



South African National Space Agency (SANSA)

Annual Performance Plan 2018/19



science
& technology
Department:
Science and Technology
REPUBLIC OF SOUTH AFRICA

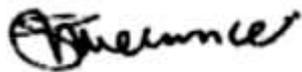


Foreword

The 2018/19 financial year brings new opportunities for South Africa in the local and international space domain and to capture some of these opportunities, SANSA has revised its 5-Year Strategic Plan for the period 2018-2023. Notwithstanding the financial challenges faced by the Agency and though the current targets are conservatively aligned to the budgetary allocation, aspirational activities have been introduced into the revised Strategic Plan to capture the new opportunities. Although the funding for these activities are yet to be secured, this does provide a blueprint for expanded growth for the South African space programme, particularly on the African continent.

This Annual Performance Plan therefore forms a convenient bridge between a measured approach to date in terms of operational focus to a bolder and expansive approach in terms of strategic positioning, including rethinking its current operational approach - where necessary. SANSA has also embarked on an organisational culture change exercise and a realignment process of certain elements of its organisational structure, which will be continued into the 2018/19 financial year. It is envisaged that 2018/19 will be a year of consolidation and venturing into new domains that will realise increased growth of the local space sector.

The Board and Management of SANSA remain committed to repositioning SANSA to support a new growth trajectory for the sector through a more outward focus. This will ensure the development and strengthening of the local space landscape through effective partnerships that focus on new and expanded initiatives. Local and international partnerships will be a key vehicle for such a transformation and this will ensure a more systemic approach in which SANSA's leadership will be critical. The 2018/19 financial year will be a year of exploring new possibilities and we hereby present the 2018/19 Annual Performance Plan for SANSA.



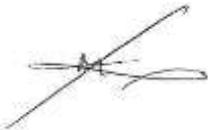
Joy-Marie Lawrence
Chairperson of the SANSA Board
Accounting Authority

Official sign-off

It is hereby certified that this Annual Performance Plan:

- was developed by the management and Board of the South African National Space Agency (SANSA) in consultation with the Department of Science & Technology (DST);
- was prepared in line with the current Strategic Plan of SANSA; and
- accurately reflects the performance targets that SANSA will endeavour to achieve given the resources made available in the budget for 2018/19.

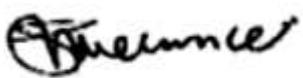
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Chief Financial Officer

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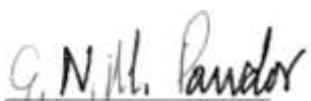
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Ms Joy-Marie Lawrence
Board Chairperson
On behalf of Accounting Authority

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Minister of Science and Technology
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Contents

ACRONYMS	4
EXECUTIVE SUMMARY	5
PART A: STRATEGIC OVERVIEW	7
VISION	7
MISSION	7
STRATEGIC GOALS	7
Strategic Goal 1: The development of a suite of space application products and services that directly respond to user needs	7
Strategic Goal 2: The building of core space infrastructure, both ground and space based, that will enable the delivery of essential space services	8
Strategic Goal 3: The generation of space relevant knowledge that supports the developmental agenda.....	8
Strategic Goal 4: The development of requisite human capacity that is needed for the implementation of key space initiatives	8
VALUES	8
SITUATIONAL ANALYSIS	10
ORGANISATIONAL ENVIRONMENT	14
REVISIONS TO LEGISLATIVE AND OTHER MANDATES	14
PERFORMANCE DELIVERY ENVIRONMENT	15
CONSOLIDATED PERFORMANCE OUTPUTS	18
OVERVIEW OF 2018/19 BUDGET AND MEDIUM TERM EXPENDITURE ESTIMATES	22
ENTERPRISE RISK MANAGEMENT PERIOD 2018/19	25
Part B: Programme Performance Plans	27
PROGRAMME 1: ADMINISTRATION PROGRAMME (AP)	27
PROGRAMME 2: EARTH OBSERVATION PROGRAMME (EOP)	31
PROGRAMME 3: SPACE SCIENCE PROGRAMME (SSP)	39
PROGRAMME 4: SPACE OPERATIONS PROGRAMME (SOP)	49
PROGRAMME 5: SPACE ENGINEERING PROGRAMME (SEP)	54
ANNEXURE A – Amendments to the 2015-2020 Strategic Plan	62
MODIFICATIONS TO MEASURES OR KPI's OR TARGETS	63
KEY PERFORMANCE INDICATOR DESCRIPTORS	67
REFERENCES	84

ACRONYMS

ABBREVIATION	MEANING
AfriGEOSS	African Group on Earth Observation System of Systems
AIT	Assembly Integration and Testing Facility
ARMC	African Resource Management Constellation
AU	African Union
BRICS	Brazil Russia India China and South Africa
CASI	Committee of African Space Institutions
CBERS	China Brazil Earth Resource Satellite
CEOS	Committee on Earth Observation Satellites
COSPAR	Committee on Space Research
CSP	Corporate Support Programme
DST	Department of Science and Technology
EO	Earth Observation
EISCAT	European Incoherent Scatter Scientific Association
EODC	Earth observation Data Centre
EOP	Earth Observation Programme
ESA	European Space Agency
GEO	Group on Earth Observation
GICs	Geomagnetically Induced Currents
GNSS	Global Navigation Satellite Services
GPS	Global Positioning System
HF	High Frequency
ICAO	International Civil Aviation Organisation
ICT	Information Communication Technology
ISES	International Space Environment Service
LEO	Low Earth Orbit
MODIS	Moderate Resolution Imaging Spectro radiometer
MTEF	Medium Term Expenditure Framework
MTSF	Medium- Term Strategic Framework
NASSP	National Astronomy and Space Science Programme
NDP	National Development Plan
NRF	National Research Foundation
NSS	National Space Strategy
R&D	Research and Development
SAASTA	South African Agency for Science and Technology
SADC	Southern African Development Community
SAEOS	South African Earth Observation Strategy
SCAR	Scientific Committee on Antarctic Research
SEP	Space Engineering Programme
SET	Science Engineering and Technology
SMEs	Small Medium Enterprises
SOP	Space Operations Programme
SSP	Space Science Programme
STEM	Science, Technology, Engineering, Mathematics
STI	Science Technology & Innovation

EXECUTIVE SUMMARY

SANSA's vision is to position

"South Africa as the leading innovator of space science and technology solutions on the African continent and beyond"

and the mission of the Agency is

"Serving humanity without borders".

To achieve this, SANSA has four strategic goals:

- Goal 1: The development of a suite of space application products and services that directly respond to user needs,
- Goal 2: The building of core space infrastructure, both ground and space based, that will enable the delivery of essential space services,
- Goal 3: The generation of space relevant knowledge that supports the developmental agenda, and
- Goal 4: The development of requisite human capacity that is needed for the implementation of key space initiatives.

SANSA implements its four strategic goals by clustering its activities across five broad strategic programmes, as listed below:

- Programme 1: Administration Support Programme,
- Programme 2: Earth Observation Programme,
- Programme 3: Space Science Programme,
- Programme 4: Space Operations Programme, and
- Programme 5: Space Engineering Programme.

The National Development Plan (NDP), the National Space Strategy (NSS), the South African Earth Observation Strategy (SAEOS) and other relevant strategies and policies of government informs the strategic focus of SANSA. For example, the creation of high-technology jobs; the improvement of geospatial information to support the development of marginalised communities; promote the planning and monitoring of vital national infrastructure; and provide critical health, safety and security data are ways by which SANSA contributes to the NDP.

A key challenge in delivering on these various policies/strategies is the suboptimal funding levels that are allocated to SANSA. This has resulted in SANSA not meeting its full mandate and consequently being selective about the suite of activities it can actually implement. This Annual Performance Plan is aligned to the current level of funding allocated to SANSA, but noting that the SANSA 2018-2023 Strategic Plan includes aspirational initiatives that SANSA should be implementing if it was to fully achieve its mandate. The SANSA team, while committing to the targets articulated in this Annual Performance Plan, will endeavour to mobilise resources for the implementation of the aspirational initiatives.

Key Deliverables for the Year

1. SANSA will deliver the following **four high-impact products and services** (i) Sensor portfolio and data products; (ii) national land-use and land-cover base datasets; (iii) space weather products and services; (iv) magnetic technology products and services.
2. SANSA will aim to achieve a **research productivity score of 1 300**, which is a composite score based on publications, graduated students, research funding, and researcher rating achieved (see Annexure for further explanation).
3. SANSA will provide support to approximately **50 students and interns** for studies in Earth Observation, Space Science, and Space Engineering.
4. SANSA will aim to **generate about R58 million from both national and international space operations contracts**.
5. If the satellite programme funding is received, SANSA aims to continue to **support about 55 external jobs** and **out-source R50 million to the broader space industry** and **R10 million to SMEs** through the satellite built programme.

PART A: STRATEGIC OVERVIEW

VISION

SANSA's vision statement for positioning the South African space programme is:
South Africa as the leading innovator of space science and technology solutions on the African continent and beyond

MISSION

The objective of SANSA's mission statement for the South African space programme is:
Serving humanity without borders

STRATEGIC GOALS

SANSA has four strategic goals as a means of achieving its mandate. These goals reflect SANSA's strategic intent to lead, coordinate and drive programmes in collaboration with national partners to achieve SANSA's legislated mandate and the attainment of key national priorities in line with the NSS.

SANSA implements its four strategic goals by clustering its activities along five broad strategic programmes as listed below:

- Programme 1: Administration Programme,
- Programme 2: Earth Observations Programme,
- Programme 3: Space Science Programme,
- Programme 4: Space Operations Programme, and
- Programme 5: Space Engineering Programme

Each of the programmes contributes in varying degrees to the strategic goals as indicated in the table below.

PROGRAMMES					
Strategic Goals	Administration	Earth Observation	Space Science	Space Operations	Space Engineering
The development of a suite of space application products and services that directly respond to user needs	✓	✓	✓	✓	✓
The building of core space infrastructure, both ground and space based, that will enable the delivery of essential space services	✓	✓	✓	✓	✓
The generation of space relevant knowledge that supports the developmental agenda	✓	✓	✓		
The development of requisite human capacity that is needed for the implementation of key space initiatives	✓	✓	✓	✓	✓

Strategic Goal 1: The development of a suite of space application products and services that directly respond to user needs

Space has a crucial role in providing operational applications/solutions that will address national/regional challenges and provide decision support tools for government. These include applications in natural resource management, climate change and environmental management, disaster management, rural development and urban planning, magnetic technology, aviation compliance, and national safety and security.

SANSA may develop some of these applications within the Agency, but the primary approach should be to leverage domain expertise externally. SANSA's approach, therefore, should not be to do everything internally, but to focus on a few high-impact national operational applications that require significant state investment, are not commercially viable for private industry or are essentially public good services and therefore a state responsibility.

Strategic Goal 2: The building of core space infrastructure, both ground and space based, that will enable the delivery of essential space services

Infrastructure development forms the critical backbone for the national space programme. This is especially important for the efficient and effective delivery of products and services, across the space value chain, through to the end-users. SANSA will ensure that there is seamless interfacing between its programmes across the space value chain so that its infrastructure operate in concert to deliver on national/regional requirements.

SANSA will take stock of the current infrastructure base and the future infrastructure requirements and plan accordingly to ensure an optimal infrastructure capacity that is adequately able to respond to user requirements both nationally and at a regional scale. SANSA will work with the local industry and other agencies on the continent to promote the infrastructure expansion required to respond to the growth potential of the African market.

Strategic Goal 3: The generation of space relevant knowledge that supports the developmental agenda

SANSA firmly believes in the value of fundamental and applied science to create new knowledge that leads to new technologies and innovation that directly impact on the economy and society. Science also increases our knowledge and understanding of ourselves, our universe and its sustainability. Therefore SANSA will foster and lead collaborative R&D in space-related areas on a national scale. SANSA will set the national R&D agenda, its priorities, targets and outcomes in line with this Strategic Plan.

Through such R&D, provision will be made for the leadership, coordination and support to applied research in order to increase the knowledge base, devise new applications through space missions, and allow the transfer of intellectual property and enabling technologies to local industry, academia, and government organisations. Such interventions will ensure that South Africa remains on the cusp of cutting edge space technologies and applications.

Strategic Goal 4: The development of requisite human capacity that is needed for the implementation of key space initiatives

A significant increase in the interest in STEM (science, technology, engineering, mathematics) fields, as well as the development of rare and transferable skills are required to meet national demand for a viable space programme that can deliver against its targets. Capacity development in space-related areas will not only benefit space, but will have an impact in other areas that require scientists, engineers and technicians.

All capacity development initiatives should be conducted with a transformational agenda to redress inequality in race, gender and people with disabilities. Such initiatives will target transformation of both the student cohort and the broader industry. These initiatives will ensure that the representative demographics is reflected in our national space initiatives.

VALUES

The values adopted by SANSA are core to its effective transformation into a high performing agency. SANSA subscribes to the following six "STRIPE" values:

1. **Service-** deliver superior customer value on time every time;
2. **Teamwork-** consult, inform and share knowledge;
3. **Respect -** acknowledge and value what is good;
4. **Integrity-** keep promises and own up to mistakes;
5. **Personal Growth-** acknowledge potential and grow competence; and
6. **Excellence-** go the extra mile and implement tasks to the best of our ability.

SITUATIONAL ANALYSIS

The Current Global Space Environment

Introduction

The Global space environment is changing very fast and requires developing countries to come up with strategies that will increase their individual participation in space activities. Key to this is the local and Foreign Direct Investments in national space programmes. Joint satellite development programmes are also key in making sure that developing countries become serious players in the space industry. Regional and international/multinational partnerships also play an important role. Developing countries need to make sure that their voices are heard at, for example the United Nations Committee on the Peaceful Uses of Outer Space and the International Telecommunications Union, in order to influence the international regulations to protect and favour them.

Global Trends

Each year, SIA (Space Industry Association) publishes the leading analysis of the satellite industry's economic performance.

The 2016 State of the Satellite Industry Report is SIA's nineteenth annual summary of the industry. The Report is derived from proprietary surveys of satellite companies, in-depth public information, and independent analysis, which are combined to assess the performance of four satellite industry sectors: satellite services, satellite manufacturing, satellite launch services, and satellite ground equipment.

The 2016 State of the Satellite Industry Report includes the following results:

Satellite Services revenues increased by four percent globally from 2014 to 2015, reaching \$127.4 billion, powered by continued growth in consumer satellite television, satellite broadband and Earth observation services.

Satellite Manufacturing revenues, reflecting the value of satellites launched in 2015, grew by four percent worldwide to \$16.6 billion. There were orders for 17 commercial GEO satellites with 11 orders won by U.S. manufacturers for a domestic market share of 65 percent, up from 57 percent in 2014.

Satellite Launch Services Industry revenues, which include revenues for all commercially completed launches that occurred in 2015, decreased by nine percent from 2014 to 2015. In 2015, 202 satellites were launched compared with 208 launched in 2014, and the number of commercially procured launches conducted worldwide decreased to 65 from 73 in 2014. This is probably a sign of fiscal pressures experienced in the industry and is expected to turn around given the growing requirements for satellite services.

Satellite Ground Equipment revenues rose by one percent over 2014 to reach \$58.9 billion. Satellite navigation (GNSS) equipment for both consumer and industrial customers represented approximately 53 percent of the overall ground equipment revenue.

African Space Activities

A growing number of African countries are establishing their own national space agencies. Kenya recently launched a national space agency. Ghana launched its first Cubesat built by students. Nigeria and Algeria continue to lead the area of satellite developments and Earth Observations (EO) satellites being launched. South Africa is busy with an EO satellite built programme and the Operations Phakisa Cubesat Missions. South Africa also recently signed

and launched its BRICS partnership specifically focusing on space matters, which could potentially be leveraged for Africa. These are all efforts by African countries to develop the space industry on the African continent. It is expected that in 10 years' time this picture will be different as more countries are expected to launch their respective national space programmes.

SANSA will also strategically drive the establishment of a Committee of African Space Institutions (CASI) to provide the bottom-up impetus for implementation of an African space programme. This will ensure that leading space agencies collectively define and implement flagship programmes that will advance the development of space applications and technologies on the continent. Programmes such as AfriGEOSS, the African Instrumentation Network and the African Resource Management Constellation (ARMC) will become a prime focus along the implementation path for CASI.

Space Industry Trends

- For many years, global EO services were offered by small number of operators;
 - Typically founded and financed by space industry with the objective to provide high resolution imagery
 - Medium to large satellites with on-board data processing and advanced, custom-designed payloads
 - Governments as primary customers
- New competitors and new partnerships have recently emerged
 - Typically founded and financed by IT/analytics/tech sector to provide web-accessible, frequently updated imagery
 - Smaller satellites, with lower costs of manufacture, launch, and operation, supplemented with sophisticated ground-based data analytics
 - Customer base is developing
 - Planet Labs acquired BlackBridge satellites and data library; UrtheCast purchased Deimos satellites and data
 - DigitalGlobe recently entered a joint venture with Saudi Arabia-based TAQNIA for a small constellation
- Investment driven by interest in business intelligence products from satellite imagery
 - 2015 a record-setting year with investment in start-up space ventures of \$2.3 billion
 - Several EO firms received venture capital investment in 2015: BlackSky Global, GeoOptics, Hera, OmniEarth, Planet Labs, Satellogic, Spire Global

SANSA's Interface in the NSI Landscape

Stakeholder Relations

SANSA has a significant footprint within the NSI and has linkages to six key stakeholder groups, namely:

- (i) Government departments with an interest in space-related activities, including but not limited to the DST, to which the Agency reports;
- (ii) Government departments and entities that fulfil some agency function e.g. funding agencies;
- (iii) Government departments and entities that SANSA supports in one form or the other;
- (iv) Partner R&D institutions;
- (v) Industry partners and clients; and
- (vi) Students, educators and the public.

Contribution to the Medium Term Strategic Framework

The key policy instrument of government is the Medium Term Strategic Framework (MTSF) Outcomes. Government has adopted the 2014-2019 MTSF, as the first five-year building block towards realising the 2030 Vision in the NDP. The MTSF lists 14 key outcomes, as well as

associated activities and targets, to be achieved by 2019 that cover the focus areas identified in the NDP. There are eight outcomes for which SANSA can make a direct impact on and these include:

- **Outcome 1: Quality basic education** – The initiatives in this outcome include sustaining and accelerating improvements in school performance. Satellite technologies can assist the Department of Basic Education to design digital classrooms to assist remote and rural located learners with accessing learning material. This quality lesson can assist to improve and increase school performance results.
- **Outcome 3: All people in South Africa are and feel safe** – This outcome can be achieved only if South Africa’s borders are effectively defended and secured, an area in which SANSA can contribute. Earth observation satellites provide information on monitoring cross -border theft, drug trafficking and African peace-keeping, as well as crime prevention and national security monitoring. The use of space technologies and space weather information also contributes to the protection of South Africa’s borders and other security related applications.
- **Outcome 4: Decent employment through inclusive economic growth** – Key targets in this outcome include growing the economy rate to above 5%, achieving much higher levels of employment creation and more rapidly reducing inequality. SANSA will make a meaningful contribution towards the achievement of this outcome through satellite manufacturing as a potential employment generator.
- **Outcome 5: A skilled and capable workforce to support an inclusive growth path** – SANSA will contribute to building an inclusive society and a growing and competitive economy through fundamental and applied science and human capital development by creating new knowledge and highly skilled individuals. The FUNDISA Disk resources, which is an example of a SANSA initiative, provide students and learners with an overview of and gateway to remote sensing and Earth observation technologies.
- **Outcome 6: Comprehensive rural development and land reform** – SANSA will advocate the use of space technology to improve access to quality basic infrastructure and services, particularly education, in remote, rural and infrastructure-challenged regions of our country. Partnerships and collaboration that promote cost-effective satellite enabled distance-learning programmes independent of ground-based infrastructure, will help ensure connectivity across physical boundaries to bridge the gap between the “haves” and “have-nots”.
- **Outcome 8: Sustainable human settlements and improved quality of household life** – SANSA will provide government with satellite-derived products, such as the National Human Settlements Layer, to clearly map human settlements patterns, specifically the dynamics of informal settlements. This will improve the linkages between human settlements planning, economic and commercial development and spatial planning frameworks to guide investment decisions, increase integration and improve the location of human settlements.
- **Outcome 9: A responsive, accountable, effective and efficient local government system** – The expected central focus is sustainable and reliable access to basic services. SANSA will equip municipalities and local governments to extend basic services to millions of households by providing national geospatial support data products, as well as national land-use and land-cover products. GIS and RS technologies will assist government to make better decisions and monitor service delivery progress.
- **Outcome 10: Environmental assets and natural resources that are well-protected and continually enhanced** – Government must improve decision-making tools and harness research and information management capacity to identify, develop and maintain datasets to generate policy-relevant statistics, indicators and indices to achieve this outcome. Globally, space-based systems are critically important for risk prediction and mitigation. Space technologies are crucial to providing operational applications or solutions that address national challenges, as well as decision support

tools for government. These include applications in natural resource management, climate change, environmental management and disaster management. SANSA will ensure that space-derived solutions are integrated into service delivery for the benefit of society.

National Space Strategy

The NSS is a national road map and implementation framework for a viable and sustainable national space programme. The NSS, as approved by Cabinet in 2008, sets national goals and objectives for space science and technology. The table below indicates the alignment of SANSA's strategic goals with the objectives of the NSS:

No	National Space Strategy Objectives	SANSA's Goal Alignment
1	Developing the local private space science and technology industry sector	Goals 1 and 4
2	Developing services and products that can respond to user needs	Goal 1
3	Satellite or services offered from existing facilities	Goals 1 and 2
4	Organising some of the current space science and technology activities into strategic programmes	Goal 2
5	Optimising the organisation of future space activities to respond to opportunities with international industrial partners or international space agencies	Goals 2 and 4
6	Partnerships with established and developing spacefaring countries for industrial and capacity development purposes	Goal 4
7	Strengthening training and technology transfer programmes, including the sharing of experience and expertise	Goal 4
8	Promoting space science and technology in academic institutions and science centres and the provision of opportunities for both short-term and long-term training and education	Goals 3 and 4
9	Responding to challenges and opportunities in Africa	Goals 1, 2, 3 and 4
10	Advocating the importance of space science and technology as a priority measure for meeting national development needs	Goals 1, 2, 3 and 4
11	Building local awareness of space science and technology	Goal 4

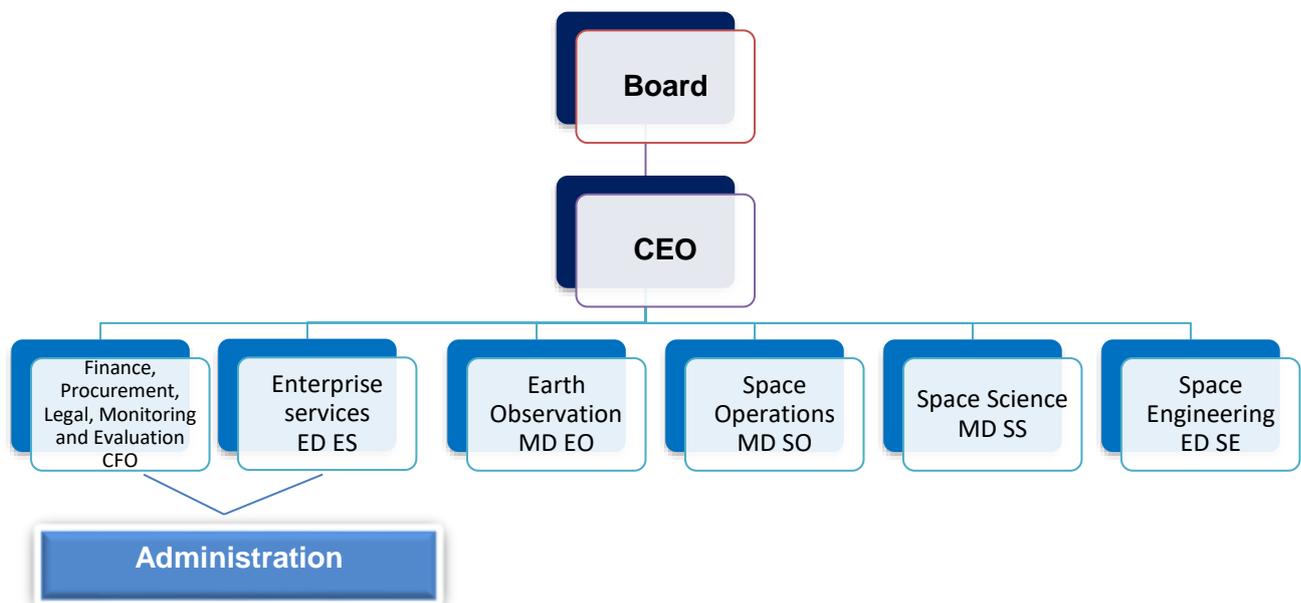
Alignment to the DST Priorities

SANSA reports to the DST and contributes to the DST key priorities as follows:

Key DST Outputs	SANSA Contribution
Knowledge Outputs	Aim to achieve a research productivity score of 1300, which is a composite score based on publications, graduated students, research funding, and researcher rating achieved
Knowledge Applications Products	Deliver the following four high-impact products and services (i) sensor portfolio and data products, (ii) national land-use and land-cover base datasets, (iii) space weather products and services, (iv) magnetic technology products and services
Postgraduate Student Training	Provide support to approximately 50 students for postgraduate studies
Leveraging Partnerships	Generate an equivalent of 3% of SANSA's non-commercial operating revenue through partnerships
Commercial outputs	Generate about R65 million from both national and international space operations contracts. Support about 55 external jobs and out-source in excess of R50 million to the broader space industry and R10 million to SMEs through the satellite build programme

ORGANISATIONAL ENVIRONMENT

During the 2017/18 financial year, the reporting structure has been realigned to allow for programme oversight at the CEO level. The key programme structure did not change



REVISIONS TO LEGISLATIVE AND OTHER MANDATES

The South African National Space Agency legislation and other mandates that directly relate to SANSA have not changed. However, the Space Affairs Act (Act 83 of 1993) is being redrafted and Cabinet approval thereto will be sought in 2018/19. Material changes are expected with respect to regulations affecting the national space industry. Such changes will be considered during the implementation phase of SANSA's programmes and activities that involve the local space industry.

PERFORMANCE DELIVERY ENVIRONMENT

During the first six years of SANSA's operations, its Annual Performance Plans and Strategic Plans have been pragmatically aligned against the budgetary allocations made to it for both its internal business operations and broader support to the national space sector. This approach vis-à-vis the frugal budgetary allocations imposed a limitation on SANSA's scope of initiatives that were planned and implemented versus implementation of initiatives actually needed to achieve its full mandate. Such limitation had the following impact:

- SANSA's inability to fully meet its mandate, especially with regards to global navigation satellite services (GNSS) and satellite telecommunications solutions and applications;
- Limited support to the local space industry, as per SANSA's mandate, due to funding constraints; and
- As an implementing agency, SANSA's salary bill accounts for its major cost.

This situation necessitates that SANSA receives an appropriate and sustained base-funding to support its mandate. However, this warrants that SANSA defines a predetermined strategic direction that will inform its funding requirements to support the national space sector and its growing internal operations. In its effort to support the local industry, SANSA will work with the broader space industry.

Impact on Key Strategic Programmes:

The funding constraints remain and are affecting the implementation of the National Space Strategy and impacting on key performance indicators. The following major key cost drivers for SANSA operations still prevail as pressure points in the SANSA budget as the baseline funding still remains insufficient. The key cost drivers are mainly:

Cost of access to earth observation satellites.

South Africa does not own an earth observation satellite and has to rely on other countries' satellites for its geospatial information requirements. Commercial agreements with international suppliers have to be concluded to obtain access to the satellite and/or request high resolution images on demand. Currently the SPOT (French: Satellite Pour l'Observation de la Terre, "Satellite for observation of Earth") series of satellites are utilised for the country's coverage and this has been in use since early 2000 for the annual mosaic and other applications for the country's needs. Licence fees to access the satellite have now significantly increased over the past three years from R16 million per annum in 2012 for the SPOT 5 satellite to R36 million per annum from 2013 for the SPOT 6&7 satellites for a negotiated multi-user licence agreement. This is a major cost element in the goods and services budget and a pressure point that cannot be sustained at the current budget levels. The SPOT 6&7 licence agreement has a few months remaining, should funding not be forthcoming, the impact will be catastrophic to continuing with the national geospatial information for South Africa as the renewal of this licence or an acquisition of another sensor will be unaffordable for SANSA.

Cost of maintaining data storage facilities

The cost of maintaining the ICT Infrastructure for the data and imagery archive and storage facilities, data processing and management systems, access to communication networks, running the ground station facility and maintaining observation networks across the country and the remote islands for research purposes are becoming significant as these are becoming prone to technology obsolescence and need upgrading and/or replacements at shorter intervals. Most of these assets are currently at zero carrying book values in the balance sheet as they have exceeded their useful lives. Currently there is no budget available to replace and efficiently maintain these assets.

Cost of attracting and retaining high end skills

The employee cost budget is significantly under pressure due to the funding challenges. This leads to the cost of retaining high end skills mainly scientists and engineers becoming a challenge as there are limited programmes to pursue to ensure that scientist and engineers are gainfully employed.

Continuation of the Earth Observation Satellite Development Programme (EO-Sat 1)

The current Earth Observation Satellite Development programme (EO-Sat 1) is one of the key flagship projects that SANSA is undertaking for South Africa, as part of the broader National Space Programme in implementing the National Space Strategy and contribution to the ARMC African Resource Management Constellation (ARMC). This is currently funded from the Economic Competitiveness Support Package (ECSP) fund. The fund has reached its end in 2017/18. Beyond that, there is uncertainty and the current satellite development project is at risk.

The Department has indicated that there is still commitment to support the satellite development project to its completion and further to this, it is formulating a proposal for the continuation of the ECSP funding and also undertaking discussions with the National Treasury for the broader National Space Programme projects in pursuit of the economic competitiveness of the space industry and its development.

Associated performance impact and quantification

The key performance indicators that are at risk in the implementation of the strategy are as follows:

T2.1.1 22 national high-impact operational space related products & services by end March 2023

- National geospatial decision support data products – unaffordability of satellite imagery will impact the ability to deliver geospatial information supporting various departments and entities in their service delivery mandates, key decisions and policy support tools

T2.2.1 Research productivity score of 2000 per annum by end March 2023

- Research outcomes are dependent on the availability of historical and mostly current satellite imagery or data stock for space supported national research programmes.

T3.2.1 A total of 100 direct jobs supported per year externally through SANSA programme contracting by end March 2023

- 55 external jobs currently supported by the programme will cease as these are linked to the satellite development programme

T3.2.2 A total contract expenditure of R65 million to SMEs for core space projects by end March 2023

- Targeted contracting to SME's of R15 million in the broader space industry will cease

T3.2.3 The total contract expenditure of R306 million to the broad space related industry for core space projects by end March 2023

- The space industry cannot be stimulated for growth where funding is not forthcoming. This KPI is at risk as the satellite programme funding is not confirmed. Contracting with key industry players in the satellite build programme will cease

T4.1.1 Proportional progress based on Key Defining Point as per project lifecycle culminating in EO-Sat1 launch

- The satellite build cannot be completed if funding for the MTEF is not confirmed

CONSOLIDATED PERFORMANCE OUTPUTS

The tables below present the consolidated performance outputs of SANSA for the five strategic objectives that are aligned to the four strategic goals over the period 2018 to 2023.

2018/2023 Strategic Outcome Oriented Objectives – Annual Targets				Audited Actual Performance	Audited Actual Performance	Estimated Performance	Medium-Term Targets		
Strategic Objective	Activities	Key Performance Indicator/Measure	Strategic Plan Five-Year Target	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
S1 To support the development of a critical mass of skills and expertise needed to give effect to national space initiatives	S1.1 Increase youth awareness of science	M1.1.1 Number of youth directly engaged	T1.1.1 Total of 74500 young people directly engaged by March 2023	18 769 (Target - 8000)	18 782 (Target – 9000)	12 000	10800	13500	15000
	S1.2 Support students and interns	M1.2.1 Number of students and interns supported for formalized training	T1.2.1 Total of 350 students and interns supported by March 2023	53 (Target - 40)	87 (Target – 50)	70	50	50	70
S2 To expand and exploit our knowledge base for the development of essential services and products that respond to user needs	S2.1 Lead and facilitate the creation of high-impact applications to address society's needs and challenges	M2.1.1 Number of national high-impact products and applications	T2.1.1 22 national high-impact operational space-related applications by March 2023	4 (Target – 4)	5 (Target – 5)	5	4	4	4
	S2.2 Increase the national space research output	M2.2.1 The national research productivity score for space supported R&D	T2.2.1 Achieve a total research productivity score of 9200 by March 2021	1992 (Target – 750)	1656 (Target – 950)	1200	1300	1500	1800
S3 To develop, grow and transform the indigenous space industry that is responsive to local needs and is	S3.1. Generate greater benefit for the space programme through space operations activities	M3.1.1 Successful satellite pass monitoring rate for Earth Observation	T3.1.1 Successful satellite pass monitoring maintained at a rate of 98% by March 2020	99.7% (Target - 97%)	99.98% (Target - 98%)	98%	98%	98%	98%

2018/2023 Strategic Outcome Oriented Objectives – Annual Targets				Audited Actual Performance	Audited Actual Performance	Estimated Performance	Medium-Term Targets		
Strategic Objective	Activities	Key Performance Indicator/Measure	Strategic Plan Five-Year Target	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
globally positioned		M3.1.2 Total income generated from space operations activities	T3.1.2 Total income of R326 million generated from space operations activities by March 2023	R77 million (Target - R58 million)	R66.7 million (Target – R60 million)	R44 million	R58 million	R61 million	R65 million
		M3.1.3 Total amount of space operations subsidized in other SANSAs programmes	T3.1.3 Total subsidized amount of 5% of space operations income provided to other SANSAs programmes by March 2023	Target introduced in 2017/18	Target introduced in 2017/18	5% of income	5% of income (R3 million)	5% of income (R3.05 million)	5% of income (R3.25 million)
	S3.2 Grow the national space industry	M3.2.1 The number of direct jobs supported externally through SANSAs programme contracting	T3.2.1 A total of 100 direct jobs maintained externally through SANSAs programme contracting by March 2023	53 (Target 40)	52 (Target – 50)	55	55	70	100
		M3.2.2 The total contract expenditure to SMEs for core space projects	T3.2.2 A total contract expenditure of R65 million to SMEs for core space projects by March 2023	R7.8 million (Target – R10 million)	R13 million (Target – R12 million)	R14.2 million	R10 million	R12 million	R13 million
		M3.2.3 The total contract expenditure to the broad space related	T3.2.3 The total contract expenditure of R306 to the broad space	R98.1 million (Target – R50 million)	R77 million (Target – R55 million)	R65 million	R50 million	R55 million	R61 million

2018/2023 Strategic Outcome Oriented Objectives – Annual Targets				Audited Actual Performance	Audited Actual Performance	Estimated Performance	Medium-Term Targets		
Strategic Objective	Activities	Key Performance Indicator/Measure	Strategic Plan Five-Year Target	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
		industry for core space projects	related industry for core space projects by March 2023						
S4 To build and host the appropriate infrastructure that will support the national space sector	S4.1 Successful launch and operations of EO-Sat 1 and CubeSat mission	M4.1.1 The progress status on the EO-Sat1 development	T4.1.1 Proportional progress based on Key Defining Points as per project lifecycle culminating in EO-Sat1 launch	21% (Target – 25%)	37% (Target – 50%)	Preliminary Design Review (PDR) completed for the Space System in preparation for Critical Design review in 2018/19	Critical Design Review (CDR) completed for the space system flight model	Completion of the qualification phase and Flight model Phase	Post Launch Satellite reliability and validation assessment and operational phase
		M4.1.2 The progress status on the CubeSat development	T4.1.2 Proportional progress based on Key Defining Points as per project lifecycle culminating in Cubesat launch	Target introduced in 2018/19	Target introduced in 2018/19	Target introduced in 2018/19	Completion of the qualification phase and Flight model Phase, and Launch and Commission	Post Launch Satellite reliability and validation assessment and operational phase	Operational phase
S5 Develop active global partnerships	S5.1 Leverage a significant benefit for the space programme through global partnerships	M5.1.1 Number of active formal overseas partnerships	T5.1.1 10 active formal overseas partnerships by March 2023	Target introduced in 2018/19	Target introduced in 2018/19	Target introduced in 2018/19	5	6	7
		M5.1.2 Number of active formal African partnerships	T5.1.2 10 active formal African partnerships by March 2023	Target introduced in 2018/19	Target introduced in 2018/19	Target introduced in 2018/19	5	6	7

2018/2023 Strategic Outcome Oriented Obejctives –Annual Targets				Audited Actual Performance	Audited Actual Performance	Estimated Performance	Medium-Term Targets		
Strategic Objective	Activities	Key Performance Indicator/Measure	Strategic Plan Five-Year Target	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
		M5.1.3 Number of active formal national partnerships	T5.1.3 10 active formal national partnerships by March 2023	Target introduced in 2018/19	Target introduced in 2018/19	Target introduced in 2018/19	5	6	7

OVERVIEW OF 2018/19 BUDGET AND MEDIUM TERM EXPENDITURE ESTIMATES

Sources of revenue

Table 5: Consolidated Revenue Estimates

Rand	Audited	Audited	Audited	Revised	Medium Term Expenditure Framework			Total MTEF
	Outcomes	Outcomes	Outcomes	Budget	2018/19	2019/20	2020/21	
	2014/15	2015/16	2016/17	2017/18				
REVENUE								
Revenue from Non - Exchange Transactions	162 998 661	232 440 718	246 306 405	253 494 690	144 907 500	153 025 505	156 740 580	454 673 585
Operational Transfers	118 298 000	124 383 068	124 977 000	131 226 000	138 036 000	145 453 000	153 453 000	436 942 000
Parliamentary Grant	118 298 000	124 383 068	124 977 000	131 226 000	138 036 000	145 453 000	153 453 000	436 942 000
Ring fenced Grants	44 700 661	108 057 650	121 329 405	122 268 690	6 871 500	7 572 505	3 287 580	17 731 585
Principal/Agent Transfers	17 750 534	34 225 427	8 258 803	9 268 569	-	-	-	-
Revenue from Exchange Transactions	76 113 342	110 397 274	98 522 471	81 127 460	76 656 596	78 685 612	82 601 910	237 944 119
Rendering of Services	67 680 858	96 828 628	71 764 813	70 595 637	76 286 596	78 307 212	82 214 522	236 808 331
Contract Revenue - Public Sector	28 543 442	32 222 035	22 689 805	22 888 860	25 927 128	26 762 786	27 647 711	80 337 626
Contract Revenue - Private Sector	570 112	1 004 655	558 968	4 277 768	2 611 833	2 735 205	2 864 000	8 211 037
Contract Revenue - Foreign	38 567 304	63 601 938	48 516 040	43 429 010	47 747 635	48 809 221	51 702 812	148 259 668
Other Income	8 432 484	13 568 646	26 757 658	10 531 823	370 000	378 400	387 388	1 135 788
Interest Income	5 579 081	8 394 521	9 578 634	5 984 813	250 000	250 000	250 000	750 000
Other Income	668 054	5 174 125	17 179 024	3 917 879	120 000	128 400	137 388	385 788
Net Gains on Foreign exchange transactions	2 185 350	-	-	629 131	-	-	-	-
Accumulated surplus	57 471 398	16 672 766	8 483 375	46 958 834	-	-	-	-
Total Revenue	314 333 935	393 736 185	361 571 054	390 849 554	221 564 096	231 711 117	239 342 491	692 617 704

The projected total annual funding for SANSa is R222 million in 2018/19, R232 million in 2018/19 and R239 million in 2019/20 with a total of R693 million over the medium term. The decline in the annual projections from 2018/19 related to the additional satellite development programme funding not yet confirmed by the Department.

Expenditure estimates

Table 6: Consolidated Expenditure Estimates

Rand	Audited Outcomes	Audited Outcomes	Audited Outcomes	Revised Budget	Medium Term Expenditure Framework			Total MTEF
	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	
Expenditure								
Employee Related Costs	93 019 881	96 046 176	104 695 500	120 105 951	123 983 457	130 928 719	138 087 663	392 999 840
Board Member Remuneration	650 119	914 270	1 069 887	1 023 830	877 200	926 323	977 271	2 780 794
Depreciation and Amortisation	22 902 663	25 097 187	23 878 330	-	-	-	-	-
Repairs and Maintenance	7 620 613	8 355 117	7 435 449	17 680 858	6 294 141	7 562 428	7 836 075	21 692 644
Finance Costs	49 680	10 202	24 339	-	-	-	-	-
Data Licence fees	26 729 023	31 406 738	36 124 088	61 779 570	24 199 000	23 841 000	23 777 340	71 817 340
Grants and Subsidies Paid	19 671 537	24 928 952	5 452 793	8 320 057	7 179 920	7 894 228	3 622 447	18 696 595
Antenna Infrastructure Services	1 102 997	4 146 811	203 266	2 971 575	-	-	-	-
Training Expenses	1 578 862	1 733 803	1 720 023	2 935 686	1 784 296	1 842 146	1 902 594	5 529 037
General Expenses	50 108 039	47 378 832	57 713 920	48 599 588	51 858 983	53 805 575	57 053 153	162 717 711
Net Losses on foreign exchange transactions	4 876	5 470 529	1 352 836	52 881	-	-	-	-
Loss on Disposal of Property, Plant and Equipment	149 771	1 149 071	564 608	3 303	-	-	-	-
Total Operating Expenditure	223 588 061	246 637 688	240 235 040	263 473 298	216 176 996	226 800 420	233 256 545	676 233 961
Principal/Agent Transfers	17 750 534	34 225 427	8 258 803	9 268 569	-	-	-	-
AIT facilities/Industry Upgrade/Incentives	17 750 534	34 225 427	-	-	-	-	-	-
Operation Phakisa - CPUT	-	-	8 258 803	9 268 569	-	-	-	-
Other	-	-	-	-	-	-	-	-
Surplus / (Deficit) for the year	72 995 340	112 873 070	113 077 211	118 107 687	5 387 100	4 910 697	6 085 946	16 383 743
Capital Expenditure	72 995 340	112 873 070	113 077 211	118 107 687	5 387 100	4 910 697	6 085 946	16 383 743
Buildings and other fixed structures	-	-	-	50 000	-	-	-	-
Machinery and equipment	18 065 814	8 923 758	18 222 259	35 202 786	2 787 100	3 810 697	4 785 946	11 383 743
Computer Equipment	345 265	3 548 908	984 615	6 555 157	2 000 000	500 000	500 000	3 000 000
Software and intangible assets	14 747	6 180	14 959	5 174 553	600 000	-	-	600 000
Vehicles	174 900	541 062	-	300 000	-	600 000	800 000	1 400 000
AIT Facility	-	-	-	6 525 530	-	-	-	-
Satellite Development	54 394 614	99 853 162	93 855 378	64 299 661	-	-	-	-
Total Expenditure	314 333 935	393 736 185	361 571 054	390 849 554	221 564 096	231 711 117	239 342 490	692 617 704

Expenditure by economic classification

The Agency derives its revenue from transfers from the DST. The parliamentary grant is estimated to increase only by 5% over the medium term. Other sources of revenue include interest earned on investments, rendering services and other income. Contract revenue is thus expected to grow over the medium term by 3% as a result of a limited scope in terms of providing mandate work at a fee from state institutions, fixed term hosting contracts from international clients reaching their term end and the inability to project for launch support revenues as these are dependent of the success of the launches.

Compensation of employees remains one of the significant drivers of expenditure which amounts to 55% of the budget. This enable the Agency to source scientists, engineers and researchers in the space science industry to support its mandate as well as the satellite build programme. The headcount on permanent staff will marginally increase from 190 in 2017/18 to 192 in 2019/20 in order to remain within budget.

Expenditure on goods and services contributes to 41% of the total budget, and noticeably decreases over the medium term. This is due to total transfers over the medium term decreasing by 17% coupled with a marginal increase of only 5% on contract revenue. Due to current budget constraints, personnel costs only can only increase by the CPI at an average growth rate of 3.8% over the medium term and goods and services decline by 8% over the medium term. The impact of the decrease will affect the institution's ability to source satellite imagery which is largely from international suppliers and a fundamental deliverable in terms of the SANSA mandate, to effectively operate SANSA's facilities and maintain infrastructure operational, and will also result in the ceasing of the satellite build programme.

Payments for capital assets constitute 4% of the total budget over the medium term. The satellite programme funding is not yet confirmed for the medium term, hence the substantial reduction in projections. This will have an impact on the completion and commissioning of the satellite.

ENTERPRISE RISK MANAGEMENT PERIOD 2018/19

Enterprise Risk Management (ERM) is now established within the organisation and is applied across the organisation in line with the Board's approved ERM Policy and Framework. The SANSA ERM plan and strategic risk register are reviewed and approved annually by the Board, to ensure alignment with the strategic goals of SANSA. ERM awareness is also conducted to promote a risk management culture throughout SANSA.

ERM has also implemented necessary policies, prevention plans and awareness sessions to assist the organisation to counter fraud and corruption.

The table below highlights the identified risks and some of the associated control measures as per the SANSA Strategic Risk Register:

	SANSA Objective	Risk Description	Consequences of Risk	Inherent Risk			Current Controls
				Impact	Likelihood	Rating	
1	Goal 4 &5	Inability to execute and deliver on the objectives; i.e. EO-Sat 1 Satellite program and Industry Development	1. Inadequate Satellite program 2. No Competitive Space Industry 3. Unable to develop the required human capital to capacitate the space programme 4. Unable to develop required technologies to give SA Space Industry the global competitive edge 5. Extended delays to the satellite program 6. Financial losses	5	5	25	1. Continuous Engagement with the Department of Science and Technology (DST) for increased funding 2. Industry Development and Localisation Policy in place to guide in developing the industry 3. National Space Strategy in place 4. User Specification requirements have been developed and discussed with the contactors 5. Life Cycle Costing estimation completed and approved by the Board 6. Managing the Industry Development process and localisation through the EO-Sat1 contract 7. SANSA to complete an analysis on the absolute minimum cost for the acquisition of the EO-Sat1 system to be presented to the DST 8. Prepare the annual programme plan which will indicate to DST the resource challenges for the next financial year
2	Goal 1, 2,3,4, 5, 6&7	Failure to reach the 80% minimal threshold of SANSA annual performance targets	1. Failure to meet shareholders compact as agreed with the Minister 2. Inability to demonstrate impact and shareholder's return 3. Loss of public value and return 4. Loss of credibility as a key player in the space industry 5. Loss of funding 6. Financial unsustainability	5	3	15	1. Ongoing engagement with key stakeholders regarding funding, i.e. Department of Science and Technology (DST) 2. Communication and roll-out of the strategy and the annual performance plan. (Annually) 3. Quarterly reporting on performance 4. Finalise and submit the Financial Sustainability Framework and Strategy for SANSA to the Board for approval
3	Goal 1, 2, 4,5, 6 &7	Inability to maintain and replace infrastructure	1. Loss of income 2. Loss of credibility (reputational risk) 3. Failures to fulfil the SANSA mandate 4. Increase replacement and replacement costs 5. Repudiated claims	5	3	15	1. Insurance in place for infrastructure 2. Good maintenance practice and plan in place 3. Redundancy plan documented and implemented (System Architecture Risk Assessment) 4. The Computerised Maintenance Management System (CMMS) 5. Funding challenges escalated to EXCO 6. There is a process in place to notify clients of any downgraded services

Part B: Programme Performance Plans

PROGRAMME 1: ADMINISTRATION PROGRAMME (AP)

Purpose

The Administration Programme provides management, administrative and technical support at an Enterprise level across the organisation. This facilitates operational efficiency and cost-effective management, alignment with sound governance principles and the seamless integration and collaboration within the organisation.

Strategic Focus

To ensure the Agency's mandate is efficiently and effectively executed, a strong focus on new business development, effective engagement with key stakeholders, and the impactful communication and promotion of SANSA's activities, are necessary. Such initiatives will help foster favourable support for the SANSA brand as well as increase the Agency's brand value. The initiatives will also contribute positively towards the revenue growth of the Agency. The growth of SANSA is reliant on the adoption and resourcing of the National Space Programme, a framework that articulates the national space agenda for the country up until 2030. Throughout the growth phase, SANSA will lead and coordinate national space activities to ensure minimal duplication of efforts and the seamless integration of such activities.

Annual Priorities

The National Space Programme Activities

The National Space Programme activities will be monitored through reports generated quarterly by the respective SANSA divisions. The NSP is not fully funded hence the NSP has been removed as a target as the organisation cannot guarantee its performance. The EO-SAT1 and the Operations Phakisa project can be classified as part of the NSP. Until these programmes are fully-funded, SANSA has taken a decision not to report the NSP as a target. It is recognised that not all the projects under the NSP will be initiated at once and so the monitoring will be at the level of assessing if there is ongoing activity in each of the projects. This effort will also strengthen the programme coordination efforts of SANSA.

Financial Sustainability

To ensure the Agency's mandate is efficiently and effectively executed, a strong focus on new business development, effective engagement with key stakeholders, and the impactful communication and promotion of SANSA's activities, are necessary. Such initiatives will help foster favourable support for the SANSA brand as well as increase the Agency's brand value. The initiatives will also contribute positively towards the revenue growth of the Agency.

To move SANSA towards sustainability the following will be undertaken:

- A streamlined stakeholder engagement strategy will be developed and implemented; and
- A communications protocol including policies and processes aligned to the organisation's communication strategy will be developed.
- Revenue enhancement strategies through new business development initiatives
- Cost recovery mechanism for value added services provided, and
- Asset infrastructure investment and monitoring to ensure continued provision of value added services

High performance culture

The achievements of the SANSA objectives require a high-performance organisation that is characterised by transformational leadership, sound human resource management, inclusive working environment culture, and operational and technological efficiency and effectiveness.

To ensure that SANSA is optimised for high performance, the following will be undertaken:

- Driving a high-performance culture through sound leadership, client / customer focus, stakeholder management and partnering, best practice business processes, and “living” the organisational values;
- Rolling out the new performance management and development system;
- Developing a workforce plan that demonstrates the skills requirements for the SANSA strategic framework;
- Building Management capability and skills;
- Optimising SANSA’s business processes to ensure a continuous smooth workflow across units;
- Implementation of a new ICT strategy;
- Legal services are delivered in accordance with service standards contained in the legal standards and procedural manual; and
- Effective and efficient compliance function that contributes to improved corporate governance.

Reconciling performance targets with the Budget and MTEF

Administration Programme – Revenue Estimates

Table 8: Administration - Revenue estimates

Administration	Audited	Audited	Audited	Revised	Medium Term Expenditure Framework			Total MTEF
	Outcomes	Outcomes	Outcomes	Budget	2018/19	2019/20	2020/21	
	2014/15	2015/16	2016/17	2017/18				
REVENUE								
Revenue from Non - Exchange Transactions	37 662 523	46 868 202	44 028 103	48 967 953	44 560 548	47 332 067	45 550 249	137 442 864
Operational Transfers	36 911 523	45 596 001	40 168 000	42 996 256	40 560 548	42 832 067	45 550 249	128 942 864
Parliamentary Grant	36 911 523	45 596 001	40 168 000	42 996 256	40 560 548	42 832 067	45 550 249	128 942 864
Ring fenced Grants	751 000	1 272 201	3 860 103	5 971 696	4 000 000	4 500 000	-	8 500 000
Post graduate student bursary support -NRF				-				-
Post graduate student bursary support -DST	751 000	1 272 201	3 860 103	5 971 696	4 000 000	4 500 000	-	8 500 000
				-				-
Revenue from Exchange Transactions	4 720 483	5 454 665	9 865 128	5 083 750	-	-	-	-
Other Income	4 720 483	5 454 665	9 865 128	5 083 750	-	-	-	-
Interest Income	4 435 977	5 435 177	8 165 802	5 083 750				-
Other Income	284 506	19 489	1 699 326	-	-	-	-	-
				-				-
Accumulated surplus roll over	2 540 135	-13 266 928	-6 110 285	6 540 644				
Total Revenue	44 923 140	39 055 939	47 782 945	60 592 346	44 560 548	47 332 067	45 550 249	137 442 864

Administration programme – Expenditure estimates

Table 9: Administration - Expenditure projections

Administration	Audited	Audited	Audited	Revised	Medium Term Expenditure Framework			Total MTEF
	Outcomes	Outcomes	Outcomes	Budget	2018/19	2019/20	2020/21	
	2014/15	2015/16	2016/17	2017/18				
Expenditure								
Employee Related Costs	24 573 256	21 206 319	27 077 308	29 208 355	29 682 344	31 344 555	33 068 506	94 095 405
Board Member Remuneration	650 119	914 270	1 069 887	1 023 830	877 200	926 323	977 271	2 780 794
Depreciation and Amortisation	2 554 950	2 417 048	1 362 128	-	-	-	-	-
Repairs and Maintenance	2 510 968	352 187	274 944	308 071	358 583	378 664	399 490	1 136 737
Finance Costs	29 608	10 125	24 339	-	-	-	-	-
Data Licence fees	-	-	-	-	-	-	-	-
Grants and Subsidies Paid	-	1 161 500	927 500	5 971 696	4 000 000	4 500 000	-	8 500 000
Antenna Infrastructure Services	-	-	-	-	-	-	-	-
Training Expenses	484 497	604 532	982 267	620 132	436 446	460 887	486 236	1 383 568
General Expenses	14 095 370	12 340 120	15 873 702	17 019 265	8 755 975	9 271 638	10 218 746	28 246 360
Net Losses on foreign exchange transactions	4 876	49 839	154 563	-	-	-	-	-
Loss on Disposal of Property, Plant and Equipment	19 497	-	36 306	-	-	-	-	-
Total Operating Expenditure	44 923 140	39 055 939	47 782 945	54 151 349	44 110 548	46 882 067	45 150 249	136 142 864
Surplus / (Deficit) for the year	-	-	-	6 440 997	450 000	450 000	400 000	1 300 000
Capital Expenditure	-	-	-	6 440 997	450 000	450 000	400 000	1 300 000
Buildings and other fixed structures	-	-	-	50 000	-	-	-	-
Machinery and equipment	-	-	-	-	450 000	450 000	400 000	1 300 000
Computer Equipment	-	-	-	1 246 892	-	-	-	-
Software and intangible assets	-	-	-	5 144 106	-	-	-	-
Total Expenditure	44 923 140	39 055 939	47 782 945	60 592 346	44 560 548	47 332 067	45 550 249	137 442 864

PROGRAMME 2: EARTH OBSERVATION PROGRAMME (EOP)

Purpose

The Earth Observation Programme (EOP) leads, enables and coordinates the development and promotion of Earth observations products for socio-economic development and environmental management in South Africa, the African continent and globally. The Programme's main core function is the implementation of the South African Earth Observation Strategy (SAEOS). This is achieved through maintenance of an up to date long-term archive of satellite data, provision of adequate data handling infrastructure and efficient distribution systems, informs satellite mission planning, provision of Earth observations value-added products to government entities, research councils and education institutions working natural resources, disaster management, urban development, health and safety and security sectors towards the achievement of the set national and global sustainable development goals. In addition, EOP contributes to science engagement and advancement, human capital development and facilitates industry development in particular through building and connecting the EO community locally and abroad through SA-GEO, AfriGEOSS, Committee of African Space Institutions (CASI), Group on Earth Observations (GEO) and Committee on Earth Observation Satellites (CEOS).

Strategic Focus

Goal 1: The development of a suite of space application products and services that directly respond to user needs

- Fit for purpose data archive through a relevant sensor portfolio and data products
- National land use and land cover base datasets

Goal 2: The building of core space infrastructure, both ground and space based, that will enable the delivery of essential space services

- Earth Observation Data Centre (EODC) a data management and distribution system

Goal 3: The generation of space relevant knowledge that supports the developmental agenda

- Remote sensing research
- Industry development
- Development and servicing of national, regional and international partnerships

Goal 4: The development of requisite human capacity that is needed for the implementation of key space initiatives

- Science outreach and awareness
- Student funding and intern training
- Education (Fundisa) resources
- University support

Strategic Goal 1: The development of a suite of space application products and services that directly respond to user needs

1. Sensor Portfolio and Data Products

The acquisition, archiving and dissemination of satellite datasets is thus a core function of SANSA Earth Observation. Satellite datasets are a critical input in stimulating innovation and the development of value added products and services within the entire earth observation landscape across the African continent. SANSA acquires satellite data from many international satellite vendors for national use. These include Landsat 7 and 8, SPOT 6 and 7, MODIS and CBERS-4. The centralised acquisition under a single-license multi-user arrangement, as is the case with SPOT 6 and 7, eradicates costly and multiple acquisitions of the same datasets by the public sector and ensures the long-term archiving of the valuable

data stock. An estimated 40 government entities, on both the national and provincial level, use these data resources. SANSA has also negotiated favourable licensing to allow for discounted access to this data to the South African private sector and the Southern African Development Community (SADC) region.

To meet the wide user demands, SANSA anticipates widening its sensor portfolio to increase its range of satellite data products to improve the diversity of its offerings at various spatial, spectral and temporal resolutions. The GEO Open Data Sharing Principles have significantly increased the range of open and free datasets that SANSA will archive and distribute at no cost to users in South Africa and the Southern African community. The inclusion of the open access Sentinel data into the SANSA sensor portfolio will be further explored, looking at interim measures, whilst awaiting the agreement between the European Commission and the African Union.

The recently signed BRICS virtual constellation partnership will further unlock potential additional datasets into the sensor portfolio such as Superview, Kanopus-V1, Resourcesat-2, GF-1 and ZY-3/02 in addition to the CBERS-4 data that is already being directly received.

SANSA will play a critical role in supporting Operation Phakisa: The Oceans Economy initiative through the direct reception and provision of Synthetic Aperture Radar (SAR) data. The SAR data will be used for ship surveillance, water pollution detection and monitoring of fishing activities. SANSA will avail its sensor portfolio and research capability to support maritime spatial planning and coastal infrastructure mapping.

2. National Land Use and Land Cover Base Datasets

The development of national base datasets such as biophysical variables, water bodies, human settlements, vegetation layers and satellite mosaics is critical in supporting the Earth observation community with fundamental environmental parameters for further manipulation and transformation. Base datasets will provide scientists and industry professionals with the opportunity to develop specific value-added products and services to meet dedicated user needs. We aim to focus on key base layers that fulfil multiple user needs such as water, vegetation and human settlements. SANSA's new strategic goals are intended to be responsive to the user needs in earth observation and have been tailored to bridge the gap in the provision of essential public good national base products. SANSA scientists will focus on the development of essential base products and services that is needed by the end-users and by public and private sector entities for use in their respective products and services. The development and distribution of these base products and services will provide an enabling environment for other entities to further pursue business and development opportunities; thus meeting SANSA's mandate of developing the local space industry. In 2018/19 the focus will be on:

- (a) **Biophysical parameters:** Primary focus will be on generating quarterly composites of vegetation biophysical variables that are indicative of vegetation stress, chlorophyll content and general health condition at a national scale. Typical variables that will be generated include Leaf Area Indices, Normalized Vegetation Indices, and Fraction of Absorbed Photosynthetically Active Radiation. These biophysical parameters are critical in monitoring crops, rangelands and ecosystem health. Target users include the Department of Agriculture Forestry and Fisheries, Department of Water and Sanitation, Department of Environmental Affairs and agricultural companies and associations.
- (b) **National Human Settlement Layer:** The key focus on the generation of the human settlements layer will be extending on improving the existing automated algorithms for mapping built-up areas and expanding the user base. Primary users of the human settlement layer include the Department of Human Settlements, Gauteng Provincial Government, Limpopo Provincial Government, Municipal Demarcation Board, Housing Development Agency, Statistics South Africa, Eskom, Department of Environmental

Affairs, municipalities, Department of Agriculture, Forestry and Fisheries and the Department of Water Affairs and Sanitation.

- (c) **National Water Layer:** The water layer is proving to a fundamental dataset for inventory of small water bodies for water licencing. The focus will be on supporting the Department of Water Affairs and Sanitation, Randwater, Water Research Commission, Department of Environmental Affairs and the Department of Agriculture, Forestry and Fisheries with water information products. Two national water layers will be produced annually using automated mapping techniques. Water body maps will incorporate an inventory of all water bodies including dams, in the country to ensure compliance with the Water Act and for water licencing purposes. Dedicated attention will also be provided to water quality mapping, particularly to eutrophication in major dams.
- (d) **Disaster Management Maps:** In response to environmental related disaster events that occur frequently in the Southern African region, SANSA will support the provincial and National Disaster Management Centres in the SADC region with reference datasets for disaster management such as flood and drought maps in the affected areas. Our Disaster and Risk Management Response competency will be strengthened through collaborations with other space agencies in the CEOS Working Group on Disasters.

Strategic Goal 2: The building of core space infrastructure, both ground and space based, that will enable the delivery of essential space services

Earth Observation Data Centre

The collection, storage, archiving, processing and dissemination of satellite imagery, together with the development of fundamental data sets and the coordination of the development of value added products and services through the National System of Innovation (NSI) are at the core of the Earth Observation Programme function through the coordination of the provision of Earth observation products and services. The development of geospatial products and services is reliant on the availability of satellite data and IT infrastructure. SANSA seeks to:

- increase the ease of access to the national geospatial decision support data products and services;
- develop new processing tools to enhance the user experience and benefit;
- improve the quality of the data products and services; and
- improve its turnaround delivery times.

Through building of core space infrastructure, both ground and space based, that will enable the delivery of essential space services. In order to 1) provide the appropriate infrastructure, such as data cubes, for the South Africa Earth observation community to run big data applications in a number of societal benefit areas; 2) further to leverage national large scale big data infrastructure such as those being established by the Square Kilometre Array Telescope, The High Performance Computing Centre and the Data Intensive Research Cloud Initiative; and 3) contribute to continental initiatives through the AfriGEOSS and the implementation of the African Space Strategy, SANSA will be establishing a node in the African Research Cloud prototype (ARC prototype). The ARC prototype is a multi-institutional, multi-disciplinary initiative involving universities and research councils to establish a distributed cloud infrastructure across South Africa. The ARC prototype will be expanded into a continental infrastructure called the African Data Intensive Research Cloud ADIRC. Three application areas are planned namely, Astronomy, Bioinformatics and Earth observation. SANSA will be the Earth observation node for ARC prototype and will contribute to the network of EO nodes in the ADIRC. In both cases SANSA will leverage capacities and capabilities of

other Earth observation institutions in the country and ensure appropriate connectivity with the SAEOS Portal.

Strategic Goal 3: The generation of space relevant knowledge that supports the developmental agenda

Remote sensing research

Cutting edge applied research and development will remain fundamental in driving the innovation process for product development. This will be achieved through algorithm development automation for data acquisition, image processing and information extraction from satellite imagery. Collaborative research partnerships will be forged and maintained with national and international institutions to develop new products and services. Key thematic areas that will be addressed include food security, water, vegetation, human settlements and disaster management.

The collection and consolidation of user requirements is a critical element in addressing the wide range of customer requirements. SANSA will use platforms such as the communities of practices in SA-GEO, AfriGEOSS and other platforms in Africa, together with survey tools, to collect user requirements. The development of value added products and services will thus be responsive to the needs of stakeholders in all the three spheres of government (national, provincial and local) and public entities.

Research in 2018/19 will also be centred on satellite mission development with a primary focus on ground segment development of EO-SAT1 and the related calibration and validation work.

Industry development

To stimulate innovation in South Africa, SANSA, in partnership with the Innovation Hub Company's Open Innovation Exchange (a Gauteng Government funded entity) and commercial Earth observation imagery providers, will collaborate to run an innovation challenge aimed at encouraging the development of novel applications using earth observation data. The objective of the challenge, in the first instance, is to stimulate the innovative development of earth observation applications to provide a knowledge base for evidenced based environmental and socio-economic decision making and reporting in government. An example of the latter is the use of earth observation to support country level reporting for progress on the United Nation's Sustainable Development Goal areas of agriculture, environmental monitoring, water management, marine management, and sustainable cities. In the second instance, the objective would be to stimulate and encourage the development of such applications by South African small, medium and micro enterprises. The open innovation challenge will therefore ensure high level of engagement with participating companies and facilitation of interactions with decision makers.

Development and servicing of national, regional and international partnerships

The Earth Observation Programme will proactively collaborative with national and international partners across the earth observation value chain to deliver on its strategic goals and improve the range and quality of its product and service. Partnerships will be actively pursued to increase the agency's impact in research and development, data supply, human capital development and stimulation of the space industry. Joint proposals will be exploited as a means of soliciting funding to drive the innovative development of products and services. At a national level SANSA will partner and collaborate with institutions in the national system of innovation such as research councils, universities and user entities in the private and public sector. The new strategic focus on Africa provides SANSA with an opportunity to strengthen its collaborations through partnerships with African institutions such as NEPAD and the African Union Commission. Space agency / institute to space agency collaborations will be strengthened through leadership on the Committee of African Space Institutes (CASI), ARMC and participation in CEOS and the BRICS Constellation Partnership. In addition, SANSA will

play a greater role in co-ordinating national earth observation through SA-GEO for a greater and more influential participation in AfriGEOSS and GEO.

Strategic Goal 4: The development of requisite human capacity that is needed for the implementation of key space initiatives

To reach a vibrant human capital development programme that builds on existing capability, a multi-pronged approach that includes funding of postgraduate students, short training courses, guest lecturing at universities, student co-supervision, internships and studentship programmes will be applied. Students from previously disadvantaged backgrounds are targeted in all the training and funding interventions. The agency aims to provide advanced theoretical content and practical skills in remote sensing to university students and professionals in the public and private sector. Advanced short training courses will be provided through SANSAs partnership with JICA and CEOS Working Group on Capacity Building. Satellite datasets, open source software, reading materials and other geospatial datasets will be distributed to university through the Fundisa Disc. The Fundisa online web portal will provide various remote sensing learning materials and tools to university students.

The Science Advancement services will be implemented within the context of the DST's Science Engagement Strategy and the national space awareness programme with the purpose to stimulate space science and technology interest in the public and demonstrate the value Science, Technology, Engineering, Mathematics and Innovation (STEMI) plays in society. The target audience to be engaged is aligned with the 11 identified segments of the public in the Department of Science & Technology (DST) Science Engagement Strategy intended to improve the coordination of and encourage science promotion, communication and engagement activities across the DST, its entities, universities, other government departments and science councils, museums and partners outside the public sector. The science advancement programme is implemented in partnership with industry partners such as NRF SAASTA that play the coordinating role in the system and through whom external funding is sourced on specific projects. Other stakeholders, such as the Department of Basic Education, share common objectives including improved learner performance in Mathematics and Physical Science while the network of science centres distributed nationwide is a strategic partner in outreach and awareness activities. To leverage on the multiplier effects of the train the trainer model, Geography educators in schools will be empowered with practical skills in GIS and remote sensing to enable them to effectively teach the grades 10 – 12 curricula. The Fundisa Disk School Edition learning resources will be provided to schools countrywide.

Programme Performance Indicators and Quarterly Targets – 2018/19

EARTH OBSERVATION PROGRAMME

Earth Observation Programme				Quarterly Targets			
Strategic Goal	Strategic Objective	Key Performance Indicator/Measure	Annual Target	Q1	Q2	Q3	Q4
Goal 1: The development of a suite of space application products and services that directly respond to user needs	S2.1 Lead and facilitate the creation of high-impact products and services to address society's needs and challenges	M2.1.1 The number of national high-impact products and services	1. 50 000 images distributed	10 000	15 000	18 000	40 000
			2. Five thematic categories for national base datasets	Implementation plan for production of national base datasets	50% development of identified national base datasets	80 % development of identified national base datasets	100% development of identified national base datasets
Goal 3: The generation of space relevant knowledge that supports the developmental agenda	S2.2 Increase the national space research output	M2.2.1 The national research productivity score for space supported R&D	300	-	150	-	150
	S3.2 Grow the national space industry	M3.2.2 Total contract expenditure to SMEs for core space projects	R1.9 million	1.9 million			
	S5.1 Leverage a significant benefit for the space programme through global partnerships	M5.1.1 Number of active overseas partnerships	2	1	0	1	0
		M5.1.2 Number of active African partnerships	2	1	0	1	0
		M5.1.3 Number of active national partnerships	2	1	0	1	0
Goal 4: Develop national human capacity and ensure transformation	S1.1 Increase youth awareness of science	M1.1.1 Number of youth directly engaged	5400	1500	2000	600	1300
	S1.2 Support students and interns	M1.2.1 Number of students and interns supported for formalized training	15	15	-	-	-

Reconciling performance targets with the Budget and MTEF

Earth Observation Programme – Revenue Estimates

Table 11: Earth Observation Programme - Revenue Estimates

Rand	Audited Outcomes	Audited Outcomes	Audited Outcomes	Revised Budget	Medium Term Expenditure Framework			Total MTEF
	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	
REVENUE								
Revenue from Non - Exchange Transactions	44 521 477	47 064 068	60 981 000	49 542 133	48 540 706	50 945 842	53 747 948	153 234 496
Operational Transfers	44 521 477	47 064 068	60 981 000	49 442 133	48 540 706	50 945 842	53 747 948	153 234 496
Parliamentary Grant	44 521 477	47 064 068	60 981 000	49 442 133	48 540 706	50 945 842	53 747 948	153 234 496
Ring fenced Grants	-	-	-	100 000	-	-	-	-
Research Grants	-	-	-	100 000	-	-	-	-
	-	-	-	-	-	-	-	-
Revenue from Exchange Transactions	19 075 624	21 073 259	11 296 129	14 075 473	18 736 000	16 736 000	15 736 000	51 208 000
Rendering of Services	16 599 724	20 320 424	10 304 616	10 375 473	18 486 000	16 486 000	15 486 000	50 458 000
Contract Revenue - Public Sector	16 599 724	20 320 424	10 304 616	9 985 973	12 986 000	12 986 000	12 986 000	38 958 000
Contract Revenue - Private Sector	-	-	-	74 500	500 000	500 000	500 000	1 500 000
Contract Revenue - Foreign	-	-	-	315 000	5 000 000	3 000 000	2 000 000	10 000 000
Other Income	2 475 900	752 835	991 513	3 700 000	250 000	250 000	250 000	750 000
Interest Income	108 477	726 328	815 722	-	250 000	250 000	250 000	750 000
Other Income	16 363	26 507	175 791	3 700 000	-	-	-	-
Net Gains on Foreign exchange transactions	2 351 060	-	-	-	-	-	-	-
Accumulated surplus	2 762 567	17 360 969	17 375 137	-	-	-	-	-
Total Revenue	66 359 668	85 498 296	89 652 266	63 617 605	67 276 706	67 681 842	69 483 948	204 442 496

The Earth Observation programme has an allocation of R204 million over the medium term, with annual expenditure required of R67 million in 2018/19, R68 million in 2019/20 and R69 million in 2020/21. The major expense allocation is in goods and services attributed to the acquisition, distribution and storage of satellite imagery for national geo-spatial information.

Earth Observation Programme – Expenditure Estimates

Table 12: Earth Observation Programme - Expenditure Estimates

Rand	Audited	Audited	Audited	Revised	Medium Term Expenditure Framework			Total MTEF
	Outcomes	Outcomes	Outcomes	Budget	2018/19	2019/20	2020/21	
	2014/15	2015/16	2016/17	2017/18				
Expenditure								
Employee Related Costs	20 568 855	21 594 546	23 337 493	24 138 000	25 345 761	26 765 124	28 237 206	80 348 090
Board Member Remuneration	-	-	-	-	-	-	-	-
Depreciation and Amortisation	6 610 512	8 567 055	8 357 660	-	-	-	-	-
Repairs and Maintenance	2 050 817	2 940 145	2 473 603	600 500	1 000 000	2 000 000	2 200 000	5 200 000
Finance Costs	-	-	-	-	-	-	-	-
Data Licence fees	26 723 548	31 406 738	36 124 088	35 187 570	24 199 000	23 841 000	23 777 340	71 817 340
Grants and Subsidies Paid	202 642	258 396	1 445 100	-	-	-	-	-
Antenna Infrastructure Services	-	-	-	-	-	-	-	-
Training Expenses	53 744	374 216	319 919	800 000	800 000	800 000	800 000	2 400 000
General Expenses	10 149 550	12 208 877	17 353 807	1 041 535	13 331 945	13 175 718	13 169 402	39 677 065
Net Losses on foreign exchange transactions:	-	5 274 975	-6 767	-	-	-	-	-
Loss on Disposal of Property, Plant and Equi	-	-	-	-	-	-	-	-
Total Operating Expenditure	66 359 668	82 624 948	89 404 903	61 767 605	64 676 706	66 581 842	68 183 948	199 442 495
Surplus / (Deficit) for the year	-	2 873 348	247 363	1 850 000	2 600 000	1 100 000	1 300 000	5 000 000
Capital Expenditure	-	2 873 348	247 363	1 850 000	2 600 000	1 100 000	1 300 000	5 000 000
Buildings and other fixed structures	-	-	-	-	-	-	-	-
Machinery and equipment	-	2 873 348	247 363	-	-	-	-	-
Computer Equipment	-	-	-	1 850 000	2 000 000	500 000	500 000	3 000 000
Software and intangible assets	-	-	-	-	600 000	-	-	600 000
Vehicles	-	-	-	-	-	600 000	800 000	1 400 000
Total Expenditure	66 359 668	85 498 296	89 652 266	63 617 605	67 276 706	67 681 842	69 483 948	204 442 495

PROGRAMME 3: SPACE SCIENCE PROGRAMME (SSP)

Purpose

The Space Science Programme leads multi-disciplinary space science research and development. Key functions include, fundamental and applied space science research, the support of space-facilitated science through science data acquisition, coordination and management of scientific data ground segments, provision of space weather and other geo-space and magnetic technology products and services on a commercial and private basis to the defence, maritime, communications, aviation and energy sectors. The programme also provides leadership in post-graduate science and engineering student training as well as science advancement including both learner and educator science support.

Strategic Focus

Goal 1: The development of a suite of space application products and services that directly respond to user needs

- Space weather services for satellite systems, electric power networks, satellite-based navigation, communication, defence, and aviation applications
- Geomagnetic services
- Magnetic technology services for defence, maritime and aviation sectors

Goal 2: The building of core space infrastructure, both ground and space based, that will enable the delivery of essential space services

- Geo-space observational network
- Data management and distribution

Goal 3: The generation of space relevant knowledge that supports the developmental agenda

- Space science research
- Development and servicing of national, regional and international partnerships
- Joint projects with external partners

Goal 4: The development of requisite human capacity that is needed for the implementation of key space initiatives

- Science outreach and awareness
- Student and intern training
- Student funding
- University support

Strategic Goal 1: The development of a suite of space application products and services that directly respond to user needs

6. Space Weather Services

Space weather is an important field of research as severe solar storms can affect the technology society has become increasingly dependent on. Space Weather is a global phenomenon that has regional impact. SANSA aims to develop expertise in the impact areas

that affect South Africa to enable decision-makers to take the necessary mitigation steps. The relevant technologies that are vulnerable to space weather are:

- (a) **Satellite systems:** Space weather events may affect the electronics, communication and navigation systems of a satellite. These events can also cause changes in the satellite orbit, and lead to interrupted telemetry. Satellites play a vital role in the communication and navigation sector as well as base systems such as in banking, medicine and disaster and resource management etc., therefore the loss of a satellite system or its use (even for a short time) can result in significant economic losses impacting various sectors.
- (b) **Electric power networks:** Space weather changes may result in Geomagnetically Induced Currents (GICs) flowing in long distance pipelines such as those utilised in the national power grid and in some mining applications. GICs may result in the damage of costly transformers with significant economic loss to the country due to power outages.
- (c) **Satellite-based navigation:** Satellite-based navigation (e.g. GPS) range errors increase when there is a variation in the total electron content induced by a space weather event. This can impact, for example, the aviation sector that is dependent on satellite based navigation as a primary tool for landing systems as well as other navigation applications.
- (d) **Satellite-based communication:** Radio signals propagating from satellites to the Earth through the ionosphere can be disrupted by space weather events. This could, in turn, cause interruptions to radio communication from satellites such as voice, video, weather, avionics and satellite provided internet data.
- (e) **HF-based communication:** The extent to which radio signals within the High Frequency (HF) band travelling through the ionosphere are refracted, attenuated and absorbed is dependent on the geomagnetic conditions in space, which in turn depends on space weather conditions. Adverse space weather may lead to HF radio communication blackout, both ground to ground, and ground to air, which affects the defence, aviation, and amateur radio sectors.
- (f) **Aviation:** Space weather impacts on aviation can include effects such as disruption in HF communications, satellite navigation system errors, and avionics reliability. In addition, space weather events can increase radiation levels on-board planes, particularly long-haul flights because they fly at higher altitudes. The aviation industry require space weather products that assist with flight planning, and the International Civil Aviation Organisation (ICAO) have recommended that by 2018 all flight plans include space weather information by law. SANSA aims to be ready to provide this service, and to assist the aviation sector in space weather preparedness.

SANSA operates the Space Weather Regional Warning Centre for Africa, which forms part of the International Space Environment Service (ISES). SANSA's Space Weather Centre provides an important service to the nation by monitoring the sun and its activity to provide information, early warnings and forecasts on space weather conditions. Space weather and related geospace products and services are required primarily for communication and navigation systems, in the defence, aeronautics, aviation, navigation and communication sectors. SANSA currently provides daily (working day) space weather updates and early warnings, and an on-call service for clients as well as space weather training courses to

[SANSA Annual Performance Plan 2018/19](#)

improve utilisation of the provided information. SANSa Space Weather Centre has a mobile SMS and email warning system to facilitate emergency warnings. Client specific web based services are also provided to ensure that the different sectors receive the information in the most appropriate format for their usage. Priorities for 2018/19 include:

- further improvements to the space weather product and service portfolio;
- continued delivery of products and services to relevant sectors;
- enhancement of capability to meet the ICAO requirements for the provision of space weather information to the aviation sector;
- verification of space weather forecasts and predictions; and
- research into appropriate space weather related products and services.

7. Magnetic Technology Services

SANSa operates a magnetically clean facility that includes a large three axis Helmholtz coil system and a Non-magnetic temperature chamber among other specialised magnetic technology related equipment. The facility provides an important service to the nation and clients in both the space and non-space sectors through the provision of electric and magnetic navigation ground support, magnetic field modelling, and other magnetic technology services such as landing compass calibrations, and magnetic sensor sourcing and integration. In addition, SANSa provides much needed onsite training and development to both private and defence users. SANSa's magnetic technology services are primarily provided to the defence, navigation and aviation sectors. Priorities for 2018/19 include:

- continued support to the defence, aviation and maritime sectors;
- enhanced provision of magnetic related services to the space industry;
- an increased focus on magnetic sensor integration; and
- the provision of magnetic technology services to the national and international space community.

Strategic Goal 2: The building of core space infrastructure, both ground and space based, that will enable the delivery of essential space services

SANSa operates a wide and multi-faceted geo-space observational network in the southern African region extending to Antarctica and the Atlantic Islands. This provides a geo-space laboratory for the country to conduct cutting-edge research on the near-Earth space environment, and to lead the quest for innovative solutions and new science. SANSa's geomagnetic observatories form the foundation on which many of the space related applications are based, as well as upon which the space environment research is conducted. The management, maintenance and operations of the SANSa instrumentation network in order to deliver accurate reliable data as soon as possible is also an important component. Priorities for 2018/19 include:

- Continuation of the Geomagnetic Observatory Upgrade project;
- Continued participation in the SANAP programme;
- Final phase of the SANDIMs project;

Strategic Goal 3: The generation of space relevant knowledge that supports the developmental agenda

Conduct space science research and create new knowledge and a better understanding of the universe and the near-Earth space environment. Utilise this knowledge to further develop and enhance applications, and to contribute towards the knowledge economy. SANSA also provides research leadership for the nation through publication in high-impact journals, success in both national and international research proposals, and the ratings of its researchers.

Global partnerships with ISES, INTERMAGNET, EISCAT, SuperDARN, COSPAR, SCAR and various space agencies/entities will be strengthened, and stronger participation in international research proposals will be pursued. SANSA's strength as a gateway to Africa and Antarctica will be leveraged to ensure collaboration and participation in international projects for national researchers and engineers. The SANSA Geophysical Instrumentation Network, Optical Space Research Laboratory (OSR) and Antarctic and Islands Programmes will be the main vehicles for these partnerships. SANSA is also a sought after host for regional and international researchers and students, and through existing partnerships many visitors are hosted each year on specific research projects. SANSA will continue its partnership in the International Space Weather Camp, and the University of Michigan student research programmes, as well as to be a host for the SCOSTEP scholars (who are mostly from other African countries).

Priorities for 2018/19 include:

- Continue with internationally recognised space environment focused research;
- Participate in international research proposals;
- Host regional and international researchers and students;
- Participate in International Space Weather Camp and other space science related schools and workshops;
- Attend relevant strategically chosen conferences and workshops.

Strategic Goal 4: The development of requisite human capacity that is needed for the implementation of key space initiatives

Science advancement will focus more on the southern provinces working together with the other SANSA programmes that focus on the more northern parts of the country. The SANSA Science Centre and the Mobile Lab will form the primary instruments for learner and educator engagement. Student training will be pursued through targeted funding, assisted supervision, the provision of relevant space-related projects, university partnerships and collaboration with the National Astronomy and Space Science Programme (NASSP). The Space Science Programme will continue to lead the student development programme for SANSA.

Priorities for 2018/19 include:

- Utilise space as a driver to create excitement in science and technology by optimising the use of the science centre and mobile lab;
- Participate in National Science Week and World Space Week;
- Participate in University career days and fairs, and actively seek good quality postgraduate students for SANSA's programmes;

- Seek opportunities for developing student's capabilities, and for funding students for international studies;

Programme Performance Indicators and Quarterly Targets – 2018/19

SPACE SCIENCE PROGRAMME

Space Science Programme				Quarterly Targets			
Strategic Goal	Strategic Objective	Key Performance Indicator/Measure	Annual Target	Q1	Q2	Q3	Q4
Goal 1: The development of a suite of space application products and services that directly respond to user needs	S2.1 Lead and facilitate the creation of high-impact applications to address society's needs and challenges	M2.1.1 Number of national high-impact products and applications	8. Space weather products and services <ul style="list-style-type: none"> • HF Propagation Prediction Services • Space Weather Bulletins & Alerts • Space Weather Course • Space Weather Support Tools (Progressive Qualitative Target)	Provide daily space weather bulletins and HF predictions through subscription service and on website; Deliver all requested special predictions: Inform clients of adverse space weather as warnings through subscription service; Provide space weather support as requested; Deliver any requested space weather training courses. Quarterly report on products and services.	Provide daily space weather bulletins and HF predictions through subscription service and on website; Deliver all requested special predictions; Inform clients of adverse space weather as warnings through subscription service; Provide space weather support as requested; Deliver any requested space weather training courses; Quarterly report on products and services.	Provide daily space weather bulletins and HF predictions through subscription service and on website; Deliver all requested special predictions; Inform clients of adverse space weather as warnings through subscription service; Provide space weather support as requested; Deliver any requested space weather training courses; Quarterly report on products and services.	Provide daily space weather bulletins and HF predictions through subscription service and on website; Deliver all requested special predictions; Inform clients of adverse space weather as warnings through subscription service; Provide space weather support as requested. Final report on products and services

Space Science Programme				Quarterly Targets			
Strategic Goal	Strategic Objective	Key Performance Indicator/Measure	Annual Target	Q1	Q2	Q3	Q4
			9. Magnetic Technology products and services <ul style="list-style-type: none"> • Compass Calibrations • Magnetic Navigation Ground Support Services • Magnetic Field Model Maps • Magnetic Sensor Sourcing • Aircraft Swing Courses (Progressive Qualitative Target)	Calibrate at least 25 compasses for private and defence clients; Provide all requested magnetic navigation ground support consultation, magnetic field variation, aircraft swing courses & magnetic sensor services. Deliver any magnetic technology related courses or training assistance required. Quarterly report on products and services.	Calibrate at least 25 compasses for private and defence clients; Provide all requested magnetic navigation ground support consultation, magnetic field variation, aircraft swing courses & magnetic sensor services. Deliver any magnetic technology related courses or training assistance required. Quarterly report on products and services.	Calibrate at least 25 compasses for private and defence clients; Provide all requested magnetic navigation ground support consultation, magnetic field variation, aircraft swing courses & magnetic sensor services. Deliver any magnetic technology related courses or training assistance required. Quarterly report on products and services.	Calibrate at least 25 compasses for private and defence clients; Provide all requested magnetic navigation ground support consultation, magnetic field variation, aircraft swing courses & magnetic sensor services. Deliver any magnetic technology related courses or training assistance required. Final report on products and services
Goal 3: The generation of space relevant knowledge that supports the developmental agenda	S2.2 Increase the national space research output	M2.2.1 The national research productivity score for space supported R&D	1000	150	300	300	250
	S5.1 Leverage a significant benefit for the space	M5.1.1 Number of active formal overseas partnerships	2	1	0	1	0

Space Science Programme				Quarterly Targets			
Strategic Goal	Strategic Objective	Key Performance Indicator/Measure	Annual Target	Q1	Q2	Q3	Q4
	programme through partnerships						
		M5.1.2 Number of active formal African partnerships	2	1	0	1	0
		M5.1.3 Number of active formal national partnerships	2	1	0	1	0
Goal 4: The development of requisite human capacity that is needed for the implementation of key space initiatives	S1.1 Increase youth awareness of science	M1.1.1 Number of youth directly engaged	5400	1500	2000	1000	500
	S1.2 Support students and interns	M1.2.1 Number of students and interns supported for formalized training	20	20	0	0	Not measured in Q4

Reconciling performance targets with the Budget and MTEF

Space Science Programme – Revenue Estimates

Table 14: Space Science Programme - Revenue Estimates

Rand	Audited	Audited	Audited	Approved	Revised	Medium Term Expenditure Framework			Total MTEF
	Outcomes	Outcomes	Outcomes	Budget	Budget	2018/19	2019/20	2020/21	
	2014/15	2015/16	2016/17	2017 / 2018	2017/18				
REVENUE									
Revenue from Non - Exchange Transactions	27 434 024	30 287 643	29 670 026	27 819 694	31 169 261	28 488 133	30 123 669	31 826 559	90 438 361
Operational Transfers	23 665 000	23 355 000	23 828 000	25 819 694	25 819 694	25 616 633	27 051 164	28 538 978	81 206 776
Parliamentary Grant	23 665 000	23 355 000	23 828 000	25 819 694	25 819 694	25 616 633	27 051 164	28 538 978	81 206 776
Ring fenced Grants	3 769 024	6 932 643	5 842 026	2 000 000	5 349 567	2 871 500	3 072 505	3 287 580	9 231 585
Post graduate student bursary support -NRF	-	-	-	-	1 366 623	1 290 000	1 380 300	1 476 921	4 147 221
Post graduate student bursary support -DST	-	-	2 548 523	-	-	-	-	-	-
Research Grants	3 769 024	6 932 643	3 293 503	2 000 000	3 982 943	1 581 500	1 692 205	1 810 659	5 084 364
	-	-	-	-	-	-	-	-	-
Revenue from Exchange Transactions	8 105 202	9 294 149	10 460 540	7 786 000	10 739 389	8 871 427	9 492 427	10 156 897	28 520 751
Rendering of Services	7 746 359	8 484 872	8 806 902	7 786 000	10 078 843	8 751 427	9 364 027	10 019 509	28 134 963
Contract Revenue - Public Sector	6 988 023	6 819 835	6 616 239	6 400 000	8 136 397	7 925 327	8 480 100	9 073 707	25 479 134
Contract Revenue - Private Sector	561 612	995 755	540 968	680 000	429 508	365 000	390 550	417 889	1 173 439
Contract Revenue - Foreign	196 724	669 282	1 649 695	706 000	1 512 938	461 100	493 377	527 913	1 482 390
Other Income	358 843	809 277	1 653 638	-	660 546	120 000	128 400	137 388	385 788
Interest Income	168 713	334 136	432 704	-	381 048	-	-	-	-
Other Income	190 130	475 141	1 220 934	-	197 601	120 000	128 400	137 388	385 788
Net Gains on Foreign exchange transactions	-	-	-	-	81 897	-	-	-	-
Accumulated surplus	729 731	1 622 264	1 692 450		4 809 478				
Total Revenue	36 268 957	41 204 056	41 823 016	35 605 694	46 718 128	37 359 560	39 616 096	41 983 456	118 959 112

The Space Science programme has an allocation of R118 million over the medium term, with annual allocations of R37 million in 2017/18, R39 million in 2018/19 and R42 million in 2020/21. The major expense allocation is in employee costs attributed to scientists and engineers focused on fundamental and applied space science research, the management of scientific data ground segments, and the provision of space weather and other geo-space products and services.

Space Science Programme – Expenditure Estimates

Table 15: Space Science Programme - Expenditure Estimates

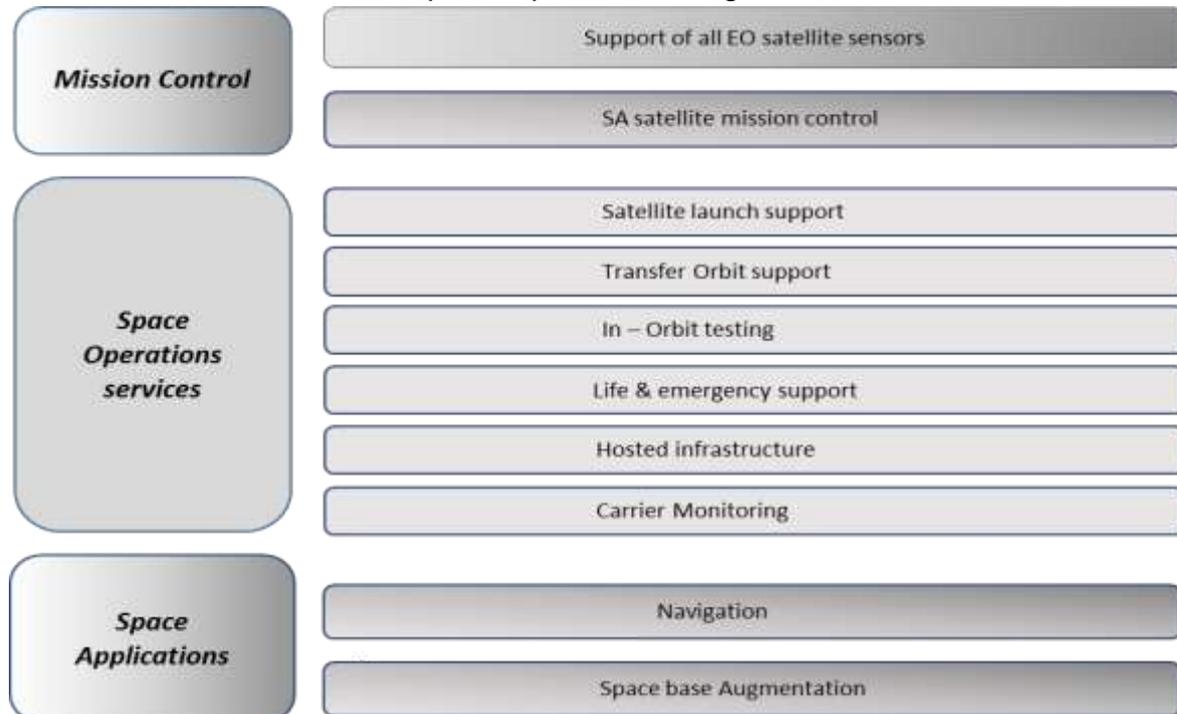
Rand	Audited	Audited	Audited	Approved	Revised	Medium Term Expenditure Framework			Total MTEF
	Outcomes	Outcomes	Outcomes	Budget	Budget	2018/19	2019/20	2020/21	
	2014/15	2015/16	2016/17	2017 / 2018	2017/18				
Expenditure									
Employee Related Costs	20 407 777	19 713 778	22 862 526	25 695 170	23 756 969	27 488 459	29 027 813	30 587 679	87 103 950
Board Member Remuneration	-	-	-	-	-	-	-	-	-
Depreciation and Amortisation	4 127 611	4 437 251	4 433 370	-	-	-	-	-	-
Repairs and Maintenance	638 640	1 399 786	1 009 648	880 079	2 883 754	1 212 628	908 672	769 325	2 890 625
Finance Costs	20 072	77	-	-	-	-	-	-	-
Data Licence fees	5 475	-	-	-	-	-	-	-	-
Grants and Subsidies Paid	1 717 328	2 202 502	3 080 193	1 927 293	1 788 360	2 588 000	2 769 160	2 963 001	8 320 161
Antenna Infrastructure Services	-	-	-	-	-	-	-	-	-
Training Expenses	300 614	205 224	213 343	145 442	468 650	195 000	208 650	223 256	626 906
General Expenses	7 362 257	7 051 604	7 175 772	6 036 206	9 361 890	5 538 373	6 341 105	7 054 249	18 933 727
Net Losses on foreign exchange transactions	-	65 821	-116 858	-	52 881	-	-	-	-
Loss on Disposal of Property, Plant and Equipm	30 694	1 134 770	213 908	-	-	-	-	-	-
Total Operating Expenditure	34 610 468	36 210 813	38 871 902	34 684 190	38 312 504	37 022 460	39 255 399	41 597 510	117 875 369
Surplus / (Deficit) for the year	1 658 489	4 993 243	2 951 114	921 504	8 405 624	337 100	360 697	385 946	1 083 743
Capital Expenditure	1 658 489	4 993 243	2 951 114	921 504	8 405 624	337 100	360 697	385 946	1 083 743
Buildings and other fixed structures	-	-	-	-	-	-	-	-	-
Machinery and equipment	1123577	897 094	1 951 540	471 378	4 616 911	337 100	360 697	385 946	1 083 743
Computer Equipment	345265	3 548 908	984 615	450 125	3 458 265	-	-	-	-
Software and intangible assets	14747	6 180	14 959	-	30 448	-	-	-	-
Vehicles	174 900	541 062	-	-	300 000	-	-	-	-
Total Expenditure	36 268 957	41 204 056	41 823 016	35 605 694	46 718 128	37 359 560	39 616 096	41 983 456	118 959 112

PROGRAMME 4: SPACE OPERATIONS PROGRAMME (SOP)

Purpose

The Space Operations Programme is responsible for the acquisition of satellite data for the Earth Observation Programme and the provision of ground segment support. Through this programme, SANSA conducts various space operations, including launch and early orbit support, in-orbit testing, satellite life-cycle support and satellite mission control for both national and international space industry clients and governments. The programme also supplies hosting capabilities with the intention of expanding this capability to Teleports.

The Functional Structure of Space Operations Programme



Strategic Focus

Goal 2: The building of core space infrastructure, both ground and space based, that will enable the delivery of essential space services,

- Data acquisition for the Earth Observation Programme
- Space operations support for various global launch activities
- Satellite in-orbit-testing
- Carrier monitoring
- Hosting of space operations infrastructure
- Satellite-based navigation
- Teleport hosting

Strategic Goal 2: The building of core space infrastructure, both ground and space based, that will enable the delivery of essential space services,

Earth Observation Support

A large proportion (100%) of SANSA's space operations activities with respect to daily passes of Low Earth Orbit (LEO) satellites are devoted to data acquisition for SANSA's Earth Observation Programme. A total of 5150 satellite passes are forecast for the year for Earth observation with a targeted success pass acquisition of 98%. The intention is to automate the process in the future. This would lead the organisation to be more efficient enabling it to maintain the current success rate.

Teleport hosting

SANSA Space operations will concentrate on developing its infrastructure in order to enable it to host teleport like services. This will entail Space operations to enhance its sustainability and provide a redundant fibre link to a central hub in SA.

Satellite support

The directorate also provides satellite support to various clients on a commercial basis, generating a significant income stream for SANSA. Global market surveys predict satellite activity to increase from about 77 launches per annum (2000-2009) to about 120 launches per annum (2010-2019). In line with this, there is an anticipated increase in SANSA's satellite launch and general orbital support business.

Navigation

Another area of growth is that of satellite-based navigation augmentation services; a third is in communication using satellites. Navigation services will be pursued in close cooperation with the Department of Transport and its agencies, while communication has to be strongly informed by the satellite communication strategy of the Department of Communications. Given the commercial nature of navigation and communication services, SANSA will also interact closely with private industry in these areas. Over the next five years, the plan is to have a fully functional open-service navigation augmentation system that is at an advanced stage in terms of Safety-of-Life certification.

Income Generation

The Space Operations Programme activities generate large foreign revenue with some local income from Earth observation data acquisition and defence related work and local organisations. The value of the programmes activities is related to its self-funding ability. Therefore, the level of income generated is important. The targeted revenue to be generated for 2016/17 is R60 million, an increase of R5 million from the 2014/15 baseline of R55 million.

Programme Performance Indicators and Quarterly Targets – 2018/19

SPACE OPERATIONS PROGRAMME

Space Operations Programme				Quarterly Targets			
Strategic Goal	Strategic Objective	Key Performance Indicator/Measure	Annual Target	Q1	Q2	Q3	Q4
Goal 2: The building of core space infrastructure, both ground and space based, that will enable the delivery of essential space services,	S3.1 Satellite or services offered from existing facilities	M3.1.1 Successful satellite pass monitoring rate for Earth Observation	Proportion: 98%	98%	98%	98%	98%
	S5.1 Optimising the organisation of future space activities to respond to opportunities with international industrial partners or international space agencies	M3.1.2: Total commercial income generated per year from space operations activities.	R58 million	R14.5 million	R29million	R43,5 million	R58 million
		M3.1.3: The proportion of space operations commercial income invested in other SANSA programmes	Proportion 5%	R750 k	R1.5m	R2.250m	R3m

Reconciling performance targets with the Budget and MTEF

Space Operations Programme - Revenue Estimates

Table 17: Space Operations Programme - Revenue Estimates

Rand	Audited Outcomes	Audited Outcomes	Audited Outcomes	Approved Budget	Revised Budget	Medium Term Expenditure Framework			Total MTEF
	2014/15	2015/16	2016/17	2017 / 2018	2017/18	2018/19	2019/20	2020/21	
REVENUE									
Revenue from Non - Exchange Transactions	13 401 600	8 367 999	-	12 967 917	12 967 917	13 263 459	14 090 264	14 865 228	42 218 950
Operational Transfers	13 200 000	8 367 999	-	12 967 917	12 967 917	13 263 459	14 090 264	14 865 228	42 218 950
Internal revenue	13 200 000	8 367 999	-	12 967 917	12 967 917	13 263 459	14 090 264	14 865 228	42 218 950
Ring fenced Grants	201 600	-	-	-	-	-	-	-	-
Post graduate student bursary support -NRF	-	-	-	-	-	-	-	-	-
Satellite Development Programme	201 600	-	-	-	-	-	-	-	-
Revenue from Exchange Transactions	44 212 033	74 575 201	66 900 674	47 565 459	51 228 849	49 049 169	52 457 185	56 709 014	158 215 368
Rendering of Services	43 334 775	68 023 332	52 653 295	47 565 459	50 141 321	49 049 169	52 457 185	56 709 014	158 215 368
Contract Revenue - Public Sector	4 955 695	5 081 776	5 768 950	5 754 907	4 766 490	5 015 801	5 296 686	5 588 004	15 900 492
Contract Revenue - Private Sector	8 500	8 900	18 000	8 900	3 773 760	1 746 833	1 844 655	1 946 111	5 537 599
Contract Revenue - Foreign	38 370 580	62 932 656	46 866 345	41 801 652	41 601 071	42 286 535	45 315 844	49 174 898	136 777 277
Other Income	877 259	6 551 869	14 247 379	-	1 087 528	-	-	-	-
Interest Income	865 914	1 898 881	164 406	-	520 015	-	-	-	-
Other Income	177 055	4 652 988	14 082 973	-	20 278	-	-	-	-
Net Gains on Foreign exchange transactions	-165 710	-	-	-	547 235	-	-	-	-
Accumulated surplus	18 967 637	-15 297 121	11 633 775	-	35 608 713	-	-	-	-
Total Revenue	76 581 271	67 646 078	78 534 449	60 533 377	99 805 479	62 312 628	66 547 449	71 574 242	200 434 318

The budget for the medium term is externally sourced at R200 million, with annual revenue generation of R62 million in 2018/19 and R66 million in 2019/20 and R72 million in 2020/21. In order to maintain the investments in the antenna infrastructure and related operating systems, international client's infrastructure is hosted to generate more income for the daily operations. Current estimates for the medium term indicate that most of the fixed term hosting contracts from international clients are reaching the end of term and will be renewed as and when. The launch support revenue is excluded from the estimates, as it is difficult to estimate the probability of the launches happening, as well as the success of the launches. With the available budget, expenditure is largely on man-hours for the maintenance support and operations staff, as well as the ICT infrastructure and communication networks, and repairs and maintenance for ground infrastructure equipment. Capital items are planned purchases as and when capital funds are available or rolled over from previous year financial surpluses.

Space Operations Programme - Expenditure Estimates

Table 18: Space Operations Programme - Expenditure Estimates

Rand	Audited	Audited	Audited	Approved	Revised	Medium Term Expenditure Framework			Total MTEF
	Outcomes	Outcomes	Outcomes	Budget	Budget	2018/19	2019/20	2020/21	
	2014/15	2015/16	2016/17	2017 / 2018	2017/18				
Expenditure									
Employee Related Costs	27 469 993	29 682 347	31 231 084	31 993 000	33 910 627	33 107 350	34 963 550	36 881 074	104 951 974
Board Member Remuneration	-	-	-	-	-				-
Depreciation and Amortisation	9 609 591	9 675 833	9 725 172	-	-				-
Repairs and Maintenance	2 420 188	3 662 999	3 677 254	5 537 772	13 813 533	3 722 929	4 275 093	4 467 260	12 465 282
Antenna Infrastructure Services	1 102 997	4 146 811	203 266	-	2 971 575				-
Training Expenses	740 007	549 831	150 574	563 402	396 904	352 850	372 610	393 103	1 118 563
General Expenses	18 196 678	14 680 746	15 888 276	18 439 203	18 123 662	23 129 498	23 936 196	25 832 805	72 898 499
Net Losses on foreign exchange transactions	-	79 894	1 321 073	-	-				-
Loss on Disposal of Property, Plant and Equipment	99 580	14 301	314 394	-	3 303				-
Total Operating Expenditure	59 639 034	62 492 762	62 511 093	56 533 377	69 219 604	60 312 628	63 547 449	67 574 242	191 434 318
Surplus / (Deficit) for the year	16 942 237	5 153 316	16 023 356	4 000 000	30 585 875	2 000 000	3 000 000	4 000 000	9 000 000
Capital Expenditure	16 942 237	5 153 316	16 023 356	4 000 000	30 585 875	2 000 000	3 000 000	4 000 000	9 000 000
Buildings and other fixed structures	-	-	-	-	-				-
Machinery and equipment	16 942 237	5 153 316	16 023 356	4 000 000	30 585 875	2 000 000	3 000 000	4 000 000	9 000 000
Total Expenditure	76 581 271	67 646 078	78 534 449	60 533 377	99 805 479	62 312 628	66 547 449	71 574 242	200 434 318

PROGRAMME 5: SPACE ENGINEERING PROGRAMME (SEP)

Purpose

The Space Engineering Programme leads systems engineering and project management excellence, and drives a small satellite development programme in South Africa in partnership with external contractors, R&D institutions and private sector partners. The programme conducts satellite and sub-systems analysis, leads the technical side of the space programme project management, human capital development in space engineering as well as facilitates private space industry partnerships.

Strategic Focus

Goal 2: The building of core space infrastructure, both ground and space based, that will enable the delivery of essential space services

- EO-Sat1 development
- Facilities development

Goal 3: The generation of space relevant knowledge, that supports the developmental agenda

- Industry development

Goal 4: The development of requisite human capacity that is needed for the implementation

- Student and intern training
- Student funding

Strategic Goal 2: The building of core space infrastructure, both ground and space based, that will enable the delivery of essential space services

EO-Sat1 and Cubesat Development

Preparation for preliminary design reviews will take place during the year and the predesign work on the technical requirements will be completed. Major components will undergo critical design review in preparation for the structural thermal design model. The qualification model will be manufactured and integrated for environmental testing culminating in the qualification of the spacecraft. The system definition activities are to be concluded with the product trees developed for the segments, so as to enable the finalisation of the acquisition plan and the procurement plans for the segments. The Ground Segment Architectural Design activities are to be concluded and the contracting baselines established by the Integrated Project Team. Work packages for both the mission control and data acquisition will be activated for final engineering implementation. The AIT facility will be upgraded to meet the minimum requirements for testing of EO-Sat1.

Zacube2 Satellite will be developed to monitor the oceans economy. The development will ensure the successful monitoring of ships bordering the South African coastline. The demonstration programme will be the first phase in developing a constellation to support the Operation Phakisa.

Space Programme Management

The South African Space programme primary focus is on supporting the National Space Programme. Space engineering supports the development of space systems to meet the broader user requirements for operational and scientific requirements of the country. The characteristics of the missions will largely be in the area of earth observation, marine,

communication and science. The NSP provides direction for the requirements of space technologies. A critical role for space engineering is to engage users on the specification of the satellite. Due to the dynamic nature of satellite requirements these often change and are managed independently. Space Engineering will define missions which, where possible, will include various payloads for different sectors. It is envisaged through systematic approach Satellites will be developed to meet the key areas of Environmental Resources Management, Health Safety & Security, and innovation & economic growth. The space programme is also critical for planning and resources skills required by various entities to support government initiatives.

To fulfil the technology risk and the use of various major components, a Space System TRL scale will be used. Space Engineering will determine the technology readiness level and the level of maturity to be included in the subsystem design process. This further allows an assessment of development areas within the industry. The following are the key areas of focus:

- For any new mission, engineering is involved from feasibility through to integration and commissioning;
- Lead the proposal evaluation team to ensure MRD, TRS (Technical Requirements Specification) :
- SPD (Space Programme Division) Programme Management /Contract management;
- System Engineering Part of PDRs (Preliminary Design Review) etc. and Verification and Validation Teams Technical compliance;
- System Engineering meeting potential users and compiles URS (User Requirements Specification);
- Implement NSP: engineering can determine the feasibility and requirements for future missions;
- Establish African space agencies/partners: Reach out to our ARMC partners for information, knowledge and Sys Eng. experience sharing;
- Build Space System Engineering communities with African & International partners;
- Establish better contact with potential Level 5 players and the System Engineering, to start preparing for future missions such as GEO Comms Geostationary Communications Satellite, LEO SAR (Low Earth Orbiting Satellite Aperture Radar), LEO Defence;
- Mission pre-studies on the above missions at level 6 at least 1-2 years before the formal launch of such a project;
- Present papers at local conferences on the work being done at SANSa in Space Engineering (e.g. INCOSE Conference); and
- Address what SO and SPD System Engineering does (telecoms and navigation satellites).

Facility development

In order to embark on providing space systems to government, facilities become crucial in the implementation of the plan. Having the ownership of Houwteq, SANSa will be able to provide AIT (Assembly, Integration and Testing) services to the South African Space, Automotive, and Defence industries, designed to incentivise the growth of those industries. An added benefit is that through this AIT activity, SANSa will keep a much closer contact with the various stakeholders, and be more in tune with their needs and aspirations.

The two core areas of development will be in assembly integration testing and calibration and validation.

These elements must be unpacked, expanded on and discussed in detail with the aim of constructing a sustainable business case and a plan for development of such a business

model. Ultimately, South African must present as a provider of life-cycle development of optical payload development from design, modelling, development, measurement, calibration, test and evaluation. This makes South Africa attractive as a partner for human capital development while ensuring a sustainable optical payload development Centre of Competence. Cal-Val cannot be a sustainable business case on its own. It becomes more attractive when offered as part of a full satellite development programmes, with a strong element on data product integrity and quality.

Strategic Goal 3: The generation of space relevant knowledge, that supports the developmental agenda

Contracting value to private SME space industry

SANSA's mandate, as prescribed in the SANSA Act, is to stimulate the South African space industry. Therefore, SANSA will ensure that its contracting efforts are tailored to stimulate the private industry for the benefit of the country. This will entail setting clear private company outsourcing targets. The industries to be targeted are both in the space technology development sectors and the Earth observation value-adding services.

Contracting value to public and private space industry

To meet SANSA's mandate of stimulating the space industry as a whole, the Agency will ensure that there is significant contracting of the space industry. Space, by its nature, is high risk and globally relies heavily on government as the anchor client for the national space industry of a particular country. SANSA, as the lead implementer of the space programme, has to provide the necessary anchor to the local space industry. This requires ensuring steady contracting to provide the base work to keep the industry going. The targeted broad industry contractual spend is R65 million over the five year period. Support for these industries and the embedded small medium enterprises will be through mechanisms such as the DST led Technology Localisation Programme (TLP), which spearheads the improvement of the technological capability of local firms leading to increased competitiveness (quality, cost, customisation), expanding capabilities (new products, services) and expanding into new markets both locally and globally.

Industry Development

Space Engineering to empower South Africa to re-establish the Space Industry across the different value chains, whilst optimising the capital made available by Government. The identification of the technologies required to satisfy the developing space industry in South Africa will provide input into the development of Centres of Excellence, or Centres of Competence, that exist in South Africa that harbour those technologies at different levels of expertise. This will further add value to human capital development by encouraging the universities, through grants, to offer relevant courses or improve/extend courses in sciences, technology and other disciplines leading to the development of human capability with focus on the relevant space sciences.

All space programmes aim to fully implement a space mission. Various technologies define space programmes to be developed for particular user requirements. Due to the complexity of a space programme, clear roles and responsibilities need to be identified in support of the broader mission objectives. Contracting strategy becomes critical in the development of a space programme. Often the prime contractor is responsible for the interface between space engineering and the product. In progressing forward a well-defined contracting strategy is critical to ensure industry development and localization. SANSA, as an agency, will provide the capability of realising the space programme through engineering, technical, economics and human capital support.

The following are the key areas of support. A centre of competency (CoC) in optical payload development capabilities in South Africa, consists of distributed, uncoordinated capabilities across the national system of innovation including industry, universities and science councils. In order to sustain these capabilities a national effort needs to be consolidated under the CoC to focus all efforts under the same programme. .

Strategic Goal 3: The development of requisite human capacity that is needed for the implementation

South Africa has a shortage of skilled personnel in the space engineering arena particularly from amongst previously disadvantaged individuals. Through the bursary programme and internship programme, SANSA aims to address this by strategically using the satellite build programme as an attractor.

Jobs Supported

SANSA and Denel Dynamics have a core complement of employees that are directly involved with the Satellite Development Programme. A total of 55 such employees are forecast for the year depending on the progress of the project. The relevant resources are highly dependent on the supporting contracts for the upgrade to the Houwteq facility.

The priorities for the year are:

- Further development of EO-Sat1;
- Engagement with users on EO-Sat1 system deliverables;
- Establishing a Calibration and Validation centre of expertise with various local partners;
- Developing a technology roadmap to support the South African Space industry;
- Establishing areas of competence and expertise within the technology framework with the various institutions in South Africa;
- Reviewing the current state of training in the local space industry;
- Administrate the development of ZACube2

Programme Performance Indicators and Quarterly Targets - 2018/19

SPACE ENGINEERING PROGRAMME

Space Engineering Programme			Quarterly Targets				
Strategic Goal	Strategic Objective	Key Performance Indicator/Measure	Annual Target	Q1	Q2	Q3	Q4
Strategic Goal 3: The generation of space relevant knowledge, that supports the developmental agenda	S3.2 Grow the national space industry	M3.2.1 The number of direct jobs supported externally through SANSAs programme contracting	55	55	55	55	55
		M3.2.2 The total contract expenditure to SMEs for core space projects	R10 million	R2 million	R2 million	R3 million	R 3 million
		M3.2.3 The total contract expenditure to the broad space related industry for core space projects	R50 million	R10 million	R10 million	R15 million	R15 million
Strategic Goal 2: The building of core space infrastructure, both ground and space based, that will enable the delivery of essential space services	S4.1 Successful launch and operations of EO-Sat 1 and CubeSat mission	M4.1.1 The progress status on the EO-Sat1 development	Critical Design Review (CDR) and completed for the space system flight model	System CDR	System CDR	System CDR	System CDR
		M4.1.2 The progress status on the CubeSat development	Completion of the qualification phase and Flight model Phase, and Launch and Commission	Flight Model completed	Satellite Launched and commissioned	Post Launch evaluation report	Testing and performance review of Zacube2 final report
Goal 3: The generation of space	S5.1 Leverage a significant benefit for the	M5.1.1 Number of active overseas partnerships	1	0	0	1	0

Space Engineering Programme			Quarterly Targets				
Strategic Goal	Strategic Objective	Key Performance Indicator/Measure	Annual Target	Q1	Q2	Q3	Q4
relevant knowledge that supports the developmental agenda	space programme through global partnerships	M5.1.2 Number of active African partnerships	1	0	0	1	0
		M5.1.3 Number of active national partnerships	1	0	0	1	0
Strategic Goal 4: The development of requisite human capacity that is needed for the implementation of key space initiatives	S1.2 Support students and interns	M1.2.1 Number of students and interns supported for formalized training	15	15	-	-	Not measured in Q4

Reconciling performance targets with the Budget and MTEF

Space Engineering Programme - Revenue Estimates

Table 19: Space Engineering Programme - Revenue Estimates

Rand	Audited	Audited	Audited	Revised	Medium Term Expenditure Framework			Total MTEF
	Outcomes	Outcomes	Outcomes	Budget	2018/19	2019/20	2020/21	
	2014/15	2015/16	2016/17	2017/18				
REVENUE								
Revenue from Non - Exchange Transactions	39 979 037	99 852 806	111 627 276	110 847 427	10 054 654	10 533 663	10 750 596	31 338 914
Operational Transfers	-	-	-	-	10 054 654	10 533 663	10 750 596	31 338 914
Parliamentary Grant				-	10 054 654	10 533 663	10 750 596	31 338 914
Ring fenced Grants	39 979 037	99 852 806	111 627 276	110 847 427	-	-	-	-
AIT Facilities	-	-	11 774 470	6 525 530				-
Operation Phakisa - EO Data	-	-	-	4 548 000				-
Operation Phakisa - Ocean and Coast Information Management system	-	-	-	22 044 000				-
Satellite Development Programme	39 979 037	99 852 806	99 852 806	77 729 897				-
Principal/Agent Transfers	17 750 534	34 225 427	8 258 803	9 268 569	-	-	-	-
Accumulated surplus	14 720 794	-7 971 845	-24 366 504					
Total Revenue	72 450 365	126 106 388	95 519 575	120 115 996	10 054 654	10 533 663	10 750 596	31 338 914

The satellite build programme has no allocation over the medium term. Funding for the continuation of the programme is yet to be confirmed. The expenditure over the MTEF reflects the funding required to cover employee costs and operational funds for the Space Engineering Division.

Space Engineering Programme – Expenditure Estimates

Table 20: Space Engineering Programme - Expenditure Estimates

Rand	Audited	Audited	Audited	Revised	Medium Term Expenditure Framework			Total MTEF
	Outcomes	Outcomes	Outcomes	Budget	2018/19	2019/20	2020/21	
	2014/15	2015/16	2016/17	2017/18				
Expenditure								
Employee Related Costs	-	3 849 186	187 088	9 092 000	8 359 543	8 827 677	9 313 199	26 500 419
Repairs and Maintenance	-			75 000	-			-
Data Licence fees	-			26 592 000	-			-
Grants and Subsidies Paid	17 751 567	21 306 554		560 000	591 920	625 068	659 446	1 876 434
Antenna Infrastructure Services	-			-	-			-
Training Expenses			53 920	650 000	-	-	-	-
General Expenses	304 184	1 097 486	1 422 363	3 053 236	1 103 191	1 080 919	777 951	2 962 061
Net Losses on foreign exchange transactions	-		826	-				-
Total Operating Expenditure	18 055 751	26 253 226	1 664 197	40 022 236	10 054 654	10 533 663	10 750 596	31 338 914
Principal/Agent Transfers	-	-	-	9 268 569	-	-	-	-
AIT facilities/Industry Upgrade/Incentives				-				-
Operation Phakisa - CPUT				9 268 569				-
				-				-
				-				-
Surplus / (Deficit) for the year	54 394 614	99 853 162	93 855 378	80 093 760	0	-0	-	-0
Capital Expenditure	54 394 614	99 853 162	93 855 378	70 825 191	-	-	-	-
AIT Facility				6 525 530				-
Satellite Development	54 394 614	99 853 162	93 855 378	64 299 661	-	-		-
Total Expenditure	72 450 365	126 106 388	95 519 575	120 115 996	10 054 654	10 533 663	10 750 596	31 338 914

ANNEXURE A – Amendments to the 2015-2020 Strategic Plan

INTRODUCTION

The Framework for Strategic Plans and Annual Performance Plans states, “A Strategic Plan may be changed during the five-year period that it covers. However, such changes should be limited to revisions related to significant policy shifts or changes in the service-delivery environment. The relevant institution does this by issuing an amendment to the existing plan, which may be published as an annexure to the Annual Performance Plan, or by issuing a revised Strategic Plan.”

The 2015-2020 SANSa Strategic Plan was implemented for the first time in 2015/16 and in the process of implementation and due to comments from the auditors, it became necessary to modify some of the KPIs and make sure that they are SMART and clear. Listed below are the modifications that have been implemented in red. Furthermore, given the financial constraints, the Agency has scaled down on some of the 2018/19 targets. The changes in the targets are also indicated in red below.

The Strategic Context for this Annual Performance Plan has also been revised through the finalisation of a new 5-Year Strategic Plan (2018-2023), which now includes aspirational activities. These aspirational activities are aligned to the mandate of SANSa for which the budgets are yet to be committed for. However, the SANSa team is committed to source the additional funding required to implement these aspirational activities and reporting against these aspirational targets will be done as and when the funding for such activities are realised.

MODIFICATIONS TO MEASURES OR KPI's OR TARGETS

Strategic Goal	Original	Modification	2018/19 Original	2018/19 Target	Reason for Modification
Goal 1: Address South Africa's challenges through space services and products	M1.2 The number of government decision or policy support tools	M1.2 The number of government decision support or policy tools	Two policy tools for government	-	This target no longer appears in the new 5-Year Strategic Plan (2018-2023)
Goal 2: Lead high-impact collaborative R&D on a national scale	M2.1 The national research productivity score for space supported R&D	M2.1 The national research productivity score for space supported R&D (This productivity score is based on a function of research funding sourced + publications (journals, books, reports, proceedings) + students graduated + research rating status.) (modification implemented in 2016/17)	2000	1300	Given the fluctuation in publication rate and research funding, and the fact that this was a new score introduced with the new strategic plan, the original target was overestimated.
Goal 3: Develop national human capacity and ensure transformation	S3.2 Support students with a transformation agenda	M3.2 The number of students supported for formalised training (This excludes short courses and focuses on students that are registered for some formal training for a degree, diploma, or certificate within the South African National Qualification Framework) (modification to be implemented in 2018/19)	80	50	The target has been adjusted to accommodate the realistic number of postgraduate students that SANSA is able to support – this decrease is largely due to funding constraints and available resources. In addition the KPI is only applicable to the EO, SS, and SE programmes who are able to support

Strategic Goal	Original	Modification	2018/19 Original	2018/19 Target	Reason for Modification
					students at this level.
Goal 4: Enhance the competitiveness of the South African space industry	M4.1.1. Successful satellite pass monitoring rate for Earth Observation	M4.1.1: Successful satellite pass monitoring rate of 98% per year for Earth Observation by end 2020	99%	98%	Current realistic target within industry norm
	M4.1.2 Total income generated per year from space operations activities	M4.1.2: Total commercial income of R296 million by year end March 2020 (modification implemented in 2017/18)	R69 million	R65 million	Realistic target based on current firm contracts and anticipated contracts
	M4.1.3 The total of space operations income invested in other SANSA programmes	M4.1.3: The proportion of space operations commercial international income invested in other SANSA programmes (modification implemented in 2017/18)	R13 million	5%	Modification implemented in 2017/18 to a proportional measure
	M4.2.1 The number of direct jobs supported externally through SANSA programme contracting	M4.2.1 A total of 55 direct jobs supported per year externally through SANSA programme contracting (modification implemented in 2017/18)	100	55	Modification implemented in 2017/18 to a more realistic target as jobs supported are based on current funding levels for the satellite programme
	M4.2.2 The progress status on the EO-Sat1 development project	M4.2.2 The achievement of key project milestones in the EO-Sat1 development (modification implemented in 2017/18)	100%	Critical Design Review (CDR) completed for the Space System Flight Model	Modification implemented in 2017/18 from a proportional measure to a progressive target

Strategic Goal	Original	Modification	2018/19 Original	2018/19 Target	Reason for Modification
Goal 5: Develop active global partnerships	M5.1 The equivalent revenue generated through partnerships as a proportion of the SANSA revenue	M5.1 The equivalent revenue generated through partnerships as a proportion of the SANSA non-commercial operating revenue (modification implemented in 2016/17)	8%	-	This target no longer appears in the new 5-Year Strategic Plan (2018-2023)
Goal 6: Ensure the growth and sustainability of SANSA	M6.1 Total SANSA Income	M6.1 Total non-ring-fenced SANSA revenue (modification implemented 2016/17)	R251 million	-	This target no longer appears in the new 5-Year Strategic Plan (2018-2023)
	M6.2 Estimated monetised impact per annum	M6.2 Estimated monetised impact of space related activities (modification implemented 2017/18)	R130 million	-	This target no longer appears in the new 5-Year Strategic Plan (2018-2023)
	M6.3 SANSA's public value awareness	M6.3 SANSA's stakeholder awareness (modification to be implemented 2017/18)	70%	-	This target no longer appears in the new 5-Year Strategic Plan (2018-2023)
	M6.4 Ensure the effective implementation of the NSP	M6.4. High-level NSP implementation progress status	60% of the NSP projects are active	-	This target no longer appears in the new 5-Year Strategic Plan (2018-2023)
Goal 7: Transform SANSA into a high-performance Agency	M7.1 Implementation of identified initiatives that enhance organisational performance	M7.1 Implementation of identified initiatives that enhance organisational performance	4	-	This target no longer appears in the new 5-Year Strategic Plan (2018-2023)
	The KPI alongside is totally new and is intended to measure SANSA's investment in its staff.	M.7.2 Proportional (%) representation of permanent staff from designated groups in the D to F grades	T.7.2 65% Proportional (%) representation of permanent staff from designated groups in the D to F grades or top two	-	This target no longer appears in the new 5-Year Strategic Plan (2018-2023)

Strategic Goal	Original	Modification	2018/19 Original	2018/19 Target	Reason for Modification
			Management Levels by end March 2020		
	The KPI alongside is totally new and is intended to measure SANSA's investment in its staff.	M.7.31% of investment into staff training & development against operating expenditure. (modification to be implemented 2017/18)	1%	-	This target no longer appears in the new 5-Year Strategic Plan (2018-2023)

KEY PERFORMANCE INDICATOR DESCRIPTORS

M1.1.1. Number of youth directly engaged

M1.2.1. Number of students and interns supported for formalised training

M2.1.1. Number of national high- impact products and applications

M2.2.1. The national research productivity score for space supported R&D

M3.1.1. Successful satellite pass monitoring rate for Earth Observation

M3.1.2.Total income generated from space operations activities

M3.1.3. Total amount of space operations subsidised in other SANSA programmes

M3.2.1. The number of direct jobs supported externally through SANSA programme contracting

M3.2.2. The total contract expenditure to SME's for core space projects

M3.2.3. The total contract expenditure to the broad space related industry for core space projects

M4.1.1. The progress status on the EO-Sat1 development

M4.1.2.The progress status on the CubeSat development

M5.1.1. Number of active formal overseas partnerships

M5.1.2. Number of active formal African partnerships

M5.1.3. Number of active formal national partnerships

Indicator title	Name of Indicator
Short definition	Provides a brief explanation of what the indicator is, with enough detail to give a general understanding of the indicator
Purpose/importance	Explains what the indicator is intended to show and why it is important.
Source/collection of data	1. A description of what source documentation or information is used as a basis for actual performance achievements. 2. A description where this source documentation or information originates from – by indicating name of responsible unit, person, etc.
Method of calculation	Describes clearly and specifically how the indicator is calculated.
System Used	Indicate the name of the system used to process the performance information and indicate whether this system is electronic or manual in nature
Description of KPI reporting activities	1. Describe the reporting activities per indicator by indicating the name of the report, frequency of reporting and to which level 2. Indicate where this output document or report originates from by referring to responsible person, supporting info and standard reporting requirements 3. Document the related control activities relevant to outputs/reporting
Means of Validation	Describes clearly and specifically how the indicator is validated
Data limitations	Identifies any limitation with the indicator data, including factors that might be beyond the directorates control
Type of indicator	Identifies whether the indicator is measuring inputs, activities, outputs, outcomes or impact, or equity
Calculation type	Identifies whether the reported performance is cumulative, or non-cumulative
Reporting cycle	Identifies if an indicator is reported quarterly, annually or at longer time intervals
New indicator	Identifies whether the indicator is new, has significantly changed, or continues without change from the previous year
Desired SANSa performance	Identifies whether actual performance that is higher or lower than targeted performance is desirable
Desired Divisional performance	Identifies whether actual performance that is higher or lower than targeted performance is desirable per division.
Indicator responsibility	Identifies who is responsible for managing and reporting the indicator

Indicator title	<u>M1.1.1 Number of youth directly engaged</u>
Short definition	This refers to the number of young people engaged directly through some specific activity (e.g. visit by learners to a SANSa facility, learner workshop/lesson, SANSa visit to a school) and will exclude a count of young people who visit SANSa stands at exhibits.
Purpose/importance	To indicate the extent to which SANSa is promoting science and increasing awareness amongst young people
Source/collection of data	Hard copies of attendance register of activities PDF of attendance registers and summary.
Method of calculation	Manual calculation
System Used	Manual System
Description of KPI reporting activities	1. Attendance register is completed at the event and signed by external supervisor of the participating group. 2. Number of attendees get captured into excel spread sheet
Means of Validation	Signed-off attendance registers
Data limitations	Omission of full details on register. Data would not reflect some of the demographics (race, gender) required by the PPC for example.
Type of indicator	Output
Calculation type	Cumulative
Reporting cycle	Quarterly
New indicator	No
Desired SANSa performance	Engage 10800
Desired Divisional performance	Earth Observation: Engage 50% of total learners - 5400 Space Science: Engage 50% of total learners - 5400
Executive responsible	MD: SS; EO;
Portfolio Responsibility	Space Science: SAU Manager Earth Observation: SAU Manager

Indicator title	<u>M1.2.1 Number of students and interns supported for formalised training</u>
Short definition	The total number of students currently linked and supported by SANSA through bursaries, or supervised. This includes interns currently supported through SANSA workplace initiatives irrespective of how their salaries are funded. SANSA employees who are supported under any SANSA staff development scheme should not be counted. Further this excludes short courses and focuses on students that are registered for some formal training for a degree, diploma, or certificate within the South African National Qualification Framework.
Purpose/importance	This measures the level to which SANSA contributes to the development of external human capacity through formal degree training and internships.
Source/collection of data	Contracts and student agreements & student records Proof of supervision engagement Internship award letters or other documentation
Method of calculation	Manual head count. Since the academic year and financial year are different – students are added in the quarter in which they joined SANSA for that financial year. That is, students have to be counted once per annum in the quarter in which they joined or began to be supported by SANSA. To simplify students will not be counted in quarter 4, however, all supported students will be counted in quarter 1 (April) for the new financial and academic year. Thereafter, only new students who have joined after June will be counted in Q2 and Q3. Interns will be counted in the year that they are supported and only once per contract year (so each intern should be counted for the 1 year that they are supported).
System Used	Excel Spreadsheet
Description of KPI reporting activities	All student contracts and other relevant documentation counted
Means of Validation	Contracts and student agreements, proof of student supervision contracts/register are available. Proof of internships.
Data limitations	There is no distinction between students; the level of training is not indicated. Therefore, it is important that data on the level of training and the successful graduates is also kept and reported on in the main narrative of the report.
Type of indicator	Output
Calculation type	Cumulative – proportion should be calculated SANSA wide
Reporting cycle	Quarterly
New indicator	No
Desired SANSA performance	Target of 50 students and interns;
Desired Divisional performance	Earth Observation: 15 Space Science: 20 Space Engineering: 15
Executive responsible	ED: SP, MD: EO, MD: SS
Portfolio Responsibility	SANSA Student Administrator

Indicator title	<u>M2.1.1 Number of national high- impact products and applications</u>
Short definition	The number of high-impact products/services (PS) delivered within any one of the following PS areas, (i) PS1 - 50 000 images distributed, (ii) PS2 - Five thematic categories for national base datasets, (iii) PS3 - Space weather products and services, (iv) PS4 - Magnetic technology products and services.
Purpose/importance	This is intended to demonstrate a sample of the products, services and applications that are impactful and delivered utilising EO and space science know how, expertise and facilities.
Source/collection of data	<p>Reports that document what has been achieved or produced including appropriate statistics for each product. Some of the specifics may include some or all of the following:</p> <p>PS1 – 50 000 images distributed</p> <p>PS2 – Five thematic categories for national base datasets</p> <p>PS3 – Space weather products and services</p> <ul style="list-style-type: none"> • HF Propagation Prediction Services • Space Weather Bulletins & Alerts • Space Weather Course • Space Weather Support Tools <p>PS4 – Magnetic Technology products and services</p> <ul style="list-style-type: none"> • Compass Calibrations • Magnetic Navigation Ground Support Services • Magnetic Field Model Maps • Magnetic Sensor Sourcing • Magnetic Technology related Courses
Method of calculation	A brief qualitative report of the services/products that have been delivered under these categories will be used as the products/services are not a simple statistical/numerical activity.
System Used	Manual
Description of KPI reporting activities	Compilation of detailed products/service reports. Recording of any activities, events, that can be used for validation e.g. data transmission logs, client acceptance signatures, contract registers, progress reports.
Means of Validation	Sample testing some of the assertions in the Product/Service report against some of the validation material e.g. data transmission logs, client acceptance signatures, contract registers, progress reports.
Data limitations	Some of the meaningful activities cannot be necessarily independently validated. This KPI is intended to progressively concretise the SANSA product/service portfolio and to quantify its impact.
Type of indicator	Output and impact/ Progressive qualitative
Calculation type	Cumulative and progressive throughout the year.
Reporting cycle	Quarterly
New indicator	No
Desired SANSA performance	Deliver all four products/services as per APP
Desired Divisional performance	Earth Observation: Deliver two high-impact products/services Space Science: Deliver two high-impact products/services
Executive responsible	MD: EO & MD: SS
Portfolio Responsibility	Earth Observation: DPS & DSM Space Science: AST & SRA

Indicator title	M2.2.1 The national research productivity score for space supported R&D
Short definition	The research productivity score for R&D
Purpose/importance	This is meant to demonstrate SANSA's research output and is an indicator of research output, quality, impact and relevance
Source/collection of data	<p>This productivity score is based on a function of research funding sourced + publications (journals, books, reports, proceedings) + students graduated + research rating status</p> <ol style="list-style-type: none"> 1. Published papers in PDF and hard copy available. For books Front pages available in pdf. Calculated with impact factor and author position. 2. Grant funding listed in grant award registers, and award letters available - also available from finance system as grant income received, copy of register from NRF or international system indicating payments received for that year up to end of quarter. Only grant funding for research projects or grant holder linked student funding should be included – no independent student (PDP) or post doc or science advancement funding. Research funding from all sources should be included. 3. Students graduated – list is maintained with PDF copies of Degree certificates or award letters. 4. Research rating status – determined by rating award letters (only counted on renewal or first time achievement of rating).
Method of calculation	Composite function as described in “determination of research productivity score” document
System Used	Manual, Excel spreadsheet
Description of KPI reporting activities	Information is collected monthly on an ongoing basis, and collated and verified quarterly.
Means of Validation	<ul style="list-style-type: none"> ▪ Count the hard copies of publications and books ▪ Verify that evidence exists for all aspects included in the formula ▪ Verify excel sheet with calculation
Data limitations	A composite score masks some of the key elements that are, in their own right, important for SANSA performance review e.g. number of publications, grant amount raised, number of graduates, number of rated researchers and their ratings. Therefore, it is important that data on these base elements is also kept and reported on in the main narrative of the report.
Type of indicator	Output
Calculation type	Cumulative
Reporting cycle	Quarterly
New indicator	No
Desired SANSA performance	Achieve a research productivity score of 1300
Desired Divisional performance	<p>Earth Observation: Research productivity score contribution of 300 to the total SANSA score</p> <p>Space Science: Research productivity score contribution of 1000 to the total SANSA score</p>
Executive responsible	MD: EO & MD: SS
Portfolio Responsibility	<p>Earth Observation: RAD Manager</p> <p>Space Science: SRA Manager</p>

Indicator title	<u>M3.1.1. Successful satellite pass monitoring rate for Earth Observation</u>
Short definition	The measurement of the rate of success in downloading SANSA EO data measured in proportional time achieved.
Purpose/importance	To measure the success rate of the SANSA Space Operations in supporting SANSA Earth Observation. It is important to measure the effectiveness of this support given the internal contracting for these services between the two directorates. It also shows the impact of SANSA's space operations activities to EO.
Source/collection of data	1. Data acquired is calculated minutes of a pass or a fraction thereof. 2. Data losses are calculated in minutes or fractions thereof 3. Operational workload is calculated in passes per day
Method of calculation	Systematic Count of minutes of data captured and demodulated
System Used	Daily passes requested from EO as per flight plan, SO data acquisition pass summary from QF and database entries
Description of KPI reporting activities	1. Operations manager totals the minutes from passes completed 2. Operations manager completes KPI quarterly
Means of Validation	SO verifies with EO on quantity (minutes) and quality of data acquired
Data limitations	
Type of indicator	Output
Calculation type	Non-accumulative
Reporting cycle	Quarterly
New indicator	Not a new indicator
Desired SANSA performance	=>98%
Desired Divisional performance	98 %
Executive responsible	MD: SO
Portfolio Responsible	Space Operations: Operations manager

Indicator title	<u>M3.1.2.Total income generated from space operations activities</u>
Short definition	The income generated by the Space Operations Programme for the financial year, includes all forms of income e.g. inter-company contractual revenue, external contracts, ring fenced grant income.
Purpose/importance	This measures the revenue generation capacity of the Space Operations activities. This is important given the commercial emphasis of this programme.
Source/collection of data	This information is based on signed contracts and the actual financial transactions on the financial system and reported numbers on the financial statements.
Method of calculation	This would be the total of all the contractual revenue generated under the space operations programme.
System Used	Financial systems
Description of KPI reporting activities	Generate income financial statement from the ERP system Cross reference with contracts received & invoices issued & grant awards Cross reference with income contract spreadsheets (Marketometer)
Means of Validation	Contracts with the clients and invoices
Data limitations	The value does not give an indication of the different sector income streams. Such information would give SANSA the necessary intelligence for making strategic choices. Therefore, information on the different income streams should be kept and reported in the report narrative.
Type of indicator	Output
Calculation type	Cumulative
Reporting cycle	Annually
New indicator	Yes
Desired SANSA performance	Target of R58 million
Desired Divisional performance	Target of R58 million
Executive responsible	MD: SO
Portfolio Responsibility	Space Operations: Finance manager / and Business Developer

Indicator title	<u>M3.1.3. Total amount of space operations income subsidised in other SANSa programmes</u>
Short definition	This measures the level to which the Space Operations Programme provides support to all the SANSa programmes and hence contributes to the primary public mandate of SANSa.
Purpose/importance	The primary mandate of SANSa is to provide public benefits. Therefore, it is important to show that in addition to the commercial activities, the space operations programme directly supports the other programmes and hence has a public mandate contribution.
Source/collection of data	Quantification of the international income into SANSa SO
Method of calculation	5% of external International income
System Used	Financial system
Description of KPI reporting activities	The International income will be calculated at the end of the fin year as per internal Financial system and Marketometer
Means of Validation	Contracts and service level agreements and the associated transactional amounts
Data limitations	None.
Type of indicator	Output
Calculation type	Cumulative
Reporting cycle	Annually
New indicator	Yes
Desired SANSa performance	Target is R3 million based on a proportion percentage of 5% of International income
Desired Divisional performance	5%
Executive responsible	MD: SO
Portfolio Responsibility	Space Operations: Finance manager

Indicator title	<u>M3.2.1. The number of direct jobs supported externally through SANSA programme contracting</u>
Short definition	Number of personnel employed full time on the EO-Sat1 Programme, Cube Sat programme or any other equipment or instrumentation build programme either by the main contractor or subcontractors funded through SANSA.
Purpose/importance	Indicates the number of opportunities being offered to the space industry in the country. One of the objectives of the Economic Competitiveness Support Programme (ECSP) is to create jobs. However, SANSA outsources the bulk of the work in line with government's decision that the satellite build programme should be done in partnership with Denel. Further, the SANSA Act mandates SANSA to stimulate the national space industry. Therefore, this KPI measures the extent to which these two objectives are met.
Source/collection of data	Signed reports issued by the contractors to whom the work is contracted.
Method of calculation	Summation of all the jobs being occupied by contractor and subcontractor personnel on this Programme
System Used	Manual
Description of KPI reporting activities	Now, a single report exists: "Industry Development & Localization Management Plan", by Denel Dynamics, from where the information is extracted This report is issued quarterly
Means of Validation	Verification of information with the main contractor/subcontractor on a regular basis
Data limitations	Given that some of the external employees do not solely focus on the SANSA contracted programmes, a more accurate count is not employee numbers but rather employee Full Time Equivalents (FTE). Therefore, going forward SANSA has to find ways of refining this metric. Currently this KPI does not measure employee demographics which information is required by the DST and the PPC. Therefore, this information has to be collected and recorded and presented in the narrative of the report.
Type of indicator	Output
Calculation type	Cumulative
Reporting cycle	Annually
New indicator	No
Desired SANSA performance	Total of 55 jobs supported
Desired Divisional performance	SPD: 55 jobs supported
Executive responsible	ED: SPD
Portfolio Responsible	Space Programme manager Cube Sat – Programme coordinator Any other designated project coordinators

Indicator title	<u>M3.2.2. The total contract expenditure to SME's for core space projects</u>
Short definition	The KPI measures the contract value that is outsourced to Small to Medium Enterprises (SMEs) for all SANSa programmes including EO, SS, SO and SE programmes, in the main SE. This should include the component that Denel outsources to SMEs as part of the EO-Sat1 project. This should exclude the EO-Sat1 money spent within Denel. This should not include consultancy expenditure for general support initiatives. This should include direct support on the satellite development
Purpose/importance	This measures the extent to which SANSa is supporting SMEs through its core space projects.
Source/collection of data	Internal contracts and invoices and auditable reports from the supported companies, such as Denel.
Method of calculation	Manual
System Used	Contract register and financial system
Description of KPI reporting activities	Quarterly
Means of Validation	Invoices
Data limitations	Accuracy in classifying which companies are SMEs and which are not. This information is dependent on the annual turnover of the relevant company and this information is not necessarily readily available.
Type of indicator	Input
Calculation type	Cumulative
Reporting cycle	Annually
New indicator	No
Desired SANSa performance	A total of R 10 million to be outsourced to SMEs this financial year.
Desired Divisional performance	Space Engineering: R10 million Earth Observation: R1,9 million
Executive responsible	ED: SP; MD:EO
Portfolio Responsibility	Earth Observation: Stakeholder and Finance manager Space Engineering: Space Programme Manager

Indicator title	<u>M3.2.3. The total contract expenditure to the broad space related industry for core space projects</u>
Short definition	The KPI measures the contract value that is outsourced to Small to Medium Enterprises (SMEs) and big industry players. This is the total investment to date on the programme. (This should not include consultancy expenditure for general support initiatives).
Purpose/importance	This is a true measure of the capital invested in re-establishing the space industry in South Africa
Source/collection of data	Internal contracts and invoices and auditable reports from affected companies.
Method of calculation	Manual
System Used	Contract register and financial system
Description of KPI reporting activities	Quarterly: The Programme Manager must keep an updated account of all funds invested, per contract, in industry. This is to be reported in the quarterly report every quarter
Means of Validation	Invoices and an extract from the financial management system on invoices paid
Data limitations	SANSA can only report on the funds expended on Programmes under its control
Type of indicator	Input: Broader impact on space industry
Calculation type	Cumulative
Reporting cycle	Quarterly
New indicator	This is an existing but modified indicator
Desired SANSA performance	A total of R50 million to be contracted to the broader space industry this financial year.
Desired Divisional performance	As above
Executive responsible	ED: SP
Portfolio Responsibility	Space Programme Manager SPD

Indicator title	<u>M4.1.1. The progress status on the EO-Sat1 development</u>
Short definition	This indicator establishes the technical progress accomplished when compared to the full development cycle and schedule of the project
Purpose/importance	This is to measure the progress that is being made in the development of EO-Sat1 and allow for any remedial actions to be taken proactively to ensure the timely completion of the project.
Source/collection of data	Original programme schedule and latest programme schedule. Tracking of progress against key milestones.
Method of calculation	Compare the date originally planned for a future programme review against the presently planned date, and calculate the difference, establishing then if the programme is delayed or if it is ahead of time. The progress is made measured on Key defining points (e.g. PDR,CDR,QAR,FAR) as planned,
System Used	Manual
Description of KPI reporting activities	An “EO-Sat1 Programme/Project Progress Report” is produced quarterly. This report is summarised to represent the important events of the last quarter and presented to the Board Strategy and Investment Committee Meeting. Once approved, the report is then escalated to the Board.
Means of Validation	Comparison of latest programme schedule against the original programme schedule
Data limitations	The schedule is dependent on the availability of funds to execute the programme schedule.
Type of indicator	Output: Measures scheduled performance
Calculation type	Cumulative
Reporting cycle	Annually
New indicator	No – Established indicator
Desired SANSA performance	Critical Design Review(CDR) completed for the Space System flight model 2018/19
Desired Divisional performance	As Above
Executive responsible	ED: SP
Portfolio Responsibility	SPD: Project Manager

Indicator title	<u>M4.1.2.The progress status on the CubeSat development</u>
Short definition	This indicator establishes the technical progress accomplished when compared to the full development cycle and schedule of the project
Purpose/importance	This is to measure the progress that is being made in the development of Cube sat and allow for any remedial actions to be taken proactively to ensure the timely completion of the project.
Source/collection of data	Original programme schedule and latest programme schedule. Tracking of progress against key milestones.
Method of calculation	Compare the date originally planned for a future programme review against the presently planned date, and calculate the difference, establishing then if the programme is delayed or if it is ahead of time.
System Used	Manual
Description of KPI reporting activities	A quarterly report is summarised to represent the important events of the last quarter and presented to the Board Strategy and Investment Committee Meeting. Once approved, the report is then escalated to the Board.
Means of Validation	Comparison of latest programme schedule against the original programme schedule
Data limitations	The schedule is dependent on the availability of funds to execute the programme schedule.
Type of indicator	Output: Measures scheduled performance
Calculation type	Cumulative
Reporting cycle	Annually
New indicator	No – Established indicator
Desired SANSA performance	Completion of the qualification phase and flight model phase, and Launch and commission.
Desired Divisional performance	Same as Above
Executive responsible	ED Space Engineering
Portfolio Responsibility	Space Engineering Project Manager

Indicator title	<u>M5.1.1. Number of active formal overseas partnerships</u>
Short definition	This indicator is aimed at developing global space partnerships
Purpose/importance	This is meant to leverage a significant benefit for the space programme through global partnerships
Source/collection of data	MoUs, Meeting minutes and Joint Project Reports
Method of calculation	MoUs signed, meetings held and progress status on joint projects
System Used	Manual
Description of KPI reporting activities	A quarterly report is summarised to represent the important events of the last quarter and presented to the Executive Committee for approval.
Means of Validation	Approval of reports by EXCO
Data limitations	Progress may be limited by the availability of funds to implement the resolutions of the MoUs
Type of indicator	Activity
Calculation type	Cumulative
Reporting cycle	Annually
New indicator	Yes
Desired SANSA performance	5
Desired Divisional performance	EO - 2 SS – 2 SE - 1
Executive responsible	MD Earth Observation, MD Space Science & MD Space Engineering
Portfolio Responsibility	SANSA Stakeholder Liaison Specialist

Indicator title	<u>M5.1.2. Number of active formal African partnerships</u>
Short definition	This indicator is aimed at developing African partnerships
Purpose/importance	This is meant to leverage a significant benefit for the space programme through African partnerships
Source/collection of data	MoUs, Meeting minutes and Joint Project Reports
Method of calculation	MoUs signed, meetings held and progress status on joint projects
System Used	Manual
Description of KPI reporting activities	A quarterly report is summarised to represent the important events of the last quarter and presented to the Executive Committee Meeting.
Means of Validation	Approval of reports by the EXCO
Data limitations	Progress may be limited by the availability of funds to implement the resolutions of the MoUs
Type of indicator	Activity
Calculation type	Cumulative
Reporting cycle	Annually
New indicator	Yes
Desired SANSA performance	5
Desired Divisional performance	EO - 2 SS – 2 SE - 1
Executive responsible	MD Earth Observation, MD Space Science & MD Space Engineering
Portfolio Responsibility	SANSA Stakeholder Liaison Specialist

Indicator title	<u>M5.1.3. Number of active formal national partnerships</u>
Short definition	This indicator is aimed at establishing national partnerships with key stakeholders
Purpose/importance	This is meant to leverage a significant benefit for the space programme through national partnerships
Source/collection of data	MoUs, Meeting minutes and Joint Project Reports
Method of calculation	MoUs signed, meetings held and progress status on joint projects
System Used	Manual
Description of KPI reporting activities	A quarterly report is summarised to represent the important events of the last quarter and presented to the Executive Committee Meeting.
Means of Validation	Approval of reports by the SANSA EXCO
Data limitations	Progress may be limited by the availability of funds to implement the resolutions of the MoUs
Type of indicator	Activity
Calculation type	Cumulative
Reporting cycle	Annually
New indicator	Yes
Desired SANSA performance	5
Desired Divisional performance	EO - 2 SS - 2 SE - 1
Executive responsible	MD Earth Observation, MD Space Science & MD Space Engineering
Portfolio Responsibility	SANSA Stakeholder Liaison Specialist

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2. South African Government Reports and Plans
3. <http://www.sia.org/annual-state-of-the-satellite-industry-reports/2014-sia-state-of-satellite-industry-report/>
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