



Annual Performance Plan 2020/21



Foreword

The 2020/21 financial year signals the start of a new five-year term for which the SANSA Strategic Plan 2020-2025 provides the essential framework for implementation. Notwithstanding the financial challenges faced by the Agency and though the current targets are conservatively aligned to the budgetary allocation, our commitment still remains in positioning the Agency to deliver on its full mandate, as espoused in the National Space Policy, the National Space Strategy and the South African Earth Observation Systems Strategy. In addition, concerted efforts will be placed on positioning the local space sector to deliver on a regional and continental space agenda, given recent initiatives to formalise a SADC and African space programmes, respectively.

This Annual Performance Plan therefore forms a convenient bridge between a measured approach taken to date in terms of operational focus to exploring a bolder, expansive approach in terms of strategic positioning, including rethinking our current operational approach - where necessary. SANSA has embarked on (i) a business model exercise, (ii) an organisational culture change initiative, and (iii) an Institutional Review, with a view to ensuring efficiencies, effectiveness and relevancy into the 2020/21 financial year and beyond. It is envisaged that 2020/21 financial will be a year of consolidation and venturing into new domains, referred to as aspirational programmes, 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. SANSA will reach out to its end-user base, both current and potential, in order to maximise the use of space products and services across all tiers of government, both nationally and on the Continent.

SANSA's relevance will be demonstrated through how well it assists in resolving the various socio-economic-environmental challenges of the Country and the Continent. SANSA will delineate its role with respect to the rest of the sector to ensure that it provides the appropriate level of leadership and support, whilst driving new ways of doing things, including embracing new technology platforms and folding in aspects of the fourth industrial revolution into our operations. Whilst this Annual Performance Plan remains aligned to the conservative fiscal allocation that is committed to the Agency, the Strategic Plan articulates aspirational programmes that will form the mainstay of our growth and sustainability trajectories.

It therefore fills me with excitement and gives me great pleasure to release the 2020/21 Annual Performance Plan of SANSA.




Ms Xoliswa Kakana
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 & Innovation (DSI);
- 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 2020/21.

Ms Bulelwa Pono
Chief Financial Officer

Signature:  _____

Dr Valanathan Munsami
Chief Executive Officer

Signature:  _____

Ms Xoliswa Kakana
Board Chairperson
On behalf of Accounting Authority

Signature:  _____

Approved by:

Dr Blade Nzimande

Signature _____
Minister of Higher Education, Science and Technology
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Contents

ACRONYMS	5
EXECUTIVE SUMMARY	6
PART A: OUR MANDATE	8
1 Updates to the relevant legislative and policy mandates	8
2 Updates to Institutional Policies and Strategies	8
PART B: OUR STRATEGIC FOCUS	8
3 Updated Situational Analysis	8
PART C: MEASURING OUR PERFORMANCE	8
4 Institutional Programme Performance Information	8
4.1 Administration Programme	8
4.2 Earth Observation Programme	11
4.3 Space Science Programme	17
4.4 Space Operations Programme	22
4.5 Space Engineering Programme.....	25
5 Updated Key Risks	29
6 Infrastructure Projects	29
7 District Delivery Model	30
PART D: TECHNICAL INDICATOR DESCRIPTION	31

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 Mission is

"To provide leadership in unlocking the potential of space for the advancement and benefit of humanity"

and the Vision of the Agency is to ensure

"An integrated national space capability that responds to socio-economic challenges in Africa by 2030"

To achieve this, SANSA has five 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,
- Goal 4: The development of requisite human capacity that is needed for the implementation of key space initiatives, and
- Goal 5: The positioning of SANSA as a key enabler of government's policy imperatives.

SANSA implements its five 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 Medium-Term Strategic Framework (MTSF), the DSI 2019 White Paper on STI, 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. In line with the White Paper on Science, Technology and Innovation, on revitalising the role of State-Owned Enterprises, SANSA will pursue R&D programmes and partnerships, identify and implement flagship programmes with a requisite focus human capital development and transformation, and closing the domestic technological knowledge gaps.

Key Deliverables for the Year

1. SANSA will deliver **6 high-impact products and services**.
2. SANSA will 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 (see Annexure for further explanation).
3. SANSA will provide support to **50 students and interns** for studies in Earth Observation, Space Science, and Space Engineering.
4. SANSA will aim to **generate R68 million from both national and international space operations contracts**.
5. SANSA will raise awareness of **4 000 youth**, through direct engagement.
6. If satellite programme funding is received, SANSA aims to continue to **out-source in excess of R10 million to the broader space industry and 20% of the total contracted value to SMEs** through the satellite-build programme.

PART A: OUR MANDATE

1 Updates to the relevant legislative and policy mandates

There have been no recent updates on the legislative and policy mandates of SANSA. However, it should be noted that the Department of Trade and Industry is in the process of revoking and replacing the Space Affairs Act, which only be realised in the next year or two.

2 Updates to Institutional Policies and Strategies

The institutional policies and strategies, as reflected in the Strategic Plan, have not been changed and therefore remains relevant for the 2020/21 Financial Year.

PART B: OUR STRATEGIC FOCUS

3 Updated Situational Analysis

The situational analysis as reflected in the Strategic Plan, including the SWOT analysis, remains relevant for the 2020/21 Financial year.

PART C: MEASURING OUR PERFORMANCE

4 Institutional Programme Performance Information

The performance information for each of the SANSA Programmes are presented next.

4.1 Administration Programme

4.1.1 Purpose of the Administration Programme

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. The focus of the Administration Programme is 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.

4.1.2 Programme Outputs

The core outputs of the Administration Programme are to:

1. Transform SANSA into a high performing Agency through effecting changes in our enterprise, financial and supply chain support functions.
2. Raising the brand value of SANSA.

By so doing, the intended outcomes are to:

1. Ensure efficiencies in terms of our people, systems and processes, and
2. Raise the brand visibility of SANSA.

The net impact of these outcomes is to (i) ensure that the socio-economic priorities of the country are achieved in a cost effective and sustainable manner, and (ii) the value proposition of space is understood by all South Africans.

4.1.3 Output Indicators and Targets

Administration Programme				Quarterly Targets			
Strategic Objective	Activities	Key Performance Indicator/ Measure	Annual Target	Q1	Q2	Q3	Q4
S5 Develop active partnerships and implement changes	S5.2 Develop and implement an Organisational Redesign and Marketing Initiatives	M5.2.3 Number of initiatives to transform SANSA into a high performing Agency	4	Approved HR Strategy	Approved Marketing Strategy and approved Communications Strategy	Approved Business Model and Organisational Design	-

4.1.4 Explanation of Planned Performance over the medium-term period

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 financial 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.

4.1.4 Programme Resource Considerations

ADMINISTRATION PROGRAMME - REVENUE ESTIMATES

Administration	Audited Outcomes	Audited Outcomes	Audited Outcomes	Original Budget	Revised Budget	Medium Term Expenditure Framework			Total MTEF
	2016/17	2017/18	2018/19	2019/20	2019/20	2020/21	2021/22	2022/23	
REVENUE									
Revenue from Non - Exchange Transactions	44 028 103	42 996 256	54 672 337	52 688 675	53 972 351	55 590 785	57 658 402	58 711 005	171 960 192
Operational Transfers	40 168 000	42 996 256	53 785 359	52 688 675	53 263 335	55 590 785	57 658 402	58 711 005	171 960 192
Parliamentary Grant	40 168 000	42 996 256	53 785 359	52 688 675	53 263 335	55 590 785	57 658 402	58 711 005	171 960 192
Ring fenced Grants	3 860 103	-	886 978	-	709 016	-	-	-	-
Post graduate student bursary support -DST Outreach Program	3 860 103	-	886 978	-	709 016	-	-	-	-
Revenue from Exchange Transactions	9 865 128	9 780 880	6 329 524	3 634 904	3 634 904	2 217 784	2 705 098	2 834 943	7 757 826
Other Income	9 865 128	9 780 880	6 329 524	3 634 904	3 634 904	2 217 784	2 705 098	2 834 943	7 757 826
Interest Income	8 165 802	6 739 834	6 329 524	3 634 904	3 634 904	2 217 784	2 705 098	2 834 943	7 757 826
Other Income	1 699 326	3 041 046	-	-	-	-	-	-	-
Commitments					9 740 995				-
Total Revenue	53 893 231	52 777 136	61 001 861	56 323 579	67 348 249	57 808 569	60 363 500	61 545 948	179 718 018

ADMINISTRATION PROGRAMME - EXPENDITURE ESTIMATES

Administration	Audited Outcomes	Audited Outcomes	Audited Outcomes	Original Budget	Revised Budget	Medium Term Expenditure Framework			Total MTEF
	2016/17	2017/18	2018/19	2019/20	2019/20	2020/21	2021/22	2022/23	
Expenditure									
Employee Related Costs - CTC	27 077 308	31 122 189	33 767 594	30 768 322	28 081 967	33 331 842	35 498 412	37 202 336	106 032 590
Incentive Bonus Provision				2 564 027	2 375 115	2 275 763	2 423 688	2 540 025	7 239 477
Board Member Remuneration	1 069 887	1 170 199	1 002 124	1 458 674	1 215 074	977 271	1 031 021	1 080 510	3 088 802
Depreciation and Amortisation	1 362 128	899 371	905 425	-	-	-	-	-	-
Repairs and Maintenance	274 944	572 473	643 690	1 445 760	1 347 833	399 490	421 462	441 692	1 262 645
Finance Costs	24 339	-	-	-	-	-	-	-	-
Grants and Subsidies Paid	927 500	354 000	48 000	-	-	-	-	-	-
Training Expenses	982 267	373 070	211 781	678 480	1 080 480	486 236	512 979	537 602	1 536 816
General Expenses	15 873 702	15 230 896	14 611 102	18 988 316	31 133 928	19 937 967	20 053 939	19 301 528	59 293 433
Net Losses on foreign exchange transactions	154 563	1 297	1 297	-	-	-	-	-	-
Loss on Disposal of Property, Plant and Equipment	36 306	30 219	18 353	-	-	-	-	-	-
Total Operating Expenditure	47 782 945	49 753 714	51 209 365	55 903 579	65 234 397	57 408 569	59 941 500	61 103 692	178 453 762
Surplus / (Deficit) for the year	6 110 285	3 023 422	9 792 496	420 000	2 113 852	400 000	422 000	442 256	1 264 256
Capital Expenditure	-	-	-	420 000	2 113 852	400 000	422 000	442 256	1 264 256
Machinery and equipment					189 326	400 000	422 000	442 256	1 264 256
Computer Equipment				420 000	577 000	-	-	-	-
					1 347 527	-	-	-	-
Total Expenditure	47 782 945	49 753 714	51 209 365	56 323 579	67 348 249	57 808 569	60 363 500	61 545 948	179 718 018

4.2 Earth Observation Programme

4.2.1 Purpose of Programme

The Earth Observation Programme (EOP) is responsible for the development and promotion of Earth observations products for socio-economic development and improved livelihoods in South Africa and the African continent. The objective is to collect, assimilate and disseminate earth observation data and products to support South Africa's policymaking and implementation for socio-economic growth through areas that include food security, water resource management, integrated spatial planning and land reform, disaster management, peace and security, oceans economy and global change.

The Programme's core function is the implementation of the South African Earth Observation Systems Strategy (SAEOSS). The SAEOSS implementation requires the contribution of all players in the EO value chain, which include academia, research councils, private sector and government departments and its entities, collectively forming the Earth observation sector. International partnerships, through initiatives such as AfriGEO, ARMC, Group on Earth Observations (GEO), the Committee on Earth Observation Satellites (CEOS) and various bilateral and multi-lateral agreements, are required to stimulate the growth of local earth observation capabilities.

The EOP will use this coordination and facilitation role to position the South Africa EO sector as a regional nucleus for innovative space solutions. Critical to this achieving this objective is broad stakeholder consultations to be achieved through focused, systematic and tailored engagements. These "listening posts" include direct interaction with stakeholders, establishment & engagement with Communities of Practice, the annual Space for National Development symposium, EO interaction with ZASpace Inc (industry association), through various workshops and surveys.

4.2.2 Programme Outputs

The core outputs of the Earth Observation (EO) programme include:

- maintaining a long-term archive of satellite data for national benefits that is essential for change detection for better understanding environmental change in time and space;
- provision of state-of-the-art data infrastructure for the delivery of essential Earth observation services,
- sector development through partnerships for learning (human capital development), growth, transformation, and competitiveness;
- managing product and services to maturity to meet user information needs;
- marketing Earth observations for understanding, creating, and delivering profitable value to customers; and
- research, develop and innovate to transact at the cutting edge of global knowledge.

The outcome of Earth observation lies in providing:

- coordinated procurement of satellite data for government and its entities;
- world class operational EO Data infrastructure (i) enabling delivery of essential information products and services (ii) stimulating local industry and scientific development and (iii) ensuring the long-term retention of EO data;
- fit for purpose and efficient products, services and decision support tools that can support the district development model; Agriculture and food security; Water resource management; Integrated spatial planning and land reform; Disaster management; Peace and security; Global change; and Oceans and coastal zone management.
- coordinated national EO research agenda;
- understanding of the national and global marketplace and positioning South Africa to capture a market share;
- organised, networked and coordinated sector;

- inclusive, growing and increasingly competitive industry;
- enriched public and youth understanding of space science and STEM;
- skilled and informed sector; and
- national, continental and international partnerships informing growth.

4.2.3 Output Indicators and Targets

Earth Observation Programme				Quarterly Targets			
Strategic Objective	Activities	Key Performance Indicator/ Measure	Annual Target	Q1	Q2	Q3	Q4
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	2000	0	0	0	2000
	S1.2 Support students and interns	M1.2.1 Number of students and interns supported for formalized training	20	20	-	-	-
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 applications to address society's needs and challenges	M2.1.1 Number of products and applications	data as a service offering	data as a service offering (ongoing)	data as a service offering (ongoing)	data as a service offering (ongoing)	data as a service offering (ongoing)
			Earth observation products and services to support decision making	Earth observation products and services to support decision making (ongoing)	Earth observation products and services to support decision making (ongoing)	Earth observation products and services to support decision making	Earth observation products and services to support decision making
			infrastructure as a service offering	Implementation plan for demonstration use case	Developed use case	User engagement on applications development	Use cases developed by users
	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 To develop, grow and transform the indigenous space industry that is responsive to local needs and is globally positioned	S3.2 Grow the local space industry	M3.2.1 The total contract expenditure to SMEs for core space projects	20%	-	20%	20%	20%

Earth Observation Programme				Quarterly Targets			
Strategic Objective	Activities	Key Performance Indicator/ Measure	Annual Target	Q1	Q2	Q3	Q4
S4 To build and host the appropriate infrastructure that will support the national space sector	S4.2 Development or upgrade of infrastructure	M4.2.2 Development of Digital Earth South Africa	Ingestion of SPOT archive	50% ingestion	100% Ingestion	-	-
S5 Develop active partnerships	S5.1 Leverage a significant benefit for the space programme through partnerships	M5.1.1 Number of active formal overseas partnerships	5	2	-	1	2
		M5.1.2 Number of active formal African partnerships	5	2	-	1	2
		M5.1.3 Number of active formal national partnerships	8	4	-	2	2
	S5.2 Develop and implement a Marketing Strategy	M5.2.1 Percentage of government departments and public entities that are using space products and services	30%	10%	15%	20%	30%
		M5.2.2 Number of awareness and training interventions to key users of space-based products and services	4	1	1	1	1

4.2.4 Explanation of planned performance over the medium-term period

Address South Africa's challenges through space services and products

Application products and services

The Earth observations programme will ensure the development and implementation of operational EO applications with high socio-economic benefit. It therefore focuses on the final destination of the space value-chain, i.e. products and services. These applications will be developed and implemented by collaboration between SANSA, research councils, universities, private sector and government departments and entities to ensure that the full suite of national capabilities are deployed.

Based on analysis of government priorities, understanding of existing broad user requirements and existing "low-hanging fruit" capability of the South African EO sector, the EOP will initially focus on seven (7) application areas, namely:

- Agriculture and food security;
- Water resource management;
- Integrated spatial planning (incl. infrastructure monitoring) and land reform;
- Disaster management;
- Peace and security;
- Global change; and
- Oceans and coastal zone management (towards blue economy).

These application areas represent priorities that address a very wide range of societal benefits, for actual products and services, further definition of user requirements will be undertaken with the user communities, to ensure response to immediate needs and challenges.

Data Infrastructure for the delivery of essential Earth observation services

Earth observation Infrastructure development (direct data reception, data processing, long term data archiving and data distribution) forms a critical backbone for the growth and competitiveness of the South African Earth observation programme. It is a unique system level value add that SANSA is able to provide, by virtue of its mandate, to the South African Earth observations community. Provision of such national level infrastructure is especially important for the efficient and effective delivery of data, value added products and services to unlock socio-economic impact, stimulate innovation, grow industry and access new markets.

An approach favoured by SANSA to realise this goal is the establishment of a High-Performance Computing Centre for operational Earth observations, enabled for Big Data processing and with the capacity to provide cloud-based services. Cloud computing and advanced machine learning will enable better scalability to accommodate information requirements beyond 2030, facilitate enhanced and ubiquitous access to space-based Earth observation data and services and promote a focused data analytics and data systems research programme.

The initial vehicle to achieve this ambition is through the development of a data cube, namely Digital Earth South Africa (DESA). DESA aims to optimise the existing SANSA Earth Observation Data Centre towards the delivery of a unique capability to process, interrogate, and present SANSA's portfolio of archived satellite imagery, dating as far back as 1972.

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.

Lead high-impact collaborative R&D on a national scale

The future success of South Africa's Earth observation ecosystem to innovate and transact is dependent on proactive and collaborative R&D to address knowledge gaps and create new knowledge throughout the Earth observations value chain. It is fundamental for South Africa to develop a coordinated national Earth observations research agenda that is facilitated by

SANSA, overseen by a multi-stakeholder Research Advisory Group and implemented in collaboration with Universities, Science Councils, local Industry and the international community.

This research agenda must in the first instance span fundamental to applied research in earth observations and be aimed at increase South Africa's research output, contribution to global knowledge and intellectual property stocks across the Earth observation value chain. Secondly, the research agenda should be aimed at developing indigenous solutions that address both local and global challenges. Thirdly, the research agenda must be geared towards creating an innovative and competitive South African industry. An intentional connection between the researchers and entrepreneurs is to be established through the Space Cluster initiative.

Enhance the competitiveness of the South African space industry

Creating a sustained inclusive growth in the South African EO sector that is cognisant of transformation imperatives will require coordination amongst different stakeholders which is best achieved through a cluster approach. A coordinated approach, that specifically explores the research, development, and innovation ambitions of South Africa, will allow for strategic impact – currently, efforts are non-directed, and therefore do not achieve defined national priorities. A variety of space clusters have been established across the world, with significant benefits for their host countries, creating tens of thousands of jobs, and spinning out numerous companies that have global coverage. The cluster approach will allow for a focused human capital development programme from learner to professional development and entrepreneurship, thereby building a truly indigenous space capability, in both the private and the public sectors, taking “South Africa to Africa and the world”.

Further, SANSA will lead the South African Earth Observation Open Innovation Challenge in collaboration with various partners in the industry development value chain as well as run a coordinated call for proposals under the national research, development and innovation fund to drive the development of fit for purpose products and services.

Develop national human capacity and ensure transformation

A vibrant human capital development programme that builds in existing capability will be implemented in 2020/21. 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. Professional development support will be provided through short training courses and direct engagements with professionals in the EO sector.

The Science Engagement services will be implemented within the context of 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 engaged is aligned with the 11 identified segments of the public in the Department of Science & Innovation's (DSI) Science Engagement Framework intended to improve the coordination of and encourage science promotion, communication and engagement activities.

Develop active partnerships

SANSA Earth Observation Directorate will proactive 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 to its clients. At a national level SANSA will partner and collaborate with institutions in the National System of Innovation such as research councils, universities and partners 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. Agency to Agency collaborations will be strengthened with agencies participating in the ARMC, CEOS, and BRIC Constellation Partnership. SANSa will play a greater role in co-ordinating national earth observation through GEO and AfriGEOSS. 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.

4.2.5 Programme Resource Considerations

EARTH OBSERVATION PROGRAMME - REVENUE ESTIMATES

Rand	Audited Outcomes	Audited Outcomes	Audited Outcomes	Original Budget	Revised Budget	Medium Term Expenditure Framework			Total MTEF
	2016/17	2017/18	2018/19	2019/20	2019/20	2020/21	2021/22	2022/23	
REVENUE									
Revenue from Non - Exchange Transactions	60 981 000	64 246 991	69 414 254	35 731 342	79 665 863	37 691 590	39 274 637	41 159 820	118 126 047
Operational Transfers	60 981 000	62 410 050	40 676 775	35 731 342	35 731 342	37 691 590	39 274 637	41 159 820	118 126 047
Parliamentary Grant	60 981 000	62 410 050	40 676 775	35 731 342	35 731 342	37 691 590	39 274 637	41 159 820	118 126 047
Ring fenced Grants	-	1 836 941	28 737 479	-	43 934 521	-	-	-	-
Post graduate student bursary support -DST	-	1 690 500	-	-	-	-	-	-	-
Operation Phakisa - Ocean and Coast SAR d	-	146 441	28 737 479	-	17 967 105	-	-	-	-
DST Afrigeos	-	-	-	-	1 500 000	-	-	-	-
EO RDI Fund	-	-	-	-	7 000 000	-	-	-	-
EO Public Awareness	-	-	-	-	1 000 000	-	-	-	-
Def Grant -IASSTI For SA	-	-	-	-	1 000 000	-	-	-	-
EO Data & Infrastructure	-	-	-	-	15 467 416	-	-	-	-
Revenue from Exchange Transactions	11 296 129	12 016 736	16 877 410	21 544 944	16 190 221	15 436 000	13 436 000	13 536 426	42 408 426
Rendering of Services	10 304 616	7 528 680	16 696 429	21 144 944	16 040 221	15 236 000	13 236 000	13 336 426	41 808 426
Contract Revenue - Public Sector	10 304 616	6 822 743	14 695 190	17 091 944	9 833 374	12 986 000	12 986 000	12 986 000	38 958 000
Contract Revenue - Private Sector	-	350 366	323 084	303 000	203 000	250 000	250 000	350 426	850 426
Contract Revenue - Foreign	-	355 572	1 678 156	3 750 000	6 003 847	2 000 000	-	-	2 000 000
Other Income	991 513	4 488 056	180 980	400 000	150 000	200 000	200 000	200 000	600 000
Interest Income	815 722	232 253	246 155	400 000	150 000	200 000	200 000	200 000	600 000
Other Income	175 791	4 255 802	7 430	-	-	-	-	-	-
Net Gains on Foreign exchange transactions	-	-	(72 604)	-	-	-	-	-	-
Commitments	-	-	-	-	8 070 636	-	-	-	-
Total Revenue	72 277 129	76 263 727	86 291 664	57 276 286	103 926 720	53 127 590	52 710 637	54 696 245	160 534 473

EARTH OBSERVATION PROGRAMME - EXPENDITURE ESTIMATES

Rand	Audited Outcomes	Audited Outcomes	Audited Outcomes	Original Budget	Revised Budget	Medium Term Expenditure Framework			Total MTEF
	2016/17	2017/18	2018/19	2019/20	2019/20	2020/21	2021/22	2022/23	
Expenditure									
Employee Related Costs - CTC	23 337 493	23 230 175	22 645 100	24 096 948	23 746 948	25 839 276	27 518 829	28 044 770	81 402 875
Incentive Bonus Provision	-	-	-	2 008 079	2 008 079	2 027 922	2 159 737	2 097 724	6 285 382
Depreciation and Amortisation	8 357 660	8 574 752	7 787 341	-	-	-	-	-	-
Repairs and Maintenance	2 473 603	2 319 891	2 818 030	3 330 000	3 646 220	2 200 000	2 321 000	2 881 213	7 402 213
Data Licence fees	36 124 088	34 451 213	28 737 479	15 690 384	30 123 107	16 553 355	17 463 790	17 596 249	51 613 394
Grants and Subsidies Paid	1 445 100	1 584 360	32 241	-	9 500 000	-	-	-	-
Training Expenses	319 919	302 009	524 316	1 500 000	1 500 000	800 000	844 000	1 000 000	2 644 000
General Expenses	17 353 807	22 991 295	3 878 981	2 650 875	3 994 471	4 407 037	2 403 282	2 521 289	9 331 608
Net Losses on foreign exchange transactions	-6 767	862 611	-	-	-	-	-	-	-
Equipment	-	1 702	-	-	-	-	-	-	-
Total Operating Expenditure	89 404 903	94 318 007	66 423 488	49 276 286	74 518 825	51 827 590	52 710 637	54 141 245	158 679 473
Surplus / (Deficit) for the year	-17 127 774	-18 054 281	19 868 176	8 000 000	29 407 895	1 300 000	-	555 000	1 855 000
Capital Expenditure	247 363	-	-	8 000 000	29 407 895	1 300 000	-	555 000	1 855 000
Machinery and equipment	247 363	-	-	-	-	-	-	-	-
Computer Equipment	-	-	-	8 000 000	23 600 000	500 000	-	555 000	1 055 000
Software and intangible assets	-	-	-	-	5 807 895	-	-	-	-
Vehicles	-	-	-	-	-	800 000	-	-	800 000
Total Expenditure	89 652 266	94 318 007	66 423 488	57 276 286	103 926 720	53 127 590	52 710 637	54 696 245	160 534 473

4.3 Space Science Programme

4.3.1 Purpose of Programme

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.

4.3.2 Programme Outputs

The core outputs of the Space Science Programme are:

- Installing and maintaining infrastructure for operational services and for R&D;
- generation of knowledge to advance our understanding of the solar terrestrial environment;
- development of products and services in accordance with the requirements of our clients;
- development of human capital to advance the above and meet the skills need of the country;
- advancement of science amongst the youth and the public
- development and maintenance of international partnerships; and
- participation in international fora such as in the United Nations and ICAO related Committee meetings.

The outcomes expected from realising these outputs are:

- creation of new knowledge; developing knowledge economy; providing foundation for enhancement of understanding and development of applications.
- contribution to safety and security through the provision of magnetic information for the region that is utilised in mapping applications.
- maintaining a world class facility that provides unique infrastructure to the nation - contributing to government priorities, knowledge economy, space industry, and regional reach.
- provision of a national southern oceans and polar regions platform that facilitates new science, new applications, and paves the way for improved space weather products and services. This in turn will impact the ability to provide early warnings that then allow for mitigation measures to be put in place.
- human capital development and science advancement in space science related fields.

4.3.3 Output Indicators and Targets

Space Science Programme				Quarterly Targets			
Strategic Objective	Activities	Key Performance Indicator/Measure	Annual Target	Q1	Q2	Q3	Q4
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 youths directly engaged	2000	0	100	400	1500
	S1.2 Support students and interns	M1.2.1 Number of students and interns supported for formalized training	21	21	-	-	-

Space Science Programme				Quarterly Targets			
Strategic Objective	Activities	Key Performance Indicator/Measure	Annual Target	Q1	Q2	Q3	Q4
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 products and applications	Space weather products and services.	Space weather products and services (ongoing)	Space weather products and services (ongoing)	Space weather products and services (ongoing)	Space weather products and services (ongoing).
			Magnetic Technology products and services	Magnetic Technology products and services (ongoing)	Magnetic Technology products and services (ongoing)	Magnetic Technology products and services (ongoing)	Magnetic Technology products and services (ongoing)
	S2.2 Increase the national space research output	M2.2.1 The national research productivity score for space supported R&D	1000	200	300	300	200
S4 To build and host the appropriate infrastructure that will support the national space sector	S4.2 Development or upgrade of infrastructure	M4.2.1 A new operational space weather centre, as per an approved Business Case	20%				20%
S5 Develop active partnerships	S5.1 Leverage a significant benefit for the space programme through partnerships	M5.1.1 Number of active formal overseas partnerships	3	1	-	1	1
		M5.1.2 Number of active formal African partnerships	3	1	-	1	1
		M5.1.3 Number of active formal national partnerships	3	1	-	1	1
	S5.2 Develop and implement organisational redesign and marketing initiatives	M5.2.2 Number of awareness and training interventions to key users of space-based products and services	3	1	1	-	1

4.3.4 Explanation of planned performance over the medium-term period

Address South Africa's challenges through space services and products

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 implemented regulations including space weather information in all flight plans. SANSA has received designation as the aviation space weather information provider for Africa and is in the process of assisting 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 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 2020/21 include:

- further improvements to the space weather product and service portfolio;
- continued delivery of products and services to the defence and energy sector;
- 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.

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 2020/21 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.

Lead high-impact collaborative R&D on a national scale

Conduct space science research and create new knowledge and a better understanding of the universe and the near-Earth space environment. 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 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. Priorities for 2020/21 include the recruitment of a Research Chair in Solar Physics to expand the research knowledge areas in support of operational space weather.

Develop national human capacity and ensure transformation

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.

Develop active partnerships

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 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. In addition, through the space weather and research projects SANSA will continue to partner with African and International institutions to grow the knowledge base for the country and the region.

4.3.5 Revenue Resource Considerations

SPACE SCIENCE PROGRAMME - REVENUE ESTIMATES

Rand	Audited Outcomes	Audited Outcomes	Audited Outcomes	Original Budget	Revised Budget	Medium Term Expenditure Framework			Total MTEF
	2016/17	2017/18	2018/19	2019/20	2019/20	2020/21	2021/22	2022/23	
REVENUE									
Revenue from Non - Exchange Transactions	29 670 026	33 835 199	37 449 186	40 501 842	66 771 949	69 102 652	66 122 734	42 534 516	177 759 901
Operational Transfers	23 828 000	25 819 694	27 774 293	33 117 037	33 117 037	34 933 543	36 400 752	38 147 988	109 482 283
Parliamentary Grant	23 828 000	25 819 694	27 774 293	33 117 037	33 117 037	34 933 543	36 400 752	38 147 988	109 482 283
Ring fenced Grants	5 842 026	8 015 505	9 674 893	7 384 805	33 654 911	34 169 109	29 721 982	4 386 528	68 277 618
Post graduate student bursary support -NRF	-	1 184 000	784 000	552 000	751 000	2 250 000	2 385 000	2 528 100	7 163 100
Post graduate student bursary support -DST	2 548 523	1 840 832	3 075 014	1 784 000	6 136 682	185 500	196 630	208 428	590 558
Research Grants	3 293 503	4 990 673	5 815 879	5 048 805	6 767 229	6 333 042	1 650 000	1 650 000	9 633 042
Space Weather Centre - DST	-	-	-	-	20 000 000	25 400 567	25 490 352	-	50 890 919
Revenue from Exchange Transactions	10 460 540	10 996 199	10 683 386	8 917 361	10 511 625	9 068 195	9 612 287	10 189 024	28 869 506
Rendering of Services	8 806 902	10 309 996	9 258 368	8 617 361	9 473 223	8 768 195	9 294 287	9 851 944	27 914 426
Contract Revenue - Public Sector	6 616 239	8 574 432	7 733 898	8 080 861	6 994 831	7 803 195	8 271 387	8 767 670	24 842 252
Contract Revenue - Private Sector	540 968	559 586	511 647	360 000	422 272	465 000	492 900	522 474	1 480 374
Contract Revenue - Foreign	1 649 695	1 175 978	1 012 823	176 500	2 056 120	500 000	530 000	561 800	1 591 800
Other Income	1 653 638	686 203	1 425 018	300 000	1 038 402	300 000	318 000	337 080	955 080
Interest Income	432 704	312 800	537 446	-	303 282	-	-	-	-
Other Income	1 220 934	373 403	792 957	300 000	727 959	300 000	318 000	337 080	955 080
Net Gains on Foreign exchange transactions	-	-	94 615	-	7 161	-	-	-	-
Commitments			6 441 715		6 984 629				-
Total Revenue	40 130 566	44 831 398	54 574 286	49 419 203	84 268 203	78 170 847	75 735 021	52 723 540	206 629 407

SPACE SCIENCE PROGRAMME - EXPENDITURE ESTIMATES

Rand	Audited Outcomes	Audited Outcomes	Audited Outcomes	Original Budget	Revised Budget	Medium Term Expenditure Framework			Total MTEF
	2016/17	2017/18	2018/19	2019/20	2019/20	2020/21	2021/22	2022/23	
Expenditure									
Employee Related Costs - CTC	22 862 526	24 332 468	25 638 717	32 225 029	32 160 815	41 804 003	47 847 564	38 440 437	128 092 004
Incentive Bonus Provision	-	-	-	2 166 456	2 356 889	2 808 851	3 323 706	2 501 291	8 633 848
Depreciation and Amortisation	4 433 370	5 116 028	4 630 168	-	-	-	-	-	-
Repairs and Maintenance	1 009 648	1 495 642	1 692 595	1 998 707	2 984 576	2 791 856	2 011 703	1 696 726	6 500 284
Grants and Subsidies Paid	3 080 193	2 696 628	4 556 325	2 639 996	7 201 166	2 681 544	2 460 236	2 607 850	7 749 630
Antenna Infrastructure Services	-	-	-	-	-	-	-	-	-
Training Expenses	213 343	175 114	380 705	532 000	877 277	993 080	750 000	265 000	2 008 080
General Expenses	7 175 772	7 631 602	7 549 938	8 702 266	12 921 255	18 842 814	10 304 690	6 118 186	35 265 689
Net Losses on foreign exchange transactions	-116 858	-40 236	81 281	-	-	-	-	-	-
Loss on Disposal of Property, Plant and Equipment	213 908	59 647	71 236	-	-	-	-	-	-
Total Operating Expenditure	38 871 902	41 466 893	44 601 070	48 264 453	58 501 978	69 922 146	66 697 899	51 629 490	188 249 535
Surplus / (Deficit) for the year	1 258 664	3 364 505	9 973 216	1 154 750	25 766 225	8 248 700	9 037 122	1 094 049	18 379 872
Capital Expenditure	2 951 114	6 495 408	4 699 889	1 154 750	25 766 225	8 248 700	9 037 122	1 094 049	18 379 872
Buildings and other fixed structures	-	-	-	-	17 552 014	-	3 000 000	-	3 000 000
Machinery and equipment	1 951 540	6 495 408	2 710 228	514 000	3 972 021	3 327 200	2 736 082	774 947	6 838 229
Computer Equipment	984 615	-	1 933 983	580 750	3 323 643	3 921 500	2 301 040	319 102	6 541 642
Software and intangible assets	14 959	-	55 678	60 000	190 000	1 000 000	1 000 000	-	2 000 000
Vehicles	-	-	-	-	728 547	-	-	-	-
Total Expenditure	41 823 016	47 962 301	49 300 959	49 419 203	84 268 203	78 170 847	75 735 021	52 723 540	206 629 407

4.4 Space Operations Programme

4.4.1 Purpose of Programme

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.

4.4.2 Programme Outputs

The core outputs of the Space Operations Programme are:

- Hosted infrastructure services to foreign and local clients;
- Telemetry, tracking and command of satellite platforms;
- Launch support; and
- Downloading of Earth observation data during satellite passes.

The outcomes expected from realising these outputs are:

- creation of a wider revenue base through locally hosted infrastructure by attracting a larger pool of local and international stakeholders, which ensures more relevance in the global space community.
- assurance of a quality service in line with international standards that helps maintain relevance in the global space industry value chain as a whole.
- ensure that we optimise the return on investment on hosted infrastructure thus promoting the growth and sustainability of SANSA and in addition promoting the retention of high-end skills.

4.4.3 Output Indicators and Target

Space Operations Programme				Quarterly Targets			
Strategic Goal	Strategic Objective	Key Performance Indicator/Measure	Annual Target	Q1	Q2	Q3	Q4
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 products and applications	1	-	-	-	1
S3 To develop, grow and transform the indigenous space industry that is responsive to local needs and is globally positioned	S3.1. Generate greater benefit for the space programme through space operations activities	M3.1.1 Successful satellite pass monitoring rate for Earth Observation	98%	98%	98%	98%	98%
		M3.1.2 Total income generated from space operations activities	R68 million	R17 million	R17 million	R17 million	R17 million

4.4.4 Explanation of planned performance over the medium-term period

Enhance the competitiveness of the South African space industry

Earth Observation Support

A proportion 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.

4.4.5 Programme Resource Considerations

SPACE OPERATIONS PROGRAMME - REVENUE ESTIMATES

Rand	Audited Outcomes	Audited Outcomes	Audited Outcomes	Original Budget	Revised Budget	Medium Term Expenditure Framework			Total MTEF
	2016/17	2017/18	2018/19	2019/20	2019/20	2020/21	2021/22	2022/23	
REVENUE									
Revenue from Non - Exchange Transactions	-	-	15 799 573	15 573 291	15 573 291	16 424 630	17 114 464	17 935 958	51 475 052
Operational Transfers	-	-	15 799 573	15 573 291	15 573 291	16 424 630	17 114 464	17 935 958	51 475 052
Parliamentary Grant	-	-	15 799 573	15 573 291	15 573 291	16 424 630	17 114 464	17 935 958	51 475 052
Revenue from Exchange Transactions	66 900 674	83 828 499	67 084 950	51 410 108	56 524 569	54 936 714	58 123 628	59 748 301	172 808 642
Rendering of Services	52 653 295	67 835 133	64 461 263	51 410 108	55 874 042	54 859 870	58 042 558	59 662 772	172 565 200
Contract Revenue - Public Sector	5 768 950	6 185 263	5 563 388	5 408 119	5 674 630	5 707 015	5 887 043	6 076 973	17 671 031
Contract Revenue - Private Sector	18 000	3 348 040	9 403 337	4 652 538	4 005 908	4 798 038	5 037 998	5 289 958	15 125 994
Contract Revenue - Foreign	46 866 345	58 301 830	49 494 538	41 349 451	46 193 503	44 354 816	47 117 517	48 295 841	139 768 175
Other Income	14 247 379	15 993 366	2 623 687	-	650 527	76 844	81 070	85 529	243 443
Interest Income	164 406	1 025 646	695 696	-	347 525	-	-	-	-
Other Income	14 082 973	14 967 720	280 712	-	303 002	76 844	81 070	85 529	243 443
Net gain on Foreign exchange transaction	-	-	1 647 279	-	-	-	-	-	-
Commitments					33 815 495				-
Total Revenue	66 900 674	83 828 499	82 884 523	66 983 399	105 913 355	71 361 343	75 238 092	77 684 259	224 283 694

SPACE OPERATIONS PROGRAMME - EXPENDITURE ESTIMATES

Rand	Audited Outcomes	Audited Outcomes	Audited Outcomes	Original Budget	Revised Budget	Medium Term Expenditure Framework			Total MTEF
	2016/17	2017/18	2018/19	2020/21	2020/21	2021/22	2022/23	2023/24	
Expenditure									
Employee Related Costs - CTC	31 231 084	31 748 543	33 648 936	31 829 270	32 342 963	35 962 955	38 120 732	40 331 735	114 415 422
Incentive Bonus Provision	-	-	-	2 652 439	2 482 334	2 711 777	2 888 043	3 026 669	8 626 489
Remote Location Allowance	-	-	-	3 999 006	4 219 047	4 363 834	4 582 026	4 801 963	13 747 823
Depreciation and Amortisation	9 725 172	10 806 151	14 133 409	-	-	-	-	-	-
Repairs and Maintenance	3 677 254	6 145 540	5 747 905	7 452 644	14 173 006	4 472 809	4 310 941	2 971 397	11 755 148
Antenna Infrastructure Services	203 266	3 270 496	2 983 292	-	5 240 976	-	-	-	-
Training Expenses	150 574	361 806	251 001	383 364	467 078	393 103	-	-	393 103
General Expenses	15 888 276	19 159 402	19 078 907	20 666 676	26 137 505	23 456 865	25 336 350	26 552 495	75 345 710
Net Losses on foreign exchange transactions	1 321 073	1 037 373	-	-	-	-	-	-	-
Loss on Disposal of Property, Plant and Equipment	314 394	4 540	670 404	-	-	-	-	-	-
Total Operating Expenditure	62 511 093	72 533 850	76 513 855	66 983 399	85 062 907	71 361 343	75 238 092	77 684 259	224 283 695
Surplus / (Deficit) for the year	4 389 581	11 294 649	6 370 668	-	20 850 448	0	-0	-0	-1
Capital Expenditure	16 023 356	23 130 248	12 146 542	-	20 850 448	-	-	-	-
Machinery and equipment	16 023 356	23 130 248	12 146 542	-	15 334 524	-	-	-	-
Computer Equipment	-	-	-	-	5 401 070	-	-	-	-
Software and intangible assets	-	-	-	-	114 854	-	-	-	-
Total Expenditure	78 534 449	95 664 098	88 660 397	66 983 399	105 913 355	71 361 343	75 238 092	77 684 259	224 283 695

4.5 Space Engineering Programme

4.5.1 Purpose of Programme

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.

4.5.2 Programme Outputs

The core outputs of the Space Engineering Programme are:

- Creation of direct jobs in the space industry;
- Mission development and support for micro-satellites;
- Mission development and support for nanosatellites; and
- The upgrade and maintenance of key infrastructure.

The outcomes expected from realising these outputs are:

- provision of space-based solutions using satellite platforms specifically designed to meet local and regional requirements, but also stimulating the development of the local satellite development industry through the satellite build programme.
- The use of cost-effective satellite platforms for the creation of new knowledge and the development of new and unique solutions for scientific applications and addressing key user requirements, for example, Oceans Phakisa.
- facilities that is modernised to international standards that promotes industry development and positioned for use by local, regional and international users.

4.5.3 Output indicators and Targets

Space Engineering Programme				Quarterly Targets			
Strategic Goal	Strategic Objective	Key Performance Indicator/Measure	Annual Target	Q1	Q2	Q3	Q4
S1 To support the development of a critical mass of skills and expertise needed to give effect to national space initiatives	S1.2 Support students and interns	M1.2.1 Number of students and interns supported for formalized training	9	9	-	-	-
S3 To develop, grow and transform the indigenous space industry that is responsive to local needs and is globally positioned		M3.2.1 A total contract expenditure of 20% to SMEs for core space projects	20%	0	0	20% of total contracted value	20% of total contracted value
		M3.2.2 The total contract expenditure to the broad space related industry for core space projects	R10 million	0	0	0	R10 million
S4 To build and host the appropriate infrastructure that will support the	S4.1 Development or upgrade of infrastructure	M4.1.3 An upgraded AIT Facility	10%	Contracting	-	-	10%

Space Engineering Programme				Quarterly Targets			
Strategic Goal	Strategic Objective	Key Performance Indicator/Measure	Annual Target	Q1	Q2	Q3	Q4
national space sector							
S5 Develop active partnerships	S5.1 Leverage a significant benefit for the space programme through partnerships	M5.1.1 Number of active formal overseas partnerships	1	-	-	-	1
		M5.1.2 Number of active formal African partnerships	1	-	-	-	1
		M5.1.3 Number of active formal national partnerships	1	-	-	-	1

4.5.4 Explanation of planned performance over the medium-term period

Develop national human capacity and ensure transformation

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.

Enhance the competitiveness of the South African Space industry

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.

EO-Sat1 Development

Preparation for preliminary design reviews will take place during the year and the pre-design 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.

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.

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.

4.5.5 Programme Resource Considerations

SPACE ENGINEERING PROGRAMME - REVENUE ESTIMATES

Rand	Audited Outcomes	Audited Outcomes	Audited Outcomes	Original Budget	Revised Budget	Medium Term Expenditure Framework			Total MTEF
	2016/17	2017/18	2018/19	2019/20	2019/20	2020/21	2021/22	2022/23	
REVENUE									
Revenue from Non - Exchange Transactions	111 627 276	77 872 936	2 561 992	6 353 655	36 953 074	7 283 452	53 978 745	26 313 725	87 575 922
Operational Transfers	-	-	-	6 353 655	5 778 996	7 283 452	53 978 745	26 313 725	87 575 922
Parliamentary Grant	-	-	-	6 353 655	5 778 996	7 283 452	53 978 745	26 313 725	87 575 922
Ring fenced Grants	111 627 276	77 872 936	2 561 992	-	31 174 079	-	-	-	-
Post graduate student bursary support - DST	-	1 339 804	-	-	-	-	-	-	-
AIT Facilities	11 774 470	1 820 854	-	-	29 704 676	-	-	-	-
Satellite Development Programme	99 852 806	74 712 278	2 561 992	-	1 469 402	-	-	-	-
Principal/Agent Transfers	8 258 803	8 258 803	-	-	-	-	-	-	-
Operation Phakisa - CPUT	8 258 803	8 258 803	-	-	-	-	-	-	-
									-
Total Revenue	119 886 079	86 131 739	2 561 992	6 353 655	36 953 074	7 283 452	53 978 745	26 313 725	87 575 922

SPACE ENGINEERING PROGRAMME - EXPENDITURE ESTIMATES

Rand	Audited Outcomes	Audited Outcomes	Audited Outcomes	Original Budget	Revised Budget	Medium Term Expenditure Framework			Total MTEF
	2016/17	2017/18	2018/19	2019/20	2019/20	2020/21	2021/22	2022/23	
Expenditure									
Employee Related Costs - CTC	187 088	-	-	5 360 141	4 808 916	5 750 797	6 124 598	6 418 579	18 293 974
Incentive Bonus Provision	-	-	-	446 678	386 524	336 795	358 687	375 904	1 071 385
Grants and Subsidies Paid	-	985 805	-	126 720	-	133 690	141 043	147 813	422 545
Training Expenses	53 920	14 375	-	-	-	586 000	-	-	586 000
General Expenses	1 422 363	1 315 189	-	420 115	583 556	476 171	354 418	371 430	1 202 019
Total Operating Expenditure	1 664 197	2 315 368	-	6 353 655	5 778 995	7 283 452	6 978 745	7 313 725	21 575 922
Principal/Agent Transfers	8 258 803	8 258 803	-	-	-	-	-	-	-
Operation Phakisa - CPUT	8 258 803	8 258 803	-	-	-	-	-	-	-
Surplus / (Deficit) for the year	118 221 882	83 816 371	2 561 992	-	31 174 079	-	47 000 000	19 000 000	66 000 000
Capital Expenditure									
AIT Facility	93 855 378	76 533 132	2 557 984	-	31 174 079	-	47 000 000	19 000 000	66 000 000
Satellite Development Programme	93 855 378	74 712 278	2 557 984	-	1 469 402	-	-	-	-
Total Expenditure	103 778 378	87 107 303	2 557 984	6 353 655	36 953 074	7 283 452	53 978 745	26 313 725	87 575 922

5 Updated Key Risks

The Strategic Risks articulated in the Strategic Plan remain relevant for the 2020/21 Financial Year.

6 Infrastructure Projects

The key infrastructure projects relate to the Space Science, Earth Observation and Space Engineering Programmes. These infrastructure projects are captured in the Table below, together with the expected outcomes of these projects.

Infrastructure Element	Sub-Elements	Specific Objective	Expected Outcomes
Space Weather Centre	Knowledge Generation of the Space Environment	To exploit our knowledge base for the development of essential services and products that assist in evidence-based decision making and supports the safety of our citizens	Providing customer centric products and services to assist in the mitigation of the potential risk to technology (as well as the economy) from adverse space weather.
	Space Science over the Southern Oceans and Polar Regions	To exploit our knowledge base for the development of essential services and products that assist in evidence-based decision making and supports the safety of our citizens	Provision of a national southern oceans and polar regions platform that facilitates new science, new applications, and paves the way for improved space weather products and services. This in turn will improve the ability to provide early warnings that then allow for mitigation measures to be put in place.
	Applied Electromagnetic Technology	To exploit our knowledge base for the development of essential services and products that assist in evidence-based decision making and supports the safety of our citizens	Contribution to the nation's safety and security as the majority of these product offerings are for the defence and aviation industry. Also, the provision of space related services to non-space applications provides value from space to the nation.
	African Instrumentation Network	To build and host the appropriate infrastructure that will support the national development imperatives	Provision of an African geophysical platform that facilitates new science, new applications, and paves the way for participation in regional and international partnerships. Growing the scientific database over Africa, and providing support as the gateway to Africa. Full participation in the African space strategy.
Earth Observation Infrastructure	Data and Infrastructure	To build and host the appropriate infrastructure that will support the national development imperatives	Raw data that is transformed into information and embedded into value added products and services, to support user needs. An improved infrastructure platform that is readily available for the storage, archiving, processing and dissemination of data, and also for use by the Earth observation community for the development of innovative products and services.
	Development of National Base Maps	To exploit our knowledge base for the development of essential services and products that assist in evidence-based decision making and supports the safety of our citizens	Raw data transformed into fundamental geospatial data sets that are used as input in a variety of services and products for use by key decision makers.
	Coordination of the Development of Products and Services	To develop, grow and transform the indigenous space industry that is responsive to local needs and that is globally positioned	Coordinated and streamlined development of products and services by the local Earth observation sector that responds to national priorities.
Satellite Infrastructure	Space Missions	To build and host the appropriate infrastructure that will support the national development imperatives	The provision of space based solutions using satellite platforms specifically designed to meet local and regional requirements, but also stimulating the development of the local satellite development industry through the satellite build programme.
	Industry Development	To develop, grow and transform the indigenous space industry that is responsive to local needs and that is globally positioned	A local satellite industry that is economically transformed thus ensuring equitable sharing of returns on investment made by government to the local satellite industry.
	Facility Development	To build and host the appropriate infrastructure that will support the national development imperatives	Facilities that are modernised to international standards that promotes industry development and positioned for use by local, regional and international users.

7 District Delivery Model

The suite of products and services that will be coordinated and developed by SANSA will find relevance and value at the local district and municipality levels. During the course of implementation of the APP, SANSA will actively seek funding to ensure local uptake of the relevant products and services at a local community level.

PART D: TECHNICAL INDICATOR DESCRIPTION

- M1.1.1 Number of youth directly engaged
- M1.2.1 Number of students and interns supported for formalized training
- M2.1.1 Number of 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
- M3.2.1 The total contract expenditure to SMEs for core space projects
- M3.2.2 The total contract expenditure to the broad space related industry for core space projects
- M4.1.1 Progress status on the follow on the MDASat mission
- M4.1.2 Progress status on ARMC nanosatellite constellation mission
- M4.2.1 A new operational space weather centre
- M4.2.2 Development of Digital Earth South Africa
- M4.2.3 An upgraded AIT Facility
- 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
- M5.2.1 Percentage of government departments and public that use geospatial information using space products and services
- M5.2.2 Awareness and training interventions to users of space products and applications
- M5.2.3 Number of initiatives to transform SANSA into a high performing Agency

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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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

Indicator title	M1.1.1 Number of youth directly engaged
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	Non-cumulative
Reporting cycle	Quarterly
New indicator	No

Indicator title	M1.2.1 The Number of PDI students and interns supported for formalised training
Short definition	The total number of students currently linked and supported by SANSA through bursaries, or supervised. 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.
Source/collection of data	Contracts and student agreements & student records Proof of supervision engagement
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 financial 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.
System Used	Excel Spreadsheet
Description of KPI reporting activities	All student contracts counted
Means of Validation	Contracts and student agreements, proof of student supervision contracts/register are available.
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	Non -cumulative
Reporting cycle	Quarterly
New indicator	No

Indicator title	M2.1.1 Number of products and services
Short definition	The number of products/services (PS) delivered within any one of the following PS areas, (i) PS1-Data as a Service, (ii) PS2 – Remote sensing products, (iii) PS3 – Infrastructure as a Service , (iv) PS4 - Magnetic technology services.
Purpose/importance	This is intended to demonstrate a sample of the products and applications that are impactful and delivered utilising 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 – Data as a Service</p> <ul style="list-style-type: none"> • Data collected (sensor portfolio) • Contracts and active agreements on data access • Data distributed including online data access • Data request & distribution statistics • Report on use & impact <p>PS2 – Remote sensing products</p> <ul style="list-style-type: none"> • Confirmed orders for services/products • Frequency of production or publication of base remote sensing & fundamental data products • Industry contracts/agreement to deliver services/product • Report on use & impact <p>PS3 – Infrastructure as a Service</p> <ul style="list-style-type: none"> • Use cases built on Digital Earth South Africa • Confirmed orders for services/products • Report on use & impact <p>PS4 – Magnetic Technology Services</p> <ul style="list-style-type: none"> • Calibration Services Sheets • Report on uptake, use & impact <p>PS5 - Space Weather Services</p> <ul style="list-style-type: none"> • Client Progress Reports, if applicable • Report detailing uptake, use & impact
Method of calculation	A brief qualitative report of the services/products that have been delivered will be used as the products/services are not a simple statistical/numerical activity. The report will also contain how the impactful product/service was determined for this KPI.
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. Further, given the qualitative nature of the KPI or associated reports, it will take some time to refine some of the metrics. Not all of the elements should and can be measured at inception, e.g. how to measure impact. However, the difficulty in the measurement should not be a reason for trying to find a meaningless metric that can be easily counted. 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

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	This productivity score is based on a function of research funding sourced + publications (journals, books, reports, proceedings) + students graduated + research rating status 1. Published papers in PDF and hard copy available. For books Front pages available in pdf. 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 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 engagement funding. 3. Students graduated – list is maintained with PDF copies of Degree certificates or award letters. 4. Research rating status – determined by rating award letters.
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	<input type="checkbox"/> Count the hard copies of publications and books <input type="checkbox"/> Verify that evidence exists for all aspects included in the formula <input type="checkbox"/> 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	Non-cumulative
Reporting cycle	Quarterly
New indicator	No

Indicator title	M3.1.1 Successful satellite pass monitoring rate for Earth Observation
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-cumulative
Reporting cycle	Quarterly
New indicator	No

Indicator title	M3.1.2 Total income generated from space operations activities
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	Non-cumulative
Reporting cycle	Annually
New indicator	Yes

Indicator title	M3.2.1 The total contract expenditure to SMEs for core space projects
Short definition	The KPI measures the contract value that is outsourced too Small to Medium Enterprises (SMEs) for all SANSA programmes including EO, SS, SO and SE programmes, in the main SE. This should not include consultancy expenditure for general support initiatives.
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	Non-cumulative
Reporting cycle	Annually
New indicator	Yes

Indicator title	M3.2.2 The total contract expenditure to the broad space related industry for core space projects
Short definition	The KPI measures the contract value that is outsourced to Small to Medium Enterprises (SMEs) and big industry players (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 Contracts 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: The Contracts Manager will compare his figures against those held by Finance before releasing his numbers to the quarterly report
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	Non-cumulative
Reporting cycle	Annually
New indicator	This is an existing but modified indicator

Indicator title	M4.1.1 Progress status on the follow on MDASat mission
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 and operations of a CubeSat
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	On a quarterly basis, a report is synthesised to represent the important events of the quarter and presented to the Board Strategy and Investment Committee. Once approved, the report is then escalated to the Board and onward to the DSI.
Means of Validation	Comparison of latest programme schedule against the original programme schedule
Data limitations	The latest programme schedule might not be entirely accurate, as a result of recent developments that have not been translated into the schedule.
Type of indicator	Output: Measures scheduled performance
Calculation type	Non-cumulative
Reporting cycle	Annually
New indicator	No – Established indicator

Indicator title	M4.1.2 Progress status on ARMC nanosatellite constellation mission
Short definition	These satellites will be either 3U or 6U configurations
Purpose/importance	The indicator is to show the development of satellites at low cost to support the needs of the ARMC partners.
Source/collection of data	The development will be largely indicated through the technology roadmaps or partnership and collaboration programmes with our ARMC partners
Method of calculation	Based on the number of actual satellites launched.
System Used	Progress report based on mission definition.
Description of KPI reporting activities	Report on nanosatellite mission progress as per project plan.
Means of Validation	It is validated against the parameters set by the acquisition process.
Data limitations	Limitation on the development is largely dependent on funding for the programme,
Type of indicator	Activities as part of the mission planning.
Calculation type	Cumulative progress on satellite development.
Reporting cycle	Reported Quarterly
New indicator	New

Indicator title	M4.2.1 A new operational space weather centre
Short definition	This indicator shows progress towards achieving the aim of a 24/7 operational space weather centre
Purpose/importance	The development of an operational space weather centre for SANSA is a priority project to bring about sustainability and this indicator demonstrates achievement against project goals
Source/collection of data	Quarterly reports are prepared on the project progress against the approved business case; Tracking of progress against key milestones.
Method of calculation	Compare the project progress with the project action plan and calculate a percentage based on the estimate progress towards the final goal.
System Used	. Manual
Description of KPI reporting activities	On a quarterly basis, a report is generated to represent the important events of the quarter and detail progress against the key milestones. This report is presented to the Hermanus Management Team who are responsible for the project. Once approved, the report is then submitted to the DSI
Means of Validation	Comparison of latest project schedule against the original project schedule and approved business case
Data limitations	The project schedule and milestones may be affected by external factors that limits the accuracy
Type of indicator	Output – measures scheduled performance
Calculation type	Non-cumulative
Reporting cycle	Annually
New indicator	New Indicator

Indicator title	M4.2.2 Development of Digital Earth South Africa
Short definition	Provision of progress towards the development of an operational data cube platform, namely, Digital Earth South Africa.
Purpose/importance	SANSA is mandated to acquire, assimilate, process and distribute satellite imagery, in order to deliver and maintain relevance SANSA needs to improve its data management and delivery mechanism, keeping up to speed with the international market.
Source/collection of data	Quarterly reports prepared on the project progress against the project concept document.
Method of calculation	Tracking of progress (in percentage) against the project action plan.
System Used	Manual.
Description of KPI reporting activities	Quarterly reporting on implementation progress done by the EO Management Team for submission to EXCO.
Means of Validation	Comparison of the current project schedule against original project action plan.
Data limitations	As it is intended to be an open system, data on system users developing use cases may be limited – sampling of use cases will be provided.
Type of indicator	Output – measuring progress on planned activities.
Calculation type	Cumulative.
Reporting cycle	Annually.
New indicator	New indicator.

Indicator title	M4.2.3 An upgraded AIT facility
Short definition	The AIT facility upgrade is to support the Space Industry. The current facility will undergo various areas of improvement to support the development of Satellites
Purpose/importance	The indicator is to support the National Space program and the industry. The development is critical to create a successful satellite program and support private companies for their own development.
Source/collection of data	As per project plan on the upgrade of the AIT facility.
Method of calculation	Compare the project progress with the project action plan and calculate a percentage based on the estimate progress towards the final goal.
System Used	Manual
Description of KPI reporting activities	On a quarterly basis, a report is generated to represent the important events of the quarter and detail progress against the key milestones as per project plan. Comparison of latest project schedule against the original project schedule and approved business case
Means of Validation	Comparison of latest project schedule against the original project schedule and approved business case
Data limitations	The project schedule and milestones may be affected by external factors that limits the accuracy
Type of indicator	Output – measures scheduled performance
Calculation type	Non-cumulative
Reporting cycle	Annually with progress reports every quarter
New indicator	New Indicator

Indicator title	M5.1.1 Number of active formal overseas partnerships
Short definition	This indicator establishes the number of activities engaged in with overseas partners
Purpose/importance	Space is a global endeavour and requires active partnerships at a number of different levels
Source/collection of data	Tracking of actual projects implemented with partners
Method of calculation	Manual
System Used	Spreadsheet of active projects kept at a Programme level
Description of KPI reporting activities	Each project title will be recorded together with the activities engaged in per quarter.
Means of Validation	Partnership reports are signed off on a quarterly basis
Data limitations	The partnership reports may not include the costing of the activities, as some projects are based on equal contributions or on funds secured from funding instruments.
Type of indicator	Output: Number of activities engaged in
Calculation type	Cumulative
Reporting cycle	Quarterly
New indicator	No – this was introduced in the 2019/20 Financial Year

Indicator title	M5.1.2 Number of active formal African partnerships
Short definition	This indicator establishes the number of activities engaged in with African partners
Purpose/importance	Space is a global endeavour and requires active partnerships at a number of different levels
Source/collection of data	Tracking of actual projects implemented with partners
Method of calculation	Manual
System Used	Spreadsheet of active projects kept at a Programme level
Description of KPI reporting activities	Each project title will be recorded together with the activities engaged in per quarter.
Means of Validation	Partnership reports are signed off on a quarterly basis
Data limitations	The partnership reports may not include the costing of the activities, as some projects are based on equal contributions or on funds secured from funding instruments.
Type of indicator	Output: Number of activities engaged in
Calculation type	Cumulative
Reporting cycle	Quarterly
New indicator	No – this was introduced in the 2019/20 Financial Year

Indicator title	M5.1.3 Number of active formal national partnerships
Short definition	This indicator establishes the number of activities engaged in with national partners
Purpose/importance	Space is a global endeavour and requires active partnerships at a number of different levels
Source/collection of data	Tracking of actual projects implemented with partners
Method of calculation	Manual
System Used	Spreadsheet of active projects kept at a Programme level
Description of KPI reporting activities	Each project title will be recorded together with the activities engaged in per quarter.
Means of Validation	Partnership reports are signed off on a quarterly basis
Data limitations	The partnership reports may not include the costing of the activities, as some projects are based on equal contributions or on funds secured from funding instruments.
Type of indicator	Output: Number of activities engaged in
Calculation type	Cumulative
Reporting cycle	Quarterly
New indicator	No – this was introduced in the 2019/20 Financial Year

Indicator title	M5.2.1 Percentage of government departments and public entities using space products and services
Short definition	The measurement of the usage of space data and value-added products by government (all three spheres) and its entities.
Purpose/importance	The return on investment on space heavily lies on the impact and value space has on driving informed decision making, in particular by government and its entities.
Source/collection of data	<p>Reports that document provision of data and value-add products to government and its entities, including appropriate statistics. This information may include some or all of the following:</p> <ul style="list-style-type: none"> • Stakeholder registry • Data and product distribution stats • Online access of data and products • Industry contracts/agreement to deliver services/product • Confirmed orders for services/products • Report on use & impact
Method of calculation	A brief qualitative report of the organs of states that use using services/products that have been delivered to which government stakeholders will be used as the products/services are not a simple statistical/numerical activity. The report will also contain how the impactful product/service was determined for this KPI.
System Used	Manual, supported by system reports from platforms such as the Earth Watch, EO catalogue, EO webservices etc.
Description of KPI reporting activities	Compilation of Organs of State using Space Products/Service Report. 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 Organs of State using Space Products/Service Report against some of the validation material e.g. data transmission logs, client acceptance signatures, contract registers, progress report.
Data limitations	Some of the meaningful activities cannot be necessarily independently validated. Further, given the qualitative nature of the KPI or associated reports, it will take some time to refine some of the metrics. Not all of the elements should and can be measured at inception, e.g. how to measure impact. However, the difficulty in the measurement should not be a reason for trying to find a meaningless metric that can be easily counted. This KPI is intended to progressively concretise SANSA's provision of space product/service to government and its entities and to quantify its impact.
Type of indicator	Output and impact/ Progressive qualitative
Calculation type	Cumulative and progressive throughout the year.
Reporting cycle	Annually
New indicator	Yes

Indicator title	M5.2.2 Number of awareness and training interventions to key users of space products and services
Short definition	The indicator is designed to measure the marketing of space products and services to key users
Purpose/importance	It is important to establish a base of key users of space products and services and ensure awareness and appropriate training on the use of these products and services is in place.
Source/collection of data	Tracking of awareness and training interventions, including the users reached.
Method of calculation	A spreadsheet will be maintained indicating the users reached, the awareness or training intervention undertaken, and the related products and services. Attendance registers will be kept as a record.
System Used	Manual
Description of KPI reporting activities	A record of awareness or training interventions undertaken will be kept.
Means of Validation	Records are signed off on a quarterly basis.
Data limitations	It may be challenging to secure the key users for an awareness or training intervention as they have their own programmes.
Type of indicator	Output – number of activities undertaken
Calculation type	Cumulative
Reporting cycle	Quarterly
New indicator	New Indicator

Indicator title	M5.2.3 Number of initiative to transform SANSA into a high performing agency
Short definition	This indicator provides the interventions needed to improve the performance of SANSA
Purpose/importance	It is important for SANSA to be prepared to implement this Strategy and specific interventions are required for this.
Source/collection of data	The EXCO approved strategies and plans relating to these interventions and the implementation thereof, as per the respective work/project plans.
Method of calculation	A count of the number of strategies and interventions that have been approved and implemented.
System Used	Manual
Description of KPI reporting activities	A report will be produced annually indicating the number of interventions achieved.
Means of Validation	Interventions/strategies presented to and approved by EXCO
Data limitations	Extensive consultations are required to ensure effective implementation, and this requires buy in from the entire organisation
Type of indicator	Output – number of initiatives to transform SANSA into a high performing agency
Calculation type	Non-cumulative
Reporting cycle	Quarterly
New indicator	New Indicator