



***New Earth Observation Frontiers (NEOFrontiers)***

**KNOWLEDGE ADVANCEMENT AND SUPPORT**

**Framework Document**

**March 2022**

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## 1. INTRODUCTION

The New Earth Observation Frontiers (NEOFrontiers) is an innovation funding mechanism established by the South African Space Agency (SANSA) in collaboration with the National Research Foundation (NRF). It seeks to stimulate collaboration, cooperation, and innovation in the South African Earth observation community, both public and private. The NEOFrontiers funding opportunity is envisaged as a collaborative yet competitive funding mechanism for developing capabilities around new sensors, products and services, and value-added components.

The NEOFrontiers seeks to achieve its objectives by publishing a call for proposals related to:

- i. **Support Actions:** short-term (1-2 years) actions that typically seek to either inform further Research and Development (R&D) investment through review/desktop study type actions or seek to develop specific short-term capabilities that enable the transition of research outputs into downstream operational services.
- ii. **Domain Development Actions:** longer term 2-3 years research and development projects that typically seek to establish new national Earth observation (EO) capabilities across the value chain, aiming at long term exploitation and bringing South Africa (SA) closer to the leading edge internationally. Both directed (closely constrained thematically) and open calls are envisaged.

## 2. STRATEGIC CONTEXT

Through a statutory mandate embedded in the SANSA Act 36 of 2008, the SANSA coordinates and integrates space science and technology programmes, conducts long-term research and implementation of space-related innovations in South Africa. The agency ensures the supply of cost-effective space-based EO data and products to support South Africa's policy, decision-making, economic growth and sustainable development. The NEOFrontiers, which is an initiative of the SANSA, is an instrument that enables capacity building and the development of innovative products and services through research and collaboration within the EO community. The SANSA national strategies and policy briefs can be found at <https://www.sansa.org.za/annual-reports-documents/>.

The NRF's objective is to contribute to National Development by:

- i. 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;
- ii. Developing, supporting and maintaining national research facilities;
- iii. Supporting and promoting public awareness of, and engagement with science; and
- iv. Government promoting the development and maintenance of the national science system and support of government priorities.

## **NRF Vision 2030**

The overall objectives for vision 2030 are to shape, influence, and impact the national research system; to establish the NRF as a thought leader and source of knowledge within the science sector; to create a clear causal relationship between research and national development; to have a transformative effect on the national research enterprise and the relationship between science and society; and to enable, initiate, facilitate, and perform excellent research with direct and indirect impact, whether immediate or long-term, that extends the frontiers of knowledge and addresses national challenges.

## **Strategy 2025**

NRF strategy 2025 is an implementation framework for the ten-year vision. This strategy is centred on the NRF's desire to contribute to national development through research with an impact. The strategic outcomes include:

- i. A transformed (internationally competitive and sustainable) research workforce;
- ii. Enhanced impact of the research enterprise;
- iii. Enhanced impact of science engagement; and
- iv. A transformed organisation that lives its culture and values.

### **2.1 Environmental scan**

In recent years there has been a growing support and uptake of the EO research by the South African government. The Department of Science and Innovation (DSI) has been instrumental in ensuring that EO research goes forward through its participation in initiatives such as the Group on Earth Observation (GEO), which led to the establishment of the South African Group on Earth Observation (SAGEO). The Government has made the funding for the NEOFrontiers programme available to support research and innovation in EO. This will be complemented with additional funding from the Space Infrastructure Hub project. There are global initiatives such as the Committee on Earth Observation Satellites (CEOS), Global Monitoring for Environment and Security (GMES) Africa and the United Nations on Global Geospatial Information Management (UN-GGIM) that foster research through collaborations within countries and regions which are important to this programme.

Earth observation research is multidisciplinary, focusing on various thematic areas such as food security and agriculture, water resource management, integrated spatial planning (including infrastructure monitoring) and land reform, and oceans and coastal zone management. The research is aligned with government priorities, existing multilateral agreements and initiatives developing earth observation expertise nationally and regionally.

The major role players in EO research include academia, science councils, public and private sectors. The academia and science councils' roles include the development of innovative solutions and knowledge generation. Earth observation is, by nature highly collaborative, with international space agencies and other national and international partners around specific project-based collaborations as appropriate.

## 2.2 Objectives

The objectives of the funding instrument are to:

- i. Advance the implementation of South African Earth Observation Strategy for addressing South Africa's socio-economic and environmental priorities;
- ii. Generate knowledge through research and collaborations within the EO sector;
- iii. Develop a transformed, sustainable national science and industrial skills base;
- iv. Stimulate coordination, collaboration, cooperation and competitiveness in the South African Earth observation sector;
- v. Stimulate the development of innovative Earth observation upstream capabilities and information services in industry;
- vi. Develop national capability to further service an African and global market; and
- vii. Effect tangible contributions to African GEO, GEO and CEOS and other international partnerships.

The NEOFrontiers seeks to establish two mechanisms presented below to achieve these objectives.

## 2.3 Specific Call Details

The Section below provides more detail as to the nature of the thematic areas to be supported in this specific call.

### **Support Action SA/2022/1:**

**Focus:** Development of Climate Change Hazard Indices based on the Digital Earth Africa Platform.

**Primary Activities and Outputs:** Earth observation provides critical tools to monitor the causes and effects of climate change, enabled further by cloud-based multi-sensor platforms providing rich time series of analysis ready data. The SANSa aims to enable community development of multi-thematic EO-based decision support tools supported by three interactive primary capabilities: the monitoring and analysis of a) ecological infrastructure and natural ecosystem variability; b) built infrastructure and socio-economic dynamics; and c) climate drivers and extreme events at multiple scales. Such information will inform dynamic decision support tools providing risk indices based on the assessment and prediction of hazard, vulnerability and exposure.

This call focuses on the development of EO-based hazard indices, providing analysis of the frequency, magnitude and intensity of both natural and/or human-induced hazards, and the resultant potential for estimating hazards at the event scale and in real time. Such hazards may include primary phenomena such as heatwaves across terrestrial, marine or atmospheric systems; heavy rainfall; flooding; drought; cyclones; atmospheric emissions or others. Secondary phenomena may also be addressed, such as biodiversity reduction and land use. The identification or development of clear hazard indicators that are highly scalable regionally, and incorporate both historical and near real time data, are critical aspects of the call. The ability to address the interaction of multiple hazards is seen as an advantage.

Proposals should address the development of demonstration decision support systems, based on the data serving capabilities of Digital Earth Africa (DE Africa), that provide the EO-based hazard component for future combined hazard/vulnerability/exposure risk indicators. Approaches that demonstrate interoperability and use freely available data that are currently not in DE Africa are strongly encouraged, e.g. other earth observation or re-analysis data, although use of Digital Earth Africa data as primary event scale information is necessary. Proposals must clearly show cognisance of existing EO-based hazard monitoring systems (available either from the SANSA or any other national or regional sources) and avoid duplication with these systems, whilst providing new potential capabilities to the community, and ideally exploit synergy with existing systems. The decision support system need not necessarily be implemented on the DE Africa platform itself, such architectural choices should form part of the proposal. The porting of existing operational systems to DE Africa will not be considered here. Proposals should identify a range of expected end users and their expected impact pathways for an operational system. Proposals must also provide a demonstration capability of how their hazard indicators can be combined with example vulnerability and exposure information to provide an integrated risk product.

**Consortia Criteria:** Consortia should include at least one government end-user, and proposals should demonstrate clear end-user co-design. **Proposals must include, as consortia members, some combination of at least three of the following:** government departments (non-funded), Tertiary Education Institutions, Science Councils, and Private Sector companies or Small Medium and Micro Enterprises (SMMEs) or Non Profit Organisations working in the relevant domains.

Key outputs should include:

- i. Publication(s) in peer reviewed international journals detailing the methods and approaches, results, and the innovation and impact potential;
- ii. A documented Python code base providing the code used for the determination of indices and hazard products;
- iii. A Jupyter Notebook in the Digital Earth Africa Sandbox demonstrating the production of indices and hazard products
- iv. Clear evidence of Masters student progressing towards graduation.

**Keywords:** climate change; natural and human-induced hazards; Digital Earth Africa; decision support systems; ecological infrastructure and natural ecosystem variability; climate related risk and vulnerability.

**Budget Considerations:** Anticipated maximum requested budget of R2 000 000 over 2 years, with an option to carry forward a small proportion of the student bursary budget for one additional year. Two proposals will be funded. Proposal budgets should not exceed R1 100 000 for human resource costs and R240 000 for running costs, including indirect costs. Proposals should include a budget for two Masters students at R162 900 per annum. Inclusion of more independently funded Masters

students would be seen as an advantage. Proposals that include supplementary non-NRF co-funding sources will be viewed favourably.

**Support Action SA/2022/2:**

**Focus:** High resolution multi-sensor object-based detection for road network monitoring.

**Primary Activities and Outputs:** Remote sensing provides valuable capabilities for a wide variety of built infrastructure monitoring, from air and space-borne optical, thermal and radar sensors. The SANSA aims to develop a multi-sensor ability to provide an ongoing, automated capability to monitor key built infrastructure, primarily from high resolution visible (HRV) and synthetic aperture radar (SAR) imagery in combination with machine learning object extraction and fusion techniques. As an initial R&D initiative in this domain, roads and road networks are the focus: an economically critical national and continental infrastructure that provides socio-economic and ecological complexity, this is in addition to technical challenges around optimal sensor choices, object extraction and data fusion.

This call focuses on a multi-sensor capability to monitor roads and road networks based on HRV, SAR and other data. Proposals should address the development of automatic object extraction of roads from single and multiple HRV and SAR sensors. The SANSA will provide appropriate data suites from commercial HRV, SAR and other sensors for development. Validation of object extraction techniques across sensor types should be addressed. Other key capabilities that must be addressed are the data fusion techniques required to combine extracted road objects into a coherent road network, and the ability to classify common road surface types, e.g. tar and dirt. An example of desirable outputs from these capabilities are quantified road lengths and classification types and their respective changes in time. Proposals need to address the ability to quantify road network changes in time based on both single and multiple sensor data, i.e. change detection using different sensors. Outputs should include recommendations on optimal machine learning and fusion techniques, and guidance on optimal sensor types across target types. Integration of additional non-EO data is also encouraged.

**Consortia Criteria:** Consortia should include at least one government financial development or infrastructure focused investment agencies end-users, and proposals should demonstrate clear end-user co-design. In addition the proposals **must include, some combination of at least three of the following:** government departments (non-funded), Tertiary Education Institutions, Science Councils, and Private Sector companies or SMMEs or Non Profit Organisations working in the relevant domains as consortia members.

Key outputs should include:

- i. Publication(s) in peer reviewed international journals detailing the methods and approaches, results, or technical/innovation recommendation document;

- ii. A documented Python code base providing the code used for the EO processing, machine learning, data fusion and post processing analysis;
- iii. Clear evidence of Masters student progress towards graduation.

**Keywords:** EO-based road network quantification, machine learning, automated object extraction, high resolution visible earth observation, synthetic aperture radar, change detection

**Budget Considerations:** Anticipated maximum requested budget of R2 000 000 over 2 years, with an option to carry forward a small proportion of the student bursary budget for one additional year. One proposal will be funded. Proposal budgets should not exceed R1 100 000 million for human resource costs and R240 000 for running costs, including indirect costs. Proposals should include a budget for two Masters students at R162 900 per annum. Inclusion of more independently funded Masters students would be seen as an advantage. Proposals that include supplementary non-NRF co-funding sources will be viewed favourably.

**Domain Development Action DDA/2022/1:**

**Focus:** Multi-Sensor Campaign Postgraduate Research and Development Support

**Primary Activities:** The Multi-Sensor Campaign (MSC) is a community R&D initiative focusing on the acquisition and exploitation of a diverse set of airborne and spaceborne SAR, hyper and multi-spectral optical, thermal and other sensors, supported by substantial acquisition of *in situ* and ground-based validation data. The MSC community is large, diverse and voluntary: comprised of science councils, space industry companies, government bodies, and universities. The MSC is focused on a wide variety of application domains and target types across agriculture, wetlands, mining, infrastructure monitoring, urban dynamics, water quality, and surveillance, amongst others. Its aims include the development of new processing capabilities, algorithm development, sensor and algorithm validation, new multi-sensor approaches, SAR and hyperspectral signal analysis, and sensor optimisation, amongst others.

The SANSA seeks to enable the MSC community to support postgraduate based R&D studies based on the MSC data and community expertise, with the aims of substantially developing human capacity and expertise for EO sensor exploitation to develop leading edge national sensor knowledge and applications. A single proposal from an MSC community consortia is anticipated, detailing a coherent multi-sensor and multi-disciplinary research plan, to be realized in the main by a series of highly complementary Doctoral and Masters students. Priority should be given to thesis-based research projects designed to provide new capabilities, e.g. optimized sensors, new algorithms, multi-sensor applications, amongst others. Synergy with planned international collaborations, such as the National Aeronautics and Space Agency (NASA) Bioscape project, is also encouraged. Proposals should explicitly provide for:

- i) Collaborative mechanisms facilitating a cohort-based approach amongst students, e.g. enabling peer-peer learning and expertise transfer; and

- ii) Regular student-led community showcases for emerging outputs. The NEOFrontiers will focus primarily on supporting student bursary costs and field work and does not anticipate requests for equipment or major operational costs.

**Consortia Criteria:** Proposals **must include, as consortia members, all of the following:** government departments (non-funded), Tertiary Education Institutions, Science Councils, and Private Sector companies or SMMEs.

Key outputs should include:

- i. Publications in peer reviewed international journals detailing the methods and approaches, results, and the innovation and impact potential;
- ii. Documented code bases, where appropriate;
- iii. Regular student-led community showcases for emerging outputs;
- iv. Clear evidence of Masters and Doctoral student progress towards graduation.

**Keywords:** air-borne and space-borne airborne sensors, synthetic aperture radar, hyperspectral, validation, sensor optimization, algorithm development

**Budget Considerations:** Anticipated maximum requested budget of R4 300 000 over 3 years, with an option to carry forward a small proportion of the student bursary budget for one additional year. One proposal will be funded. Proposal budgets should not exceed R300 000 for human resource costs and R550 000 for running costs, including indirect costs. Proposals should include budget for four Masters students at R162 900 per annum and four Doctoral students at R170 430 per annum. Including more independently funded Masters' students would be seen as an advantage. Proposals that include supplementary non-NRF co-funding sources will be viewed favourably.

## 2.4 Management of the funding instrument

A steering committee consisting of the SANSa and the NRF management will provide oversight to the NEOFrontiers funding instrument. As stipulated in the Memorandum of Agreement (MoA) between the SANSa and the NRF, the SANSa will provide strategic direction and transfer funds to the NRF for funding of the NEOFrontiers projects. The NRF will manage the NEOFrontiers in accordance with existing policies and processes of the NRF and in-line with its organisational structural and matrix system.

The NRF will manage the NEOFrontiers funding instrument through its various directorates. The strategic direction and outcomes of the funding instrument are managed by the Knowledge Advancement and Support (KAS) Directorate. The Reviews and Evaluation (RE) Directorate is responsible for the review processes up to the recommendations of grant awards. The Grants Management and Systems Administration (GMSA) Directorate's responsibilities include posting of the research call, communicating funding decisions, disbursement of grant funds, and ensuring adherence to the conditions of the grant.

## **2.5 Financing support**

The NEOFrontiers is funded through the SANSA, and funding for this 2022/2023 Call will be limited to R10 000 000. It is envisaged that three Support Action projects with a maximum amount of R2 000 000 per project over two years, and a Domain Development Action project with a maximum of R4 300 000 per project over three years will be funded from 2022/23 as stipulated above.

## **2.6 Key stakeholders**

The intended beneficiaries for this call are Tertiary Education Institutions, Science Councils, South African Private Sector companies and SMMEs, and Non-Profit Organisations working in the relevant domain areas, and these must have a legal presence in South Africa. Intended non-funded participating beneficiaries also include government departments and their agencies.

Partnership between these entities is encouraged through collaborative consortia. The partnerships are expected to proceed in a manner that is culturally sensitive, relevant, respectful, responsive, equitable and reciprocal, with regard to the understandings and benefits shared between the research partners. It must be noted that subcontractors that provide service at a cost to the project are not viewed as partners as they are expected to benefit financially from the project.

Criteria defining the partners:

- i. Must be making a clearly defined contribution or end beneficiary of the project;
- ii. Firms/companies or Non Profit Organisations, do not have to register on the NRF grant recipient database in order to participate;
- iii. Must be South African or at least have a legal presence in South Africa.

## **3. MODUS OPERANDI**

### **3.1 Call for proposals**

Proposals will be submitted by researchers and experts based and/or affiliated with public research institutions that are registered in the NRF grant recipient database. All proposals are expected to include, as consortia members, some combination of at least three of the following: government departments (non-funded), Tertiary Education Institutions, Science Councils, and Private Sector companies or SMMEs or Non Profit Organisations working in the relevant domains. Proposals that include representation from the private sector will be viewed advantageously.

All applications must be submitted electronically via the NRF Connect system at <https://nrfconnect.nrf.ac.za>. All applications must be endorsed by the research office of the principal applicant before submission to the NRF. It is the responsibility of each applicant to familiarise himself / herself with the internal closing dates, set by his / her institution in order to meet the NRF closing date included in the "General Application Guide 2023".

### **3.2 Eligibility**

- i. The applicant or the Principal Investigator (PI) must have a minimum of 5 years of experience in research with a record of research outputs and, where relevant, supervision of students;
- ii. Full-time or contracted employees at a South African public research institution (Science Council, University or Museum);
- iii. Contractual employees must demonstrate that their appointment at the South African institution is for (at least) the duration of the project applied for; and
- iv. Other stakeholders/entities/organisations indicated in section 2.6 above may be Co-investigators and are not allowed to submit the application by themselves.

### **3.3 Proposal requirements**

This guide is aligned to the application template included in the NRF online submission system, and reflected in the scorecard presented in Annexure 1. The proposal must clearly present, and the address the following aspects:

- i. All of the requirements of the specific calls mentioned in section 2.3, and also relate the work to be done to the objectives of the NEOFrontiers programme presented above;
- ii. Proposed rationale, approaches and methodology;
- iii. Work plans must demonstrate scientific, logistical, technical and financial feasibility;
- iv. The impact of the research on knowledge production and relation of its outcomes on delivering government policies and strategies must be clearly articulated;
- v. How the research outcomes will address transformation, including equity;
- vi. The roles, deliverables and budget allocation for each consortia partner and work package;
- vii. A commitment to transformation through the make-up of their team members;
- viii. User and stakeholder consultation and co-design process where appropriate; and
- ix. A draft consortium agreement as guided in the partnership section.

### **3.4 Ethical Clearance**

It is the responsibility of the grantholder, in conjunction with the institution, to ensure that all research activities carried out in or outside South Africa comply with the laws and regulations of South Africa and/or the foreign country in which the research activities are conducted. These include all human and animal subjects, copyright and intellectual property protection, and other regulations or laws, as appropriate. A research ethics committee must review and approve the ethical and academic rigor of all research prior to the commencement of the research and acceptance of the grant.

The awarded amount will not be released for payment if a copy of the required ethical clearance certificate, as indicated in the application, is not attached to the Conditions of Grant.

Please also refer to the “Statement on Ethical Research and Scholarly Publishing Practices” on the NRF website at <https://www.nrf.ac.za/statement-on-ethical-research-and-scholarly-publishing-practices>.

### **3.5 Application assessment**

The assessment of applications will be guided by a Panel Assessment Scorecard (see Annexure 1), and scored according to the Proposal Grading (see Annexure 2). Application assessment will occur by way of a two-tiered process.

#### **Remote peer review**

The remote peer reviewers will be specialists in the ambit of the respective proposals. Requests for written reviews will be solicited electronically, or through appropriate media platform from peers located at remote locations from the NRF. Applicants will be requested to provide between 6 to 10 possible reviewers. It is in the applicant’s best interest to ensure that the selected reviewers are aware of the submission and are thus likely to respond. It is also in the applicant’s best interest to ensure that selected reviewers have no possible conflict of interest in submitting a review; should that be the case review reports will be dismissed without consideration.

#### **Panel-peer review**

The adjudication panel will be broadly constituted to include senior academics, selected based both on their respective knowledge fields and their research standing. The panel meeting will be held at a central location or by way of tele- or video-conferencing. Panel members will deliberate on submitted written reviews and will be expected to offer their own expert opinions.

**NB: Applicants must ensure that their Curriculum Vitae are updated on the NRF Connect system at <https://nrfconnect.nrf.ac.za>.**

**These Curriculum Vitae are used in the assessment processes, and incomplete or outdated inputs will jeopardise the application.**

### **3.6 Rules of participation**

ONE application will be accepted from a lead researcher. However, the lead researcher may participate either as a Co-investigator or a collaborator in more than one project. Students, technical and support staff are NOT eligible to apply as leads.

#### **Principal Investigator**

The PI (i.e. the applicant) must be an active researcher who takes intellectual responsibility for the project, its conceptualization, any strategic decisions required in its pursuit, and the communication of results. The PI must have the capacity to make a serious commitment to the project and cannot assume the role of a supplier of resources for work that will largely be placed in the hands of others. The PI will take responsibility for the management and administration of resources allocated to the grant award, and for the meeting of reporting requirements.

**i. Co-investigators/partner principal investigator**

A co-investigator/partner principal investigator is an active researcher who provides significant commitment, intellectual input and relevant expertise into the design and implementation of the research application. The co-investigator/partner principal investigator will be involved in all or at least some well-defined research activities within the scope of the application. Only South Africa-based co-investigator/partner principal investigator will be eligible for funding in successful grant applications.

**It is important to note that postdoctoral fellows, students, technical and support staff DO NOT qualify as Co-investigators**

**ii. Research Associates / Collaborators**

These individuals or groups make a relatively small, but meaningful contribution to the research endeavours outlined in the application, but do not participate in the research design. They are not considered a part of the core research team and are not eligible to receive NRF funds from the grant if the team's application is successful.

**3.7 Consortium agreements**

The lead institution is responsible for initiating the consortia agreement. A draft of the consortium agreement must form part of the documents submitted with the proposal and should be congruent with the roles, responsibilities and budget indicated in the proposal. The agreement must be drafted in a spirit of equity, and must have details regarding rights (such as copyright, publications, intellectual property etc. of products or other developments in the project), knowledge utilisation, as well as affairs such as payments, progress- and final reports, and confidentiality. The agreement furthermore details conditions and arrangements for the governance of the consortium (to the extent that it gives sufficient guarantee for effective collaboration), finances, and if applicable, basic knowledge to be contributed, liability, disputes, and information sharing within the consortium. The lead and funding recipient will be expected to submit a finalised consortia agreement within 3 months after the award has been allocated.

**3.8 Data management and use**

A data management Plan (DMP) is a formal document that describes the data expected to be acquired or generated during the course of a research project, how it will be managed, described, analyzed, and stored, and what mechanisms (including digital data storage) will be used at the end of the project to share and preserve the data. Research data sharing that underlies the findings reported in a journal article/conference paper/thesis as set out in the NRF Open Access Statement.

The findings reported in a journal article or conference paper should be deposited in accordance with the NRF Open Access Statement. It is acknowledged that some of the data generated is more sensitive than others. Before initiating the research, it is the grantholder's responsibility to consider the following: confidentiality, ethics,

security and copyright. Possible data sharing challenges should be considered in the DMP with solutions to optimise data sharing.

Researchers should note that publicly funded research data should be in the public domain, with free and open access, by default. Collaborators and co-investigators in the research project should be informed by the applicant that due to public funding and funder mandate, one is expected to share research data as openly as possible. The Data Management Plan should indicate which data will be shared. If (some) research data is to be restricted, an appropriate statement in the DMP and subsequent publication should explain why access to data is restricted. The NRF has adopted and is given permission to use the DCC Checklist for Data Management Plan, and this can be used as a guide for developing the DMP.

([http://www.dcc.ac.uk/sites/default/files/documents/resource/DMP/DMP\\_Checklist\\_2013.pdf](http://www.dcc.ac.uk/sites/default/files/documents/resource/DMP/DMP_Checklist_2013.pdf))

### 3.9 Science engagement

The NRF supports science engagement through its coordination and implementation of the Department of Science and Innovation's Engagement Strategy. The strategy embraces a broad understanding of science, encompassing systematic knowledge spanning natural and physical sciences, engineering sciences, medical sciences, agricultural sciences, mathematics, social sciences and humanities, technology, all aspects of the innovation chain and indigenous knowledge. Within this context, science engagement refers to activities, events, or interactions characterised by mutual learning and dialogue among people of varied backgrounds, scientific expertise and life experiences, who articulate and discuss their perspectives, ideas, knowledge and values. Science engagement is an overarching term for all aspects of public engagement with science, including science awareness, science education, science communication and science outreach, which aims to develop and benefit individuals and society. Researchers funded through the NRF programmes are required to contribute to science engagement and report the related outputs in their project's Progress Report.

## 4. FINANCIALS

### 4.1 Funding model

The grants of this funding instrument are to be primarily used for **research and development** and for the development of associated human resources under the auspices of the NRF standard grant and finance policies. However, unlike the majority of the NRF managed instruments, this funding instrument will provide funding for staff, consultancies and stakeholder engagement, as appropriate. Therefore, **clear motivation for the cost of staff, consultations and stakeholder engagements is required**. The funds are released upon acceptance and signing of the conditions of grant, both by the applicant and his/her employing institution. These grants will fall under the NRF audit requirements of beneficiary institutions.

Additional funding support to cater for disability will be allocated to people with disabilities as specified in the Code of Good Practice on Employment of People with Disabilities as in the Employment Equity Act No 55 of 1998.

## 4.2 Funding ranges

Successful applications will receive funding that accommodates the following budget items:

### i. Research-related operating costs

These costs include materials and supplies, travel (including conferences) and subsistence, equipment and research/technical/*ad hoc* assistance/salaries. These costs should be justified and commensurate with the planned outputs, as they will be assessed on this basis. The amount awarded within this framework can be used at the discretion of the applicant.

#### Materials and Supplies

Generally, the NRF does not provide financial support for:

Basic office equipment including computers and consumables unless the computer is required for the research itself.

- Basic office stationery, photocopying costs, and printing costs are excluded unless these items form part of the research tools;
- Journal publication costs, journal subscription costs and book costs;
- Telephone, fax and internet costs.

#### Travel and subsistence

- International conference attendance: This should be motivated clearly and consideration of the other travel budget requirements presented below must be made, and must not exceed the limit presented in Table 1 below.
- International visits: These will be considered on a case by case basis. Such visits must be integral to the research plan and strong motivations should accompany these requests. Realistic funding allocations will be based on the requested activities. Only outgoing visits will be considered depending on the availability of funding.
- Local conference attendance: The applicant should clearly motivate for the benefit to attend more than one local conference per annum, and for the number of people attending each local conference.
- Local travel: The NRF does not stipulate any rate for mileage as this will depend on the rate which varies per institution/organisation. Applicants are requested to provide details of this rate as well as the estimated distance to be travelled within the given year. This travel should be well motivated and exclude travel to the conferences mentioned above.
- Local accommodation costs should not exceed a 3-star establishment. This relates to local travel for research purposes and an estimation of accommodation costs for each trip should be clearly presented in the motivation.

### Research Equipment

Funding for small equipment will be limited to the percentage presented in **Table 1** below. Requisitions for large equipment items should be submitted through the NRF's Research Equipment Programme.

### **ii. Salaries**

Remuneration may be paid to team members including Co-investigators and should be in-line with the policy of the institution where the grant is held.

### **Expenditure limits**

The limits for expenditure per category are presented in Table 1 below.

Table 1: NEOFrontiers funding ranges per budget category

<b>Budget categories</b>	<b>Minimum number/percentage of the total grant</b>	<b>Maximum/ percentage of the total grant</b>
Research cost	No restriction	As per call text in 2.3
Mobility/travel	0%	20%
Equipment	0%	20%
Science engagement	3%	5%
Salaries	No Restriction	As per call text in 2.3
Student bursaries	As per call text in 4.2	As per call text in 4.2

### **4.3 Postgraduate student support**

The NRF has developed a new Postgraduate Student Funding Policy that will use postgraduate student funding as a lever to address the challenges of inequity of access, success and throughput. The policy is underpinned by the pursuit of research excellence in all of its dimensions and has transformation of the postgraduate cohort as the core objective. Its purpose is to retain high academic achievers in the system to pursue postgraduate studies up to the doctoral level, as part of a national drive to grow the next generation of academics to sustain South Africa's knowledge enterprise. The NRF is prioritising postgraduate students with research inclination, with the aim to grow the pool of early career researchers. Another motivation for this policy is to fast-track the development of postgraduate students in high-impact, priority and vulnerable disciplines critical for national socio-economic development.

From the 2021 academic year onwards, the NRF began phasing out the block grant nomination process as well as the grant-holder linked modalities of funding postgraduate students. All the postgraduate students are required to apply on the NRF Connect system by accessing the link: <https://nrfconnect.nrf.ac.za/>. This single entry point allows the NRF to co-ordinate the applications that have not yet had the financial means test conducted, this financial means test will be conducted by Ikusasa Students Financial Aid Programme (ISFAP). Postgraduate students will be funded

either at Full Cost of Study (FCS) or Partial Cost of Study (PCS) under the new policy. 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 with a disability will be funded at FCS. Academic high fliers achieving a distinction or first-class pass will also be eligible for funding at FCS. International students as well as any other South African student who is not eligible to be funded at FCS will be eligible for PCS funding.

The students are expected to meet the NRF minimum entry requirement in order to be eligible for FCS or PCS as illustrated in Table 1 below.

**Table 1: Eligibility criteria for NRF postgraduate funding for FCS and PCS.**

Study Level	Full Cost of Study (South African Citizens and Permanent Residents only)		Partial Cost of Study (South African Citizens; South African Permanent Residents and 5% Non-South African Citizens)
	Exceptional Achievers	Financially Needy & Students with Disability	Other
Honours	<ul style="list-style-type: none"> <li>• ≥ 75% Mark in Final Year of study</li> </ul>	<ul style="list-style-type: none"> <li>• ≥ 65% Mark in Final Year of study</li> </ul>	<ul style="list-style-type: none"> <li>• ≥ 65% Mark in Final Year of study</li> </ul>
	<p><b>Honours students</b> must be <b>28</b> years of age or younger in the year of application. Non South African Citizens are not eligible for Honours Scholarships.</p>		
Masters	<ul style="list-style-type: none"> <li>• ≥ 75% Mark for Honours</li> <li>• Completed Honours in one year</li> </ul>	<ul style="list-style-type: none"> <li>• ≥ 65% Mark for Honours</li> <li>• Completed Honours in one year</li> </ul>	<ul style="list-style-type: none"> <li>• ≥ 65% Mark for Honours</li> <li>• Completed Honours in one year</li> </ul>
	<p><b>Masters students</b> must be <b>30</b> years of age or younger in the year of application.</p>		
Doctoral	<ul style="list-style-type: none"> <li>• ≥ 75% Mark for Masters</li> <li>• Completed Masters in two years</li> </ul>	<ul style="list-style-type: none"> <li>• ≥ 65% Mark for Masters</li> <li>• Completed Masters in two years</li> </ul>	<ul style="list-style-type: none"> <li>• ≥ 65% Mark for Masters</li> <li>• Completed Masters in two years</li> </ul>
	<p><b>Doctoral students</b> must be <b>32</b> years of age or younger in the year of application.</p>		

**In cases where a grade is not indicated, the application will not be considered for funding by the NRF.**

The NRF will allocate all postgraduate bursaries under its management control as follows:

- 95% South African citizens and permanent residents;
- 5% students from Southern African Development Community countries and from the rest of the world; and
- 55% women.

The NRF disaggregates these targets for South African citizens and permanent residents as follows:

- 90% Black (African, Coloured, and Indian);
- 10% White; and
- 1% students living with a disability.

Applicants are encouraged to identify Postgraduate students that have a potential to complete their honours and Master's degree with a minimum pass mark of 65%, and who are interested in pursuing research in the area of the proposed project. The interested students must apply on the NRF Connect system by accessing the link: <https://nrfconnect.nrf.ac.za/>, and should include the reference number of your application in their applications. This will enable the identification of the students' applications for consideration for funding by the NRF. Should your application be unsuccessful, the student's chances of being funded will not be affected. In a situation where the students are not successful, you may contact the Postgraduate Office at your institution to identify students who succeeded to get the NRF bursaries, and who may require a supervisor. The success of the applications for your targeted students is not a guarantee that all of them will receive NRF bursaries. Student bursary approval will depend on the available budget and will be made in consideration of the NRF's key performance targets.

#### **4.4 Financial control and reporting**

Upon receipt of the signed Conditions of Grant, the NRF will release the awarded amount for the year. Grantholders will then be required to comply with the standard NRF financial management procedures, including the submission of a Progress Report. These are to be submitted by 15 February of the following year, and are a prerequisite for the release of the subsequent year's funding. Failure to submit a Progress Report will result in the cancellation of the grant award.

5. **ENQUIRIES**

Funding rules related queries	Application process related queries
<p><b>Dr Zolani Dyosi</b>            Director: Knowledge Advancement and Support            Tel: 012 481 4131            Email: <a href="mailto:Z.Dyosi@risa.nrf.ac.za">Z.Dyosi@risa.nrf.ac.za</a></p> <p><b>Ms Zodwa Masinga</b>            Professional Officer:            Knowledge Advancement and Support            Tel: 012 481 4310            Email: <a href="mailto:ZM.Masinga@risa.nrf.ac.za">ZM.Masinga@risa.nrf.ac.za</a></p>	<p><b>Ms Jane Mabena</b>            Professional Officer: GMSA            Tel: 012 481 4067            E-mail: <a href="mailto:JS.Mabena@risa.nrf.ac.za">JS.Mabena@risa.nrf.ac.za</a></p> <p><b>Ms Lerato Thokoane</b>            Liaison Officer: GMSA            Tel: 012 481 4327            E-mail: <a href="mailto:LB.Thokoane@risa.nrf.ac.za">LB.Thokoane@risa.nrf.ac.za</a></p>
Research Areas (Support Action and Domain Action) Related Enquiries	
<p><b>Dr Stewart Bernard</b>            Chief Scientist            SANSA Earth Observation  <a href="mailto:sbernard@sansa.org.za">sbernard@sansa.org.za</a></p>	<p><b>Mr Imraan Saloojee</b>            Chief Sector and Business Developer            SANSA Earth observation  <a href="mailto:isaloojee@sansa.org.za">isaloojee@sansa.org.za</a></p>

## 6. LIST OF ACRONYMS

CEOS	Committee on Earth Observation Satellites
DCC	Digital Curation Centre
DE Africa	Digital Earth Africa
DMP	Data Management Plan
DSI	Department of Science and Innovation
EO	Earth Observation
FCS	Full Cost of Study
GEO	Group on Earth Observation
GMES	Global Monitoring for Environment and Security
GMSA	Grant Management and Systems Administration
HRV	High Resolution Visible
ISFAP	Ikusasa Students Financial Aid Programme
KAS	Knowledge Advancement and Support
MOA	Memorandum of Agreement
NASA	National Aeronautics and Space Agency
NEOFrontiers	New Earth Observation Frontiers
NRF	National Research Foundation
MSC	Multi-Sensor Campaign
PCS	Partial Cost of Study
PI	Principal Investigator
R&D	Research and Development
RE	Reviews and Evaluation
SADC	Southern African Development Cooperation Community
SAGEO	South African Group on Earth Observation
SANSA	South African National Space Agency
SMME	Small Medium and Micro Enterprise
SAR	Synthetic Aperture Radar
UN-GGIM	United Nations on Global Geospatial Information Management

7. **ANNEXURE 1: Panel Assessment Scorecard**

<b>Criteria</b>	<b>Sub-Criteria</b>	<b>Details</b>	<b>Weight (Total = 100%)</b>
<b>Proposals</b>	Scientific merit and feasibility	Reflect on the proposed rationale, approach and methodology. Reflect on the scientific, ethical logistics and technical feasibility as proposed	50%
<b>Track record of the applicant</b>	Past research	Reflect on past contributions to knowledge production (e.g. journal articles, book chapters, designs, performances, etc.)	5%
<b>Equity</b>	Of applicant	Race / Gender	10%
	Of students supervised	M and D degrees.	5%
<b>Collaboration</b>	International, national and institutional collaborations	Are the appropriate research institution-university-private sector collaborations proposed in the application?	10%
		Are the roles of the proposed collaborators clearly indicated?	
<b>Impact</b>	Impact on knowledge production	Will the proposed work significantly advance discovery and understanding in the field?	5%
	Wider impact	Has the possibility for economic, societal or environmental impact been appropriately embedded in the proposal?	10%
<b>Data management and use</b>	Plans for digital data storage, usage &/or dissemination	A DMP is a formal document that describes the data expected to be acquired or generated during the course of a research project, how data will be managed, described, analyzed, used and stored, and what mechanisms (including digital data storage) will be used at the end of the project to share and preserve the data.	5%
<b>TOTAL</b>			<b>100%</b>

## 8. ANNEXURE 2: Proposal Grading

Score	Meaning of score	Notes
4	Excellent	Application demonstrates evidence of <b>outstanding</b> performance across all the stated criteria, as determined by the panel and relative to the knowledge field under consideration
3	Above average	Application demonstrates evidence of <b>above average</b> performance across all the stated criteria, as determined by the panel and relative to the knowledge field under consideration
2	Average	Application demonstrates evidence of <b>average</b> performance across all the stated criteria, as determined by the panel and relative to the knowledge field under consideration
1	Below average	Application demonstrates evidence of <b>below average</b> performance across all the stated criteria, as determined by panel and relative to knowledge field under consideration
0	Poor	There are <b>major shortcomings or flaws</b> as relates to the scientific / scholarly merit and feasibility of the proposed work, as determined by the panel.
<p><b>Context:</b>            Proposal grading is done with sensitivity to the context within which each application is submitted. The score of each criterion for each application will be contextualised to accommodate variability in such things as knowledge fields, institutional capacity, etc. Should a criterion not be applicable to a specific application (e.g. plans for digital data storage; collaborations; etc.), the weighting of that specific criteria will be made to equal zero, and the overall score normalised.</p>		