove that the student has enrolled at a higher education institution for a post graduate qualification, profile records, supporting evidence of expenditure by NRF to the benefit of the student.
Assumptions	The HEI accepts the student for a postgraduate degree. The student is formally registered for the degree. Both the HEI and student will accept and abide by the terms associated with receiving support from the NRF to enable collection of the records and data by the NRF.
Disaggregation of Beneficiaries	Target for Women: 59% Target for Black: 82% Estimated proportion for persons with disabilities: 1%
Spatial Transformation	N/A
Calculation Type	Cumulative, year end
Reporting Cycle	Quarterly

Desired Performance	In line with annual target
Indicator Responsibility	DCEO of Programme 3

Indicator Title (Indicator 8)	**Number of NRF funded researchers.**
Definition	This indicator measures the total number of NRF funded researchers with specific annual MTEF targets set for this number. For the purpose of this indicator only South African citizens and permanent residents, and information as voluntarily disclosed by the researchers will be taken into account.
Source of Data	Through the NRF Grants Management and Systems Administration, records of researchers funded by the NRF are maintained.
Method of Calculation / Assessment	The count of all NRF funded (including postdoctoral fellows) researchers. 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 2021 performance will be reported in the 2021/22 reporting year.
Means of Verification	Evidence of accepted financial grant and expensed by the researcher and/or research institution, profile information and a copy of the person's ID or passport.
Assumptions	Both the researcher and his/her research institution will accept and abide by the terms and conditions for receiving such support, to enable collection of the records and data by the NRF.
Disaggregation of Beneficiaries (where applicable)	Target for Women: 43% Target for Black: 49%
Spatial Transformation (where applicable)	N/A
Calculation Type	Cumulative, year end.
Reporting Cycle	Quarterly
Desired Performance	In line with annual target
Indicator Responsibility	DCEO of Programme 3

Indicator Title **(Indicator 9)**	**Number of peer-reviewed publications produced by NRF Funded researchers (including from NNEP, NEP and SRE).**
Definition	This indicator measures the research productivity of NRF funded researchers (including those funded through NNEP, NEP and SRE).
Source of Data	Peer reviewed knowledge outputs databases, such as Web of Science.
Method of Calculation / Assessment	Count the number of peer reviewed publications authored and/or co-authored by NRF-funded researchers (including those funded through NNEP, NEP and SRE). Publications with published year 2021 will be counted and reported as actual performance for the 2021/22 financial year.
Means of Verification	Evidence generated from the Web of Science database including details of the authors, institutional affiliation, titles of journal and publication year.
Assumptions	Reflection of publications in the correct annual cycle in the databases.
Disaggregation of Beneficiaries (where applicable)	N/A
Spatial Transformation (where applicable)	N/A
Calculation Type	Non-cumulative on an annual basis
Reporting Cycle	Annually
Desired Performance	In line with annual target
Indicator Responsibility	DCEO of Programme 3

Programme 4

Indicator Title (indicator 10)	**Proportion South African postgraduate students from designated groups who are users of NFs.**
Definition	Measures unique South African post-graduate students from designated groups accessing/using flagship RIPs, or their data outputs / products, or being trained, as a proportion of all unique South African post-graduate students accessing/using flagship RIPs or their data outputs/products. Access and/or usage may be physical or virtual, individual and direct, or indirectly as part of a group. For the purpose of this indicator only South African citizens and permanent residents may be classified as being from designated groups if they are: South African Black (African, Indian, Coloured), Female (A, I, C, W, inclusive) and disabled persons. Such profile information will be taken as voluntarily disclosed by the students. (Flagship RIPs for the NFs are: SARAO – MeerKAT; SAAO – SALT; SAIAB – Boats; iThemba LABS – SSC; and SAEON - Data)
Source of Data	Operation logs for each flagship RIP that include demographic details of all users, registration status for the reporting period, date of use, purpose of use and database that include all supporting evidence for the logged data, these may include self-identification/declaration via login mechanisms that are in use at the RIP.
Method of Calculation / Assessment	Divide the cumulative count of unique South African post-graduate students from designated groups by the cumulative count of all unique South African post-graduate students. This fraction is to be expressed as a percentage [%] (the reporting period will cover the calendar year, cumulatively)
Means of Verification	Examination of self-declarations made by users or data with sufficient evidence generated while the flagship RIP is being used or collected evidence in database.
Assumptions	Reliability of the self-declarations by students
Disaggregation of Beneficiaries (where applicable)	The profile of postgraduate students to be reported include proportions for all groups that constitute the full profile of postgraduate students expressed as percentages (%)
Spatial Transformation (where applicable)	N/A
Calculation Type	Cumulative, year end
Reporting Cycle	Quarterly
Desired Performance	In line with annual target
Indicator Responsibility	DCEO of Programme 4

Indicator Title (indicator 11)	**Proportion South African researchers from designated groups who are users of NFs**
Definition	Measures unique designated group South African researchers accessing/using flagship RIPs, or their data outputs/products, as a proportion of all unique South African researchers accessing/using flagship RIPs or their data outputs/products. Access/usage may be physical or virtual, individual and direct, or indirectly as part of a group. For the purpose of this indicator only South African citizens and permanent residents may be classified as being in the designated group if they are: South African Black (African, Indian, Coloured), Female (A, I, C, W, inclusive) and disabled persons. Such profile information will be taken as voluntarily disclosed by the researchers. (Flagship RIPs for the NFs are: SARAO – MeerKAT; SAAO – SALT; SAIAB – Boats; iThemba LABS – SSC; and SAEON - Data)
Source of Data	Operation logs for each flagship RIP that include demographic details of all users, date of use, purpose of use and database that include all supporting evidence for the logged data, these may include self-identification/declaration via login mechanisms that are in use at the RIP.
Method of Calculation / Assessment	Divide the cumulative count of unique South African researchers who are from designated groups by the cumulative count of all unique South African researchers. This fraction is to be expressed as a percentage [%] • The reporting period will cover the calendar year, cumulatively • Excludes NRF Staff and PDP Post Docs
Means of verification	Examination of self-declarations made by users or data with sufficient evidence generated while the flagship RIP is being used or collected evidence in database.
Assumptions	Reliability of self-declarations by researchers
Disaggregation of Beneficiaries (where applicable)	The profile of researchers to be reported include proportions for all groups that constitute the full profile of researchers expressed as percentages (%)
Spatial Transformation (where applicable)	N/A
Calculation Type	Cumulative, year end
Reporting Cycle	Quarterly
Desired Performance	In line with annual target
Indicator Responsibility	DCEO of Programme 4

Indicator Title (indicator 12)	**Foreign income (R million) derived from NFs activities / operations.**
Definition	Measures the income derived from the sale of products and services to clients abroad (e.g. isotope sales) and foreign investment leveraged for the operations and projects of NFs **For SARAO**: Foreign investment leveraged for the construction of MK+ project in terms of the signed MoA between MPG and the NRF.
Source of Data	• Financial/banking accounts / statements of the NFs • Engineering reports • MoA
Method of Calculation / Assessment	Sum of all Foreign income reflected in the banking/financial records/statements of the NF
Means of verification	• Examination of the banking/financial records/statements of the NF • Records of investment inflows into projects and activities of the NFs (e.g. INF investment into MeerKAT+ project of SARAO)
Assumptions	Successful implementation for signed MoA between MPG and NRF, and for SAIF.
Disaggregation of Beneficiaries (where applicable)	N/A
Spatial Transformation (where applicable)	N/A
Calculation Type	Cumulative, year end
Reporting Cycle	Annually
Desired Performance	In line with annual target
Indicator Responsibility	DCEO of Programme 4

Indicator Title (indicator 13)	**Number of employees from rural towns adjacent to NFs operating sites that are employed by the NFs**
Definition	Measures the contribution of NFs to employment in the rural towns near/adjacent to the operating sites of the NFs
Source of Data	HR Payroll records
Method of Calculation / Assessment	Sum of the number of employees resident in the towns adjacent to the NFs operating sites that employed by the NF.
Means of Verification	HR & Payroll records of the NF
Assumptions	
Disaggregation of Beneficiaries (where applicable)	N/A
Spatial Transformation (where applicable)	N/A
Calculation Type	Cumulative, year end
Reporting Cycle	Quarterly
Desired Performance	In line with annual target
Indicator Responsibility	DCEO of Programme 4

Indicator Title (indicator 14)	**Number of patient doses generated from radioisotopes produced by iThemba LABS**
Definition	Measures the number of patient doses generated from radio-isotopes produced by iThemba LABS. The patient dose for each isotope is defined as follows: • For Iodine-123, 5 millicurie = 1 dose = 1 patient: (A typical production batch dose of 250 millicurie will treat 50 patients • For FDG: 10 millicurie = 1 dose = 1 patient: (A typical production batch dose of 6000 millicurie will treats 600 patients) • For Germanium Generator: 0.06 millicurie = 1 dose = 1 patient (A typical production batch dose of 50 millicurie will treat 900 patient) • For Strontium Generator: 0.33 millicurie = 1 dose = 1 patient (A typical production batch dose of 100 millicurie will treat 300 patient)
Source of Data	Production and delivery records in database of information from Radioisotopes Dept. of iThemba LABS
Method of Calculation / Assessment	Sum of the number of patient doses for each isotope (as per definition), from radio-isotopes produced by iThemba LABS, and delivered to be administered to patients.
Means of Verification	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, year end
Reporting Cycle	Quarterly
Desired Performance	In line with annual target
Indicator Responsibility	DCEO of Programme 4

Indicator Title (indicator 15)	**Number of recognised publications by NFs.**
Definition	Measures the research publications produced by researchers affiliated to the National Facility published within the reporting period and as appearing in journals/periodicals registered with / recognized by WoS and/or DHET (publication lists).
Source of Data	Peer reviewed knowledge outputs databases, such as Web of Science.
Method of Calculation / Assessment	Count of publications that are published in journals/periodicals registered with / recognized by WoS and/or DHET (publication lists) which include a reference to an association or affiliation with NF/s of the NRF, or to any of its flagship RIPs. The first quarter of the calendar year will be reported as part of the proceeding financial year reporting, and excluded from the current financial year report (the reporting period will cover the calendar year, and not the financial year, cumulatively)
Means of Verification	Evidence generated from the Web of Science database, including all researchers affiliated to the NFs with details of the authors, institutional affiliation or, titles of journal and publication year. Also can be by means of physical compilations of publication outputs containing signed copies of the first and last page of the publications reported.
Assumptions	Authors will report affiliation accurately to the publishers
Disaggregation of Beneficiaries (where applicable)	N/A
Spatial Transformation (where applicable)	N/A
Calculation Type	Cumulative, year end
Reporting Cycle	Quarterly
Desired Performance	In line with annual target
Indicator Responsibility	DCEO of Programme 4

Indicator Title (indicator 16)	**Number of MeerKAT+ antenna foundations, and related Infrastructure completed by SARAO**
Definition	Measures the number of constructed and accepted antenna foundations completed with fibre and electrical ducting provision.
Source of Data	Engineering reports
Method of Calculation / Assessment	Sum of constructed and accepted antenna foundations complete with fibre and electrical ducting.
Means of verification	Project implementation records and other form of valid and reliable evidence that support the progress status included in the Engineering report.
Assumptions	• Funding commitments honoured by stakeholders. • Internal Acceptance Report and kept project management records will be adequate to indicate compliance and accurate progress status.
Disaggregation of Beneficiaries (where applicable)	N/A
Spatial Transformation (where applicable)	N/A
Calculation Type	Cumulative, year end
Reporting Cycle	Annually
Desired Performance	In line with annual target
Indicator Responsibility	DCEO of Programme 4

Indicator Title (indicator 17)	**Progress in implementation of the SAIF Project by iThemba LABS**
Definition	Measures progress of milestones achieved in the implementation of the SAIF Project by iThemba LABS
Source of Data	Certificates of completion and/or Engineering report, database of records and other forms of evidence to support the reported progress in implementing the project.
Method of Calculation / Assessment	The progress in implementation of SAIF project will be measure through the following milestones representing the indicated % progress: 1. Completion of Factory Acceptance Testing (FAT) for C70 cyclotron and delivery to site and Completion of civil construction works for the site installation of C70 cyclotron constitute *75%* of SAIF project 2. Completion of infrastructure & services for C70 cyclotron, Start-up and commissioning of the C70 cyclotron and Commissioning of SAIF pharmaceutical production facilities constitute *95%* of SAIF project 3. Expansion of SAIF pharmaceutical production facilities to double production capacity constitute *100%* of SAIF project.
Means of Verification	Examination of Certificates of Completion and records and any other form of reliable and valid evidence to support the reported progress in implementing SAIF Project.
Assumptions	No to minor disruptions that may affect implementation schedule for the project
Disaggregation of Beneficiaries (where applicable)	N/A
Spatial Transformation (where applicable)	N/A
Calculation Type	Cumulative, year end
Reporting Cycle	Annually
Desired Performance	In line with annual target
Indicator Responsibility	DCEO of Programme 4

Indicator Title **(indicator 18)**	**Number of SALT Gen 1.5 subprojects being implemented by SAAO**
Definition	Successful establishment of the Strategic Instrumentation Initiative (SII). This includes: (i) the fraction of SAAO or hosted telescopes that are incorporated in the automatic response IO network, (ii) Completion of the LFC project, (iii) Completion of the MT prototype project and (iv) Completion of the MaxE project
Source of Data	Progress reports and Acceptance test reports, database of records and any other form of reliable and valid evidence supporting the reported progress status.
Method of Calculation / Assessment	Count the completed sub-projects of SII listed below. 1. Fraction of Sutherland telescopes networked into the Intelligent Observatory (IO) Project 2. Installation of the Laser Frequency Comb 3. Installation of the Mini-Tracker prototype 4. Installation of the MaxE (RSS Dual) instrument
Means of Verification	Examination of the Certificate of Completion, the records and collected evidence to verify the reported progress status.
Assumptions	Little to no disruptions that can adversely affect the implementation schedule of the projects in the Initiative
Disaggregation of Beneficiaries (where applicable)	N/A
Spatial Transformation (where applicable)	N/A
Calculation Type	Cumulative, year end
Reporting Cycle	Annually
Desired Performance	In line with annual target
Indicator Responsibility	DCEO of Programme 4

List of Acronyms

AOSP	African Open Science Platform
ACEP	African Coelacanth Ecosystem Programme
ASSAf	Academy of Science of South Africa
ATAP	Acoustic Telemetry Array Platform
ATLAS	Asteroid Terrestrial-impact Last Alert System
BRICS	Brazil, Russia, India, China, South Africa
CCD	Charge-coupled Device
CHE	Council for Higher Education
CoEs	Centres of Excellence
CRAs	Collaborative Research Actions
DCEO	Deputy Chief Executive Officer
DEFF	Department of Environment, Fisheries and Forestry
DHEST	Department of Higher Education, Science and Technology
DHET	Department of Higher Education and Training
DSI	Department of Science and Innovation
ECR	Early Career Researchers
EFTEON	Expanded Freshwater and Terrestrial Environmental Observation Network
EOC	Engineering Operations Centre
ERP	Enterprise Resource Planning
ESRF	European Synchrotron Radiation Facility
FBS	Finance and Business Systems
FCS	Full Cost of Study
GRC	Global Research Council
HCD	Human Capacity Development
HEI	Higher Education Institution
HEMIS	Higher Education Management Information System
HESTIL	Higher Education Science and Technology Institutional Landscape
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 and Communications Technology
iThemba LABS	iThemba Laboratory for Accelerator-based Sciences
IUCAA	Inter-University Centre for Astronomy & Astrophysics
JINR	Joint Institute for Nuclear Research
LRSP	Leading Researchers and Scholars Programme
MIMS	Marine Information Management System
MINDS	Mandela Institute for Development Studies
MPG	Max-Planck-Gesellschaft
MTEF	Mid-Term Expenditure Framework
MTSF	Medium Term Strategic Framework
NACI	National Advisory Council on Innovation
NASA	National Aeronautics and Space Administration
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
NRF	National Research Foundation
NRIP	National Research Infrastructure Platforms
NSI	National System of Innovation
NSLOAP	National Site License for Open Access Project
NSO	National Science Olympiads
OAD	Office of Astronomy for Development
PCF	Partial Cost of Study
PDP	Professional Development Programme
PFMA	Public Finance Management Act
PG	Parliamentary Grant
PRIME	Prime-focus Infrared Micro-lensing Experiment
RDIP	Research Development Information Portal
RIF	Radioisotope Facility
RIP	Research Infrastructure Platforms
RISA	Research and Innovation Support and Advancement
ROV	Remotely Operated Vehicle
RRI	Responsible Research & Innovation
RSS	Robert Stobie Spectrograph
SAAO	South African Astronomical Observatory
SAASTA	South African Agency for Science and Technology Advancement
SAEON	South African Environmental Observation Network
SAIAB	South African Institute for Aquatic Biodiversity
SAIF	South African Isotope Facility
SAINTS	Southern African Institute for Nuclear Technology and Sciences
SALT	Southern African Large Telescope
SANEIM	South African National Environmental Information Management System
SARAO	South African Radio-Astronomy Observatory
SARChI	South African Research Chairs Initiative
SARIR	South African Research Infrastructure Roadmap
SCM	Supply Chain Management
SDGs	Sustainable Development Goals
SETI	Science, Engineering, Technology and Innovation
SGCI	Science Granting Council's initiative
SKA	Square Kilometre Array
SMCRI	Shallow Marine and Coastal Research Infrastructure
SOAR	Strengths, Opportunities, Aspirations and Results
SPP	Strategy, Planning and Partnerships
SRE	Strategic Research Equipment
SREP	Strategic Research Equipment Programme
STEMI	Science, Technology, Engineering, Mathematics and Innovation
STI	Science, Technology and Innovation
STISA	Science, Technology and Innovation Strategy for Africa
TIP	Technology and Innovation Platform
UFS	University of the Free State
USA	United States of America
USAf	Universities South Africa

UW	University of Washington
WP STI	White Paper on Science, Technology and Innovation