SOUTH AFRICAN NATIONAL SPACE AGENCY

ANNUAL REPORT 2018/2019

science & innovation

Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA

sansa
SOUTH AFRICAN NATIONAL SPACE AGENCY

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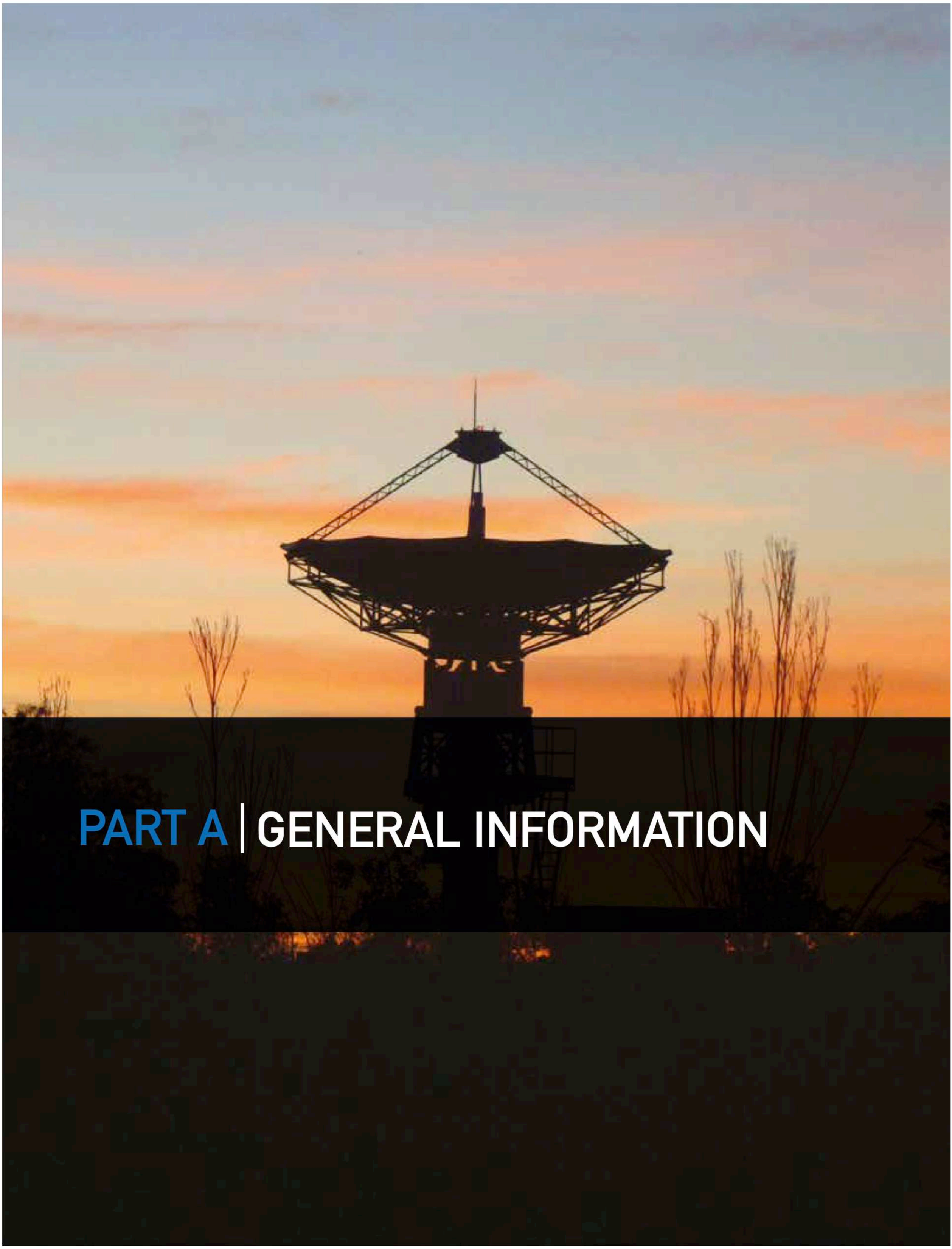

PART A | GENERAL INFORMATION

1. PUBLIC ENTITY'S GENERAL INFORMATION

REGISTERED NAME	South African National Space Agency (SANSA)
PHYSICAL ADDRESS	Enterprise Building Mark Shuttleworth Street The Innovation Hub Pretoria 0087
POSTAL ADDRESS	PO Box 484 Silverton 0127
TELEPHONE NUMBER/S	+27 (0)12 844 0500
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EMAIL ADDRESS	information@sansa.org.za
WEBSITE ADDRESS	http://www.sansa.org.za
EXTERNAL AUDITORS	Nexia SAB&T
BANKERS	ABSA Bank
COMPANY/ BOARD SECRETARY	Ms Lorraine Harrison

2. LIST OF ABBREVIATIONS/ACRONYMS

AAD	African Aerospace and Defence
ACAM	Advisory Committee for Aeronautical Management
AEB	Brazilian Space Agency
AGU	American Geophysical Union
AIT	Assembly, Integration and Testing
ARC	Agricultural Research Council
ASAL	Algerian Space Agency
ASP	African School of Fundamental Physics and Applications
ATNS	Air Traffic Navigation Services
BCT	Broadcast Communication Tool
CAA	Civil Aviation Authority
CBERS 4	China, Brazil Earth Resources Satellite
CEOS	Committee on Earth Observation Satellites
CNSA	Chinese Space Administration
CoC	Centre of Competence
CoE	Centres of Excellence
CoS	Condition of Service
CPRR	Competitive Programme for Rated Researchers
CSA	Canadian Space Agency
CSD	Central Supplier Database
CSIR	Council for Scientific and Industrial Research
CW4SA	Crop Watch 4 South Africa
DGI	Directorate Geospatial Intelligence
DIFR	Disabling Injury Frequency Rate
DLR	German Space Agency
DoD	Department of Defence
DRS	Direct Receiving Station
DST	Department of Science and Technology
DTE	Development Test Equipment
EO	Earth Observation
EO-SDLC	Earth Observation-Systems Development Life Cycle
ERP	Enterprise Resource Planning
ESA	European Space Agency
ESR	EISCAT Svalbard Radar
FBM	Fractional Brownian Motion
FGN	Fractional Gaussian Noise
GAF	Geometric Alignment Facility
GEO	Group on Earth Observation
GICs	Geomagnetically Induced Currents

GPG	Gauteng Provincial Government
GPS	Global Positioning System
HCD	Human Capital Development
HF	High Frequency
ICTP	International Centre for Theoretical Physics
IDP	Individual Development Plans
ILS	Integrated Logistics Support
INPE	Instituto Nacional de Pesquise Espaciais
IRGO	Interdisciplinary Research and Global Outlook
ISES	International Space Environment Service
ISSI	International Space Science Institute
JRC	Joint Research Commission
KIC	Knowledge, Interchange and Collaboration
LCC	Life Cycle Costing
LED	Light Emitting Diodes
MEDO	Meta Economic Development Agency
MDTP	Management Development and Training Programme
MoU	Memorandum of Understanding
MTEF	Medium Term Expenditure Framework
NASA	National Aeronautics and Space Administration
NARSS	National Authority for Remote Sensing and Space Science
NCR	National Centre for Research
NDP	National Development Plan
NIPMO	National Intellectual Property Management Office
NRCan	Natural Resource Canada
NRF	National Research Foundation
NSF	National Science Foundation
NSP	National Space Programme
NUST (PON)	Namibia University of Science and Technology
NWU	North West University
OSR	Optical Space Research Laboratory
OTF	Optical Test Frame
PDP	Professional Development Programme
PFISR	Poker Flat Incoherent Scatter Radar
PFMA	Public Finance Management Act
QMS	Quality Management System
R&D	Research and Development
RAM	Reliability, Availability and Maintainability
SAAF	South African Air Force

SAAO	South African Astronomical Observatory
SAARP	South African Association for Retired Persons
SAASTA	South African Agency for Science and Technology Advancement
SAEOS	South African Earth Observation Strategy
SANAP	South African National Antarctic Programme
SANDF	South African National Defence Force
SANDIMS	South African National geophysical Data and Instrumentation Management System
SANSA	South African National Space Agency
SARS	South African Revenue Service
SAWS	South African Weather Services
SC-ADM	Standing Committee on Antarctic Data Management
SCAR	Scientific Committee on Antarctic Research
SCOSTEP	Scientific Committee on Solar-Terrestrial Physics
SHEQ	Safety, Health, Environment and Quality
SO	Space Operations
SPOT	Satellite Pour l'Observation de la Terre
SS	Space Science
SSAU	State Space Agency of Ukraine
STEM	Science, Technology, Engineering and Mathematics
TRS	Technical Requirement Specification
UCT	University of Cape Town
UJ	University of Johannesburg
UKSA	UK Space Agency
USAID	United States
UWC	University of the Western Cape
VO	Variation Order
WBS	Work Breakdown Structure
WCED	Western Cape Education Department
CSA	Canadian Space Agency
CSIRO	Common Wealth Scientific and Research Organisation
GA	Geo-Council Australia
USGS	United States Geological Survey

3. MESSAGE FROM THE MINISTER OF SCIENCE AND TECHNOLOGY

Having recently joined the Department of Science and Technology (DST) as Minister, I have been enthusiastically engaged on the incredible work done by the DST and entities across the science, technology and innovation value chain in the country.

As an entity of the DST, the South African National Space Agency has a special mandate to bring the benefits of space investment to our citizens and the Agency has in its eight years of operations, achieved significant successes for the country and our people.

SANSA, in collaboration with the broader industry, strived to provide valuable satellite data and applications to Government Departments and entities for use in their delivery targets such as meeting housing demands, land use monitoring, natural resource management and ensuring the safety of our citizens. The forecast is that demand for spatial data in South Africa will increase as more users in the public sector begin to integrate spatial solutions into essential service delivery tools. My Department is working closely with SANSA and other government Departments to ramp up efforts to meet the growing demand for space applications products and services across all domains of the space value chain, namely, Earth observation, navigation and positioning, satellite telecommunications, satellite engineering and space science. Additionally, strategic international partnerships have been formalised and efforts are being made to extend our product and service offerings into the African continent.

Another significant accolade from the Agency is the provision of Space Weather information for the Aviation Sector that is critical for air travel safety and the state-of-the-art space weather facility offers such services to many public and private enterprises as an integral part of business operation and sustainability. We are aware of the challenges a small Agency faces in delivering national programmes in a national economy under finanicial constraints and we will continue to seek ways to ensure we deliver impact to our citizens, locally and regionally.

I wish to acknowledge the leadership of the SANSA Board in steering the Agency over the course of its operation and thank the tireless effort made by management and staff at SANSA in the execution of their duties. This has resulted in 86% of their targets being met and a clean audit. I am, therefore, pleased to present the 2018/19 Annual Report of SANSA to the public.

Dr Blade Nzimande, MP
Minister of Higher Education, Science and Technology

4. FOREWORD BY THE CHAIRMAN OF THE BOARD

It gives me great pleasure to present the 2018/19 Annual Report of this dynamic Agency of the Department of Science and Technology (DST). I wish to acknowledge the valuable contribution made by the previous Board, SANSA Management and employees as well as the previous Minister and her team at the DST.

Taking on the reigns as Board Chairperson of the South African National Space Agency at this juncture, when the global space sector is advancing rapidly, and at a time when South Africa is actively seeking to position itself as a globally competitive player in the 4th Industrial Revolution, presents great excitement and opportunities.

I continue to be inspired by the daily achievements of Team SANSA, in delivering space services and products that positively impact on the lives of the citizens. These are achieved through the delivery of quality and critical offerings that are provided daily from our Hartebeeshoek, Pretoria and Hermanus facilities, generating revenues that augment our dwindling funding. Despite the prevailing resource constraints SANSA is making significant strides in knowledge creation and human capital development that supports our scientific enquiry in this important discipline.

During this past year, amongst several other achievements, the Agency has achieved global recognition of our local space capability through the selection by the International Civil Aviation Organisation to become a Space Weather Regional Warning Centre, to provide space weather services to the global Aviation sector. This information will also be made available to other local clients and national Government stakeholders to ensure national safety, security and access to services is unhindered.

The agency is in the process of finalising arrangements for hosting the largest Space Operations Conference, SpaceOps2020, which will be coming to Africa for the first time next year, following a stringent selection process. The teams are working tirelessly to ensure an unforgettable and enriching experience for delegates of the conference, thereby positioning South Africa's space capability in the forefront.

Improvements in our stakeholder management have seen the Board engage employees, industry players and Government stakeholders to discuss the role of SANSA as we forge stronger partnerships across our stakeholder groupings. This is important as we chart a new strategic direction for the organisation, looking at the various organs of Government that interface with space in various ways as well as the synergy necessary to manage space missions, such as the successful launch of ZACube-2.

As a Board, we occupy ourselves with answering the following questions: What role should SANSA play in ensuring that it achieves its mandate, whilst responding to our socio-economic challenges; and what mechanisms are available to us in order to fund SANSA adequately? This is underpinned by our belief that a properly funded SANSA is critically important to ensuring that we leapfrog South Africa into the forefront of space technology, knowledge and the fourth industrial revolution. I look forward to sharing even more accomplishments for the next financial year.

Ms Xoliswa Kakana
Chairman of the Board

5. CHIEF EXECUTIVE OFFICER'S OVERVIEW

The 2018/19 Financial Year has seen the Agency advance closer to achieving its current Strategic Plan (2015-2020), by consistently obtaining clean audits and reaching over 80% of our year on year targets. This is a testimony of the incredible people that work at the Agency that go beyond the call of duty even with the limited resources at our disposal. I take this opportunity to personally salute each and every one of you for making SANSA such an incredibly exciting place to be in. The oversight and strategic direction provided by the SANSA Board has also provided significant impetus in moving towards a new chapter in the life of the Agency and I sincerely thank the Board for this invaluable contribution and support, and for forming part of the amazing Team that brings space solutions closer to the people of our country.

Whilst our performance has been satisfactory, this must be contextualised against a financially constrained environment in which the Agency has been operating. The level of funding committed by the fiscus has been suboptimal, with the following concomitant effects:

- SANSA has been unable to fulfil its full expected mandate with the key focus areas of global navigation satellite services and satellite telecommunications not being prioritised during the foundational phase.
- SANSA has not been able to provide the support expected of it to the broader South African space sector resulting in a less than optimal growth and development of the industry.
- SANSA's operational expenses far exceeds its parliamentary grant, which has implied that SANSA has to generate its own revenue sources to augment its operating expenses.
- Whilst the global space sector has grown steadily by approximately 8% per annum, the South African space sector has not been able to capture an appreciative level of the market share for this sector.

Despite this challenge, our notable successes during the last year include the following:

- Our recently upgraded Space Weather Centre has been selected by the International Civil Aviation Organisation as one of two accredited regional warning centres to provide space weather services to the global aviation sector.
- Our High Frequency Propagation service that is provided to our South African National Defence Force contributes to the safety and security of the nation.
- Our latest geomagnetic survey and magnetically clean environment continues to monitor the Earth's magnetic field and help keep delicate technological systems protected so that we can use essential services such as Global Positioning Systems.
- We distributed more than 60,000 satellite images, which covers a range of sensors and provide end users with a wide choice of spatial and spectral resolutions for decision support applications, to entities in Government, science councils and universities.
- We have installed our own dark fibre connection to provide reliable, high bandwidth and low latency space data transmission in real-time or near real-time to back-up ground-stations locally or internationally for conducting nominal or emergency satellite operations.
- We have achieved over 99% successful satellite pass monitoring rate for Earth observation, 16 rocket launch supports and 10 transfer orbit support services.

"Whilst our performance has been satisfactory, this must be contextualised against a financially constrained environment in which the Agency has been operating in."

- The launch of ZACube-2 on 27 December 2018, is a technology demonstrator for a high-speed communication subsystem, an advanced ADCS subsystem, an automated identification system for ship detection, and a low-resolution k-line imager payload for advanced fire detection.
- We have supported 42 postgraduate students in key space science disciplines.
- We have engaged with over 24,000 learners as part of our outreach and space awareness programme and won the Best Workshop Presentation at SciFest Africa 2019 for the format of our student workshop.
- We have participated in over 30 collaborative projects with national, regional and international partners.

Whilst noting these core successes, there is still much to be done. We are currently finalising the next five-year Strategic Plan (2020-2025) for the Agency, which envisages a more expansive approach in developing and delivering essential space services for the country, through (i) the development and support of our local space industry, and (ii) pursuing the fuller scope of our mandate, as enshrined in the SANSA Act, National Space Policy and the National Space Strategy.

This new chapter of the national space programme will require concerted efforts both in terms of structural and regulatory reforms from SANSA and our lead government Departments, namely Science and Innovation, and Trade and Industry. We also envisage stronger partnerships at many different levels, namely (i) nationally within our national system of innovation, to jointly respond to our national socio-economic challenges, (ii) regionally, to respond to and support the envisaged African space programme, and (iii) internationally, to ensure that we are firmly plugged into the global space value chain.

Finally, I must thank the leadership of the present and former Ministers responsible for the Department of Science and Technology and its senior leadership for the ongoing policy and financial support for this critical sector.

Dr Val Munsami
Chief Executive Officer

6. STATEMENT OF RESPONSIBILITY

STATEMENT OF RESPONSIBILITY AND CONFIRMATION OF ACCURACY OF THE ANNUAL REPORT

We confirm that, to the best of our knowledge:

All information and amounts disclosed in this Annual Report is consistent with the Annual Financial Statements audited by the External Auditors.

The Annual Report is complete, accurate and free from any omissions and has been prepared in accordance with the Annual Report Guidelines issued by National Treasury.

The Annual Financial Statements have been prepared in accordance with the South African Standards of Generally Recognised Accounting Practice (GRAP) that apply to a public entity.

The Accounting Authority is responsible for the preparation of the Annual Financial Statements and judgements made in this information. The Accounting Authority is also responsible for establishing and implementing a system of internal control designed to provide reasonable assurance about the integrity and reliability of the performance and human resources information and the Annual Financial Statements.

The external auditors are engaged to express an independent opinion about the Annual Financial Statements.

In our opinion, the Annual Report fairly reflects the operations, performance and human resources information and the financial affairs of the public entity for the financial year ended 31 March 2019.

Yours faithfully

Dr Val Munsami
Chief Executive Officer

Ms Xoliswa Kakana
Chairman of the Board

7. STRATEGIC OVERVIEW

VISION

South Africa to be an international hub for space solutions for the world of the future.

MISSION

Lead and inspire the South African space community to create a better future.

LEGISLATIVE AND OTHER MANDATES

The South African National Space Agency (SANSA) was established in terms of the South African National Space Agency Act (Act No. 36 of 2008), as amended. SANSA is a Schedule 3A Public Entity in terms of the Public Finance Management Act (No.1 of 1999 as amended by Act 29 of 1999).

LEGISLATIVE MANDATE

The legislative mandate is premised on two primary Acts, namely (i) the Space Affairs Act (Act No. 84 of 1993) and (ii) the South African National Space Agency Act (Act No. 36 of 2008). The former, an instrument of the dti, caters for the regulatory/policy context for a South African space programme, whereas the latter, an instrument of the DST, enables the establishment of SANSA as an implementing agency for the National Space Programme.

In terms of the SANSA Act, the objects of the agency are to:

a) promote the peaceful use of space;

b) support the creation of an environment conducive to industrial development in space technology;

c) foster research in space science, communications, navigation and space physics;

d) advance scientific, engineering and technological competencies and capabilities through human capital development outreach programmes and infrastructure development; and

e) foster international co-operation in space-related activities.

The mandatory functions of the agency as outlined in the Act, are that the agency must:

a) implement any space programme in line with the policy determined in terms of the Space Affairs Act;

b) advise the Minister on the development of national space science and technology strategies and programmes;

c) implement any national space science and technology strategy; and

d) acquire, assimilate and disseminate space satellite imagery for any organ of state.

STRATEGIC GOALS

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

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

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

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

STRATEGIC GOALS	PROGRAMMES				
	ADMINISTRATION	EARTH OBSERVATION	SPACE SCIENCE	SPACE OPERATIONS	SPACE ENGINEERING
Goal 1: Address South Africa's challenges through space services and products		✓	✓	✓	✓
Goal 2 Lead high-impact collaborative R&D on a national scale		✓	✓		✓
Goal 3 Develop national human capacity and ensure transformation		✓	✓	✓	✓
Goal 4 Enhance the competitiveness of the South African space industry		✓		✓	✓
Goal 5 Develop active global partnerships	✓	✓	✓	✓	✓

STRATEGIC GOAL 1: ADDRESS SOUTH AFRICA'S CHALLENGES THROUGH SPACE SERVICES AND PRODUCTS

The primary objective is to ensure that space-based information is integrated into service delivery platforms, within industry and government, as indispensable tools for decision-making and policy formulation. Space plays a crucial role in providing operational applications or solutions that will address national challenges through the provision of decision support tools for government. These include applications in natural resource management, climate change and environmental management, disaster management, rural development and urban planning, national safety and security.

STRATEGIC GOAL 2: LEAD HIGH-IMPACT COLLABORATIVE R&D ON A NATIONAL SCALE

The prime objective is to increase the national research output in the space science and technology sector through supporting R&D initiatives. High quality impactful research and development leads to the development of sustainable space-based applications that bring benefit to the nation. This requires close collaboration with various public and private sector institutions in South Africa, in the areas of space science and technology to meet the broader user requirements of these sectors.

STRATEGIC GOAL 3: DEVELOP NATIONAL HUMAN CAPACITY AND ENSURE TRANSFORMATION

The primary focus is on the development of high-end skills and expertise both for the space sector and other industrial sectors. For the national space programme to be sustainable, and deliver on its targets, there is a need to ensure that the appropriate skills base is in place. This requires SANSA to support building capacity in the STEM (science, technology, engineering, mathematics) areas and thus create the pipeline of students for developing the high-tech skills needed to meet national demand in the space sector. Capacity development in space related areas will not only benefit space, but will also have a spill over effect into other productive sectors that require skilled scientists, engineers, and technicians. This will support the job creation priorities of the country and thereby strengthen the economic growth potential of South Africa.

STRATEGIC GOAL 4: ENHANCE THE COMPETITIVENESS OF THE SOUTH AFRICAN SPACE INDUSTRY

The primary focus is on expanding space activities beyond the borders of South Africa to grow SANSA's market share within the global space sector. The global space industry is growing at a rapid rate and is estimated to be worth over USD 300 billion. It is an industry that drives new technologies and innovation, giving rise to applications that go beyond space systems, for example, impacting sectors such as medicine, manufacturing, security, and energy. One of the objectives of the NSS is for South Africa to capture a reasonable share of the global space market, an endeavour that will create new opportunities and help grow the national space sector. This needs to be done in concert with other industrial policies and strategies, such as the Industrial Policy and Action Plan (IPAP).

STRATEGIC GOAL 5: DEVELOP ACTIVE PARTNERSHIPS

The primary focus is on fostering international partnerships, both on the African continent and abroad, to unlock opportunities for the national space sector. Space science and technology, by its nature, can only be effectively undertaken as part of a global partnership. South Africa, through SANSA, must position itself as a strategic partner for the African continent and with other global players in space science and technology. In line with South Africa's foreign policy agenda, partnerships with African countries will be prioritised over the next five years through the support for the development of Science, Technology and Innovation (STI) capacities in Africa. Internationally, SANSA works with various partners, actively taking part in multi-national projects and forums, and continues to service a number of memorandums of understanding/agreements. SANSA will also enter into new strategic partnerships, at an inter-agency level, with a view to broadening access and creating opportunities for the national space sector.

8. ORGANISATIONAL STRUCTURE

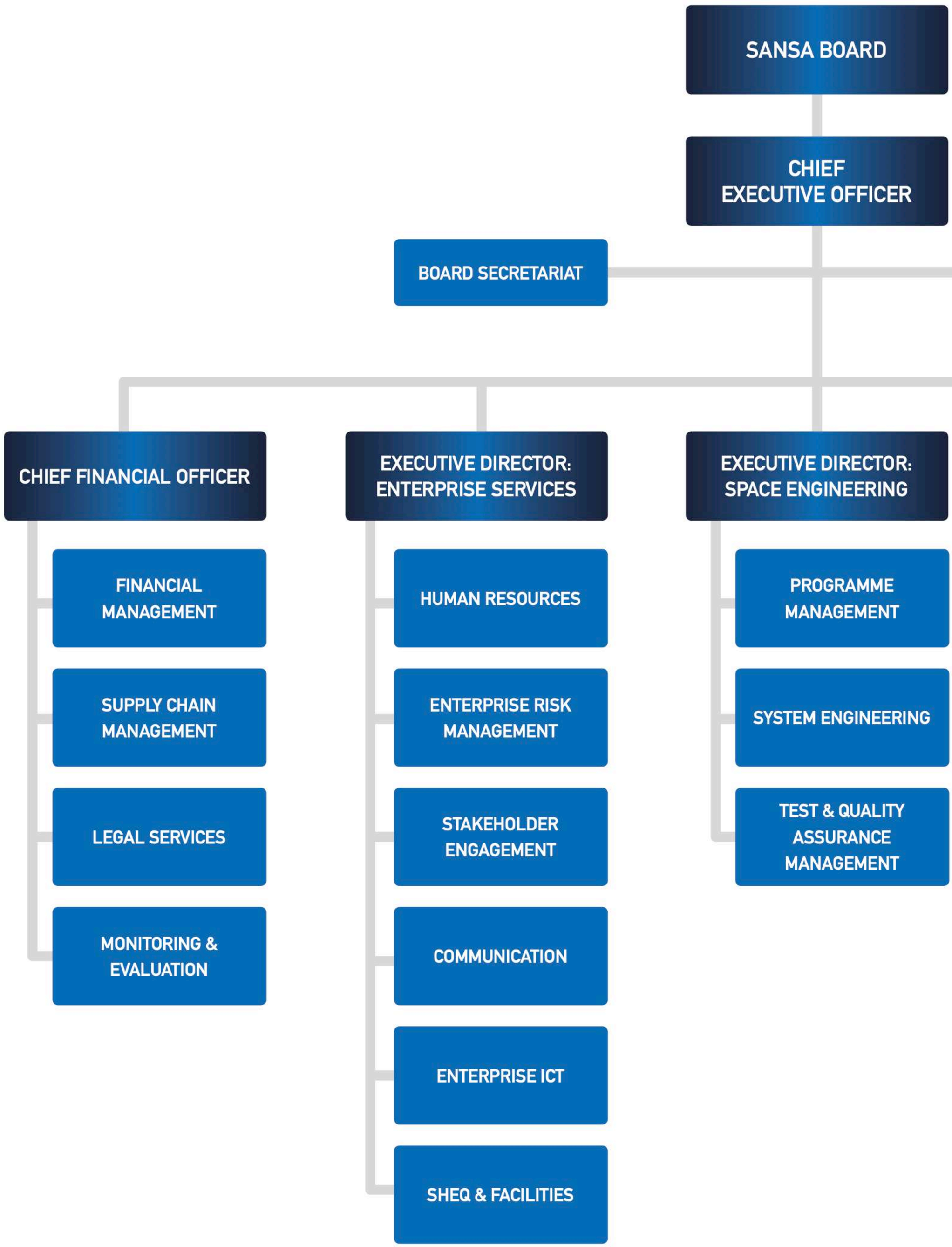
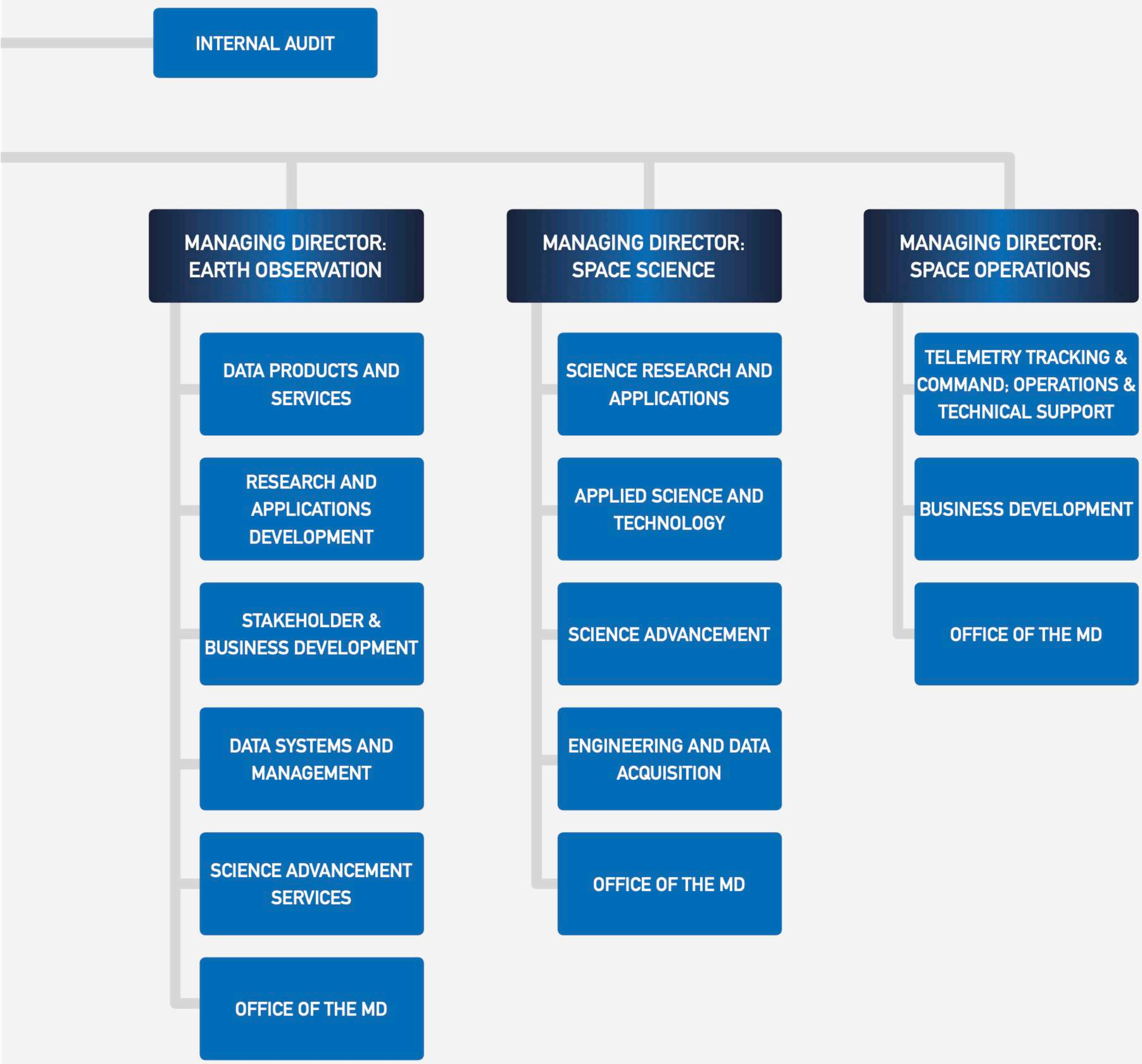
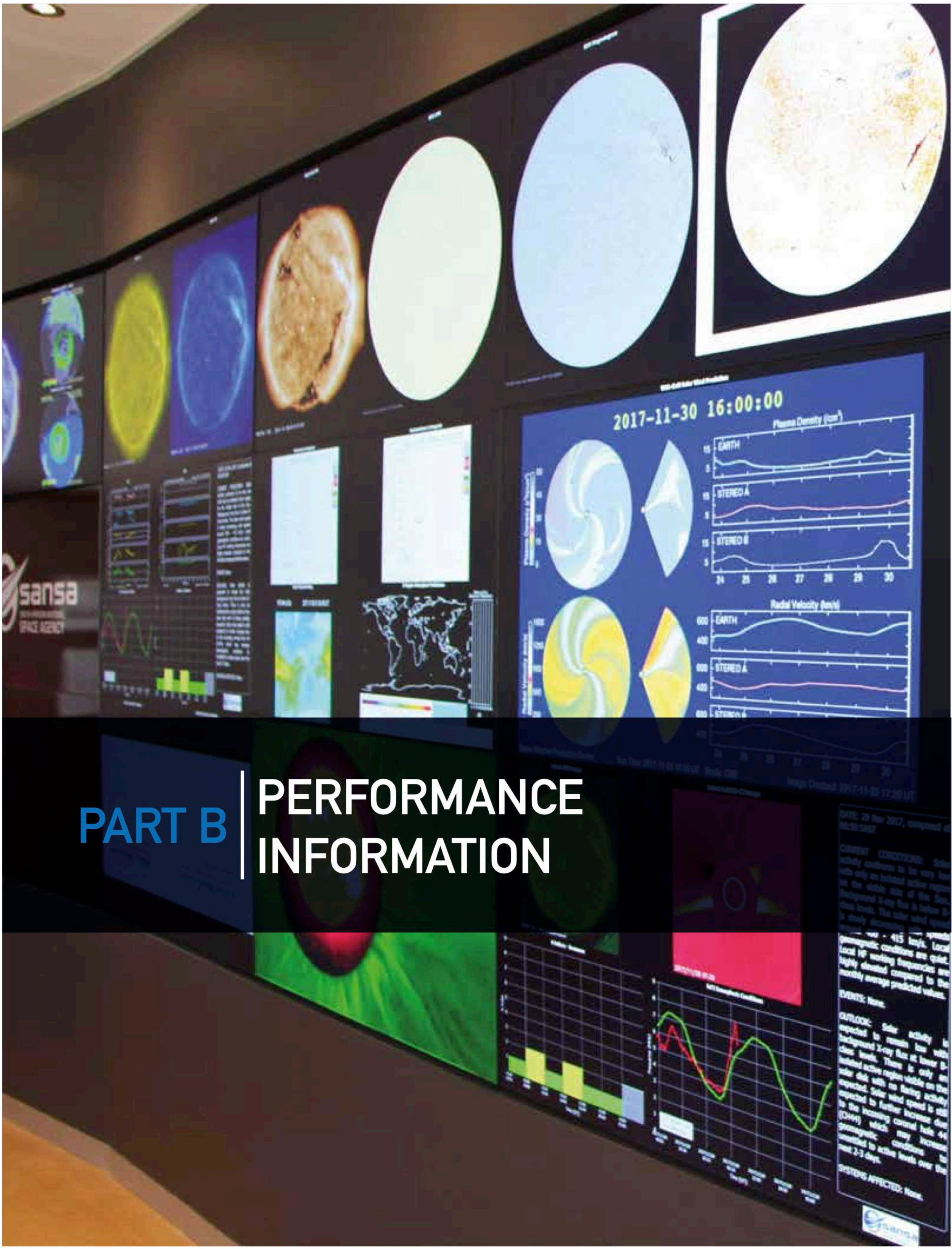


Figure 1: Organisational structure of SANSA as at 31 March 2019


INTERNAL AUDIT
MANAGING DIRECTOR: EARTH OBSERVATION
DATA PRODUCTS AND SERVICES
RESEARCH AND APPLICATIONS DEVELOPMENT
STAKEHOLDER & BUSINESS DEVELOPMENT
DATA SYSTEMS AND MANAGEMENT
SCIENCE ADVANCEMENT SERVICES
OFFICE OF THE MD
MANAGING DIRECTOR: SPACE SCIENCE
SCIENCE RESEARCH AND APPLICATIONS
APPLIED SCIENCE AND TECHNOLOGY
SCIENCE ADVANCEMENT
ENGINEERING AND DATA ACQUISITION
OFFICE OF THE MD
MANAGING DIRECTOR: SPACE OPERATIONS
TELEMETRY TRACKING & COMMAND; OPERATIONS & TECHNICAL SUPPORT
BUSINESS DEVELOPMENT
OFFICE OF THE MD



PART B | PERFORMANCE INFORMATION

9. THE IMPACT OF SPACE IN OUR SOCIETY

SPACE BASED INFORMATION INTEGRATED INTO SERVICE DELIVERY PLATFORMS

USING SPACE SCIENCE TO ENSURE NATIONAL SECURITY

SANSA continues to contribute to the safety and security of the nation through the High Frequency (HF) Propagation service that is provided to the South African National Defence Force (SANDF) from the SANSA Space Weather Centre. SANSA has built a customised tool for HF predictions called IOCAP Frequency Demonstrator to ensure the services and solutions offered to the SANDF are utilised effectively. This tool has been designed to assist the SANDF in communications planning and consists of a central core with modules customised to the needs of the Army, Air Force and the Navy. This service is important because it allows the Defence Force to prepare for operations and communicate optimally with the troops and other military personnel on the ground. The IOCAP Frequency Demonstrator is also applicable to other sectors, such as the aviation and maritime sectors, who require efficient and accurate information for their communications planning.

PROTECTING SOUTH AFRICA'S MAGNETICALLY CLEAN ENVIRONMENT FOR A BETTER WORLD

SANSA's latest geomagnetic survey and magnetically clean environment helps monitor the invisible magnetic shield around the Earth, and keeps delicate systems protected so that we can use services such as Global Positioning Systems (GPS).

The Earth is continuously battered by charged particles from the sun and other sources in outer space, but the Earth's magnetic field protects us from the majority of these. More accurately known as the geomagnetic field, it is a dynamic phenomenon that is constantly changing and shifting.

SANSA is the current torchbearer for a long line of researchers that monitored the ever-changing geomagnetic field; at the centre of South Africa's contribution is the Hermanus Magnetic Observatory. The Observatory participates in international projects involving satellite missions, and forms part of a network of geomagnetic survey stations spread across southern Africa. These stations study patterns of magnetic variation over southern Africa and the influence of the South Atlantic Magnetic Anomaly - a region where the Earth's magnetic field is 25% weaker compared to other regions of similar latitude around the globe. This anomaly effectively creates a hole in the Earth's shield against space weather which can result in radiation damage to sensitive electronics on board low-Earth orbit satellites.

SANSA Researcher, Dr Pieter Kotzé, recently penned an article on the history of geomagnetism in South Africa centered around the Hermanus Magnetic Observatory. In the article, also published in the History of Geo- and Space Sciences journal in August 2018, Kotzé relays the important historical role that SANSA's geomagnetic capacity played and still plays in South Africa and the rest of the world.

The Hermanus site was chosen after the original site in Cape Town was inundated with development, including electrified railways which cause interference to sensitive magnetic instruments. Hermanus, today, is still remote and situated away from such interference. It is for this reason that the Observatory needs to continue being protected from any development that might interfere with observations.

The Observatory at SANSA's Hermanus facility has a magnetically clean environment which makes it one of the only sites in Africa to take baseline measurements for geomagnetic surveys and calibrate magnetic equipment for aircraft and navy vessels – a valued service to the Defence force and private aviation companies.

Due to the permanent and induced magnetic properties of aircraft, all aircraft compasses have to be "swung" (calibrated) to cancel the magnetic effects of the aircraft itself, and this important procedure can only be done at the magnetically clean environment at Hermanus. All military aircraft of the South African Air Force (SAAF) are required by law to have a magnetic compass as an important back-up to the integrated navigation system.

A magnetically clean area also offers important uses in the maritime sector, in space weather applications, for space industry applications, and in predicting environmental hazards. Currently, SANSA remains the only facility in Africa that calibrates magnetic sensors for dynamic platforms such as unmanned aerial vehicles and satellites.

The magnetically clean environment in Hermanus remains important to many industries in South Africa and beyond. South African law can be used to ensure that the area

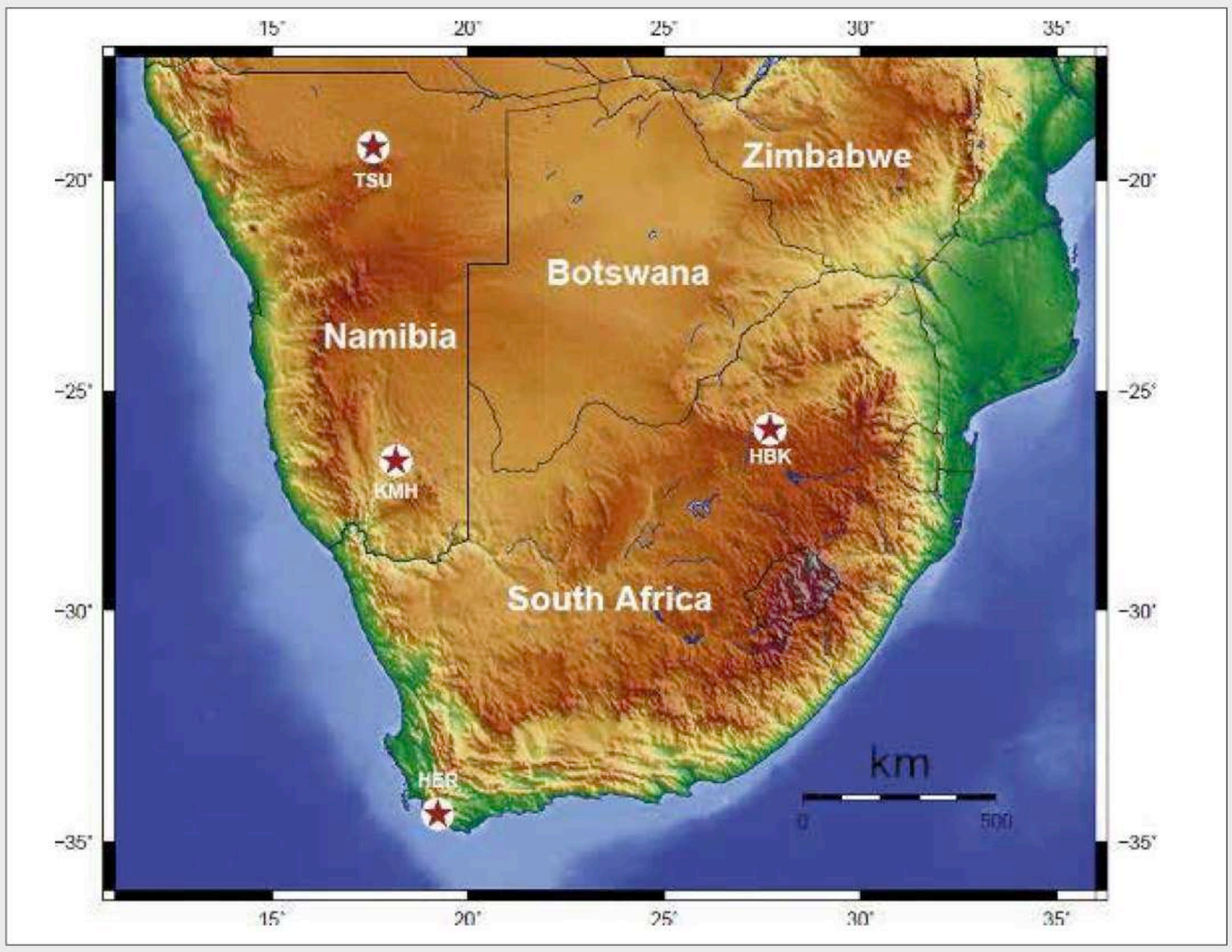


Figure 2: A map of southern Africa showing the positions of the four INTERMAGNET observatories: Hermanus (HER), Hartebeesthoek (HBK), Keetmanshoop (KMH) and Tsumeb (TSU) (red stars); as well as the positions of the field survey repeat stations (blue stars).

remains protected – one way to do this could be to expand the Astronomy Geographic Advantage Act (Act 21/2007) to include the Hermanus area.

DARK FIBRE PROJECT COMPLETION AND TELEPORT SERVICE AVAILABILITY

SANSA embarked on a project to install its own dark fibre connection, from the Hartebeesthoek facility to the Teraco Data Environments at Isando in Pretoria, in response to fulfilling one of the Agency's strategic objectives. The dark fibre that was installed spans a distance of approximately 118km and provides an advantage for SANSA and South Africa by allowing transfer of near real-time and reliable Earth observation and other telemetry data to stakeholders.

The network will also enable SANSA to provide reliable, high bandwidth and low latency space data transmission in real-time or near real-time to back-up ground-stations locally or internationally for conducting nominal or emergency satellite operations. This fibre connection will also enable the provision of space operations services (mission control, launch and early-orbit operations, housekeeping or lifecycle support) for the national satellite program. The project was completed and the fibre went live at the end of April 2019.

The dark fibre network provides SANSA with access to local and international data carriers, which helps to connect Africa to the rest of the world.

BUILDING OUR MARITIME DOMAIN AWARENESS PLATFORM

ZACube-2, designed, developed and manufactured by the Cape Peninsula University of Technology (CPUT), is a precursor mission to a constellation of nano-satellites that will provide maritime domain awareness (MDA) and veld fire detection applications. A key requirement for the programme is to support the objectives of Operations Oceans Phakisa through a constellation of satellites (MDASat).

The MDASat constellation will provide South Africa with security and control of its Automatic Identification System (AIS) and VHF Data Exchange System (VDES) maritime data with associated improved control over both data cost and access. In addition, with its flexible communications platform, the MDASat will also enable various other satellite-based services for South Africa and the African continent. The data map shows ships along the African coast detected within a short space of time of activating the SDR (Software Defined Radio) AIS payload on board ZACube-2.

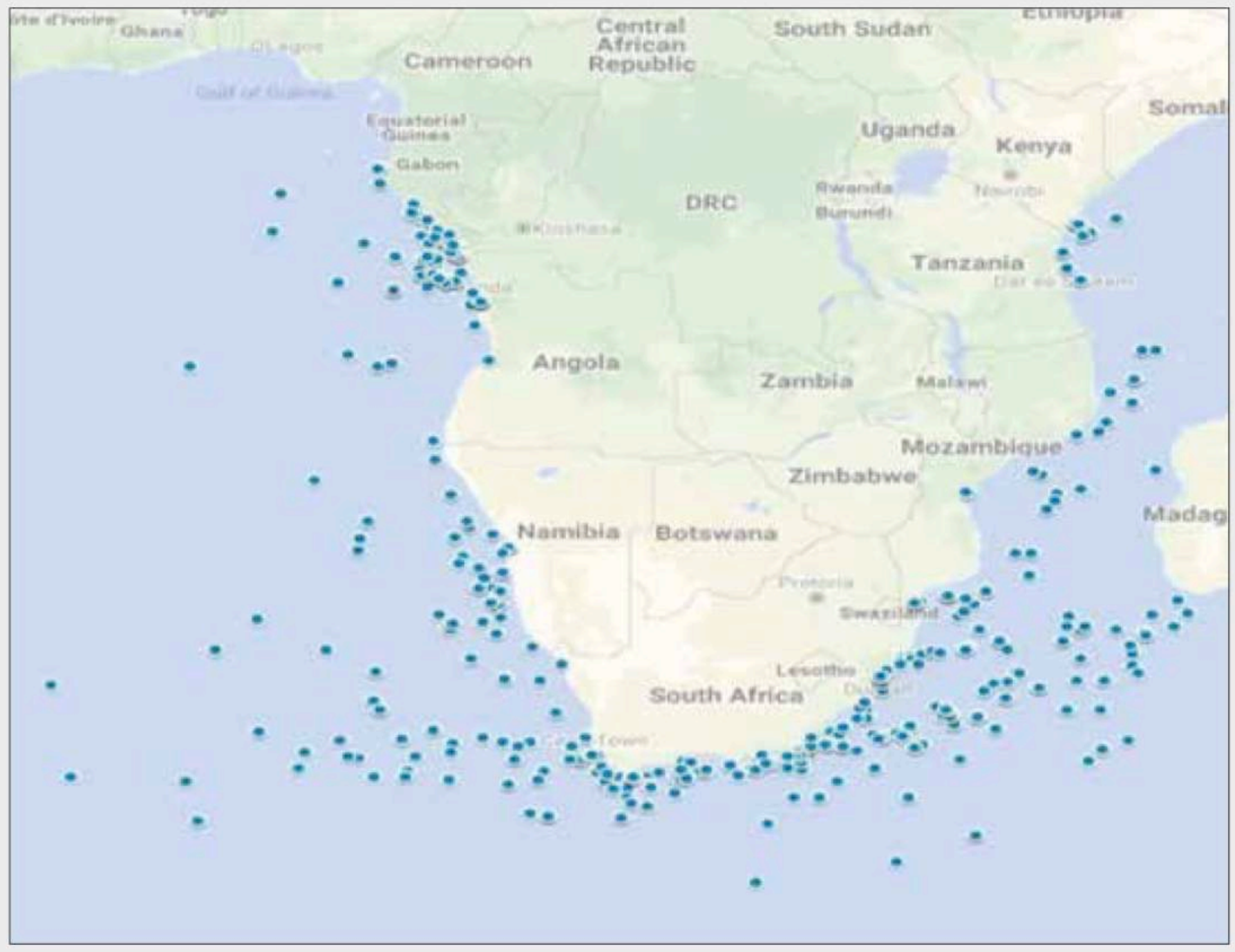


Figure 3: Ship traffic along the African coastline taken from ZACube-2.

The next phase will include the addition of several more satellites to populate the MDASat constellation. In addition, a demonstration of machine-to-machine communications integrated with artificial intelligence will also be commissioned to demonstrate how the 4th Industrial Revolution will be integrated into our future space systems.

PROVIDING DATA FOR SOCIO-ECONOMIC DEVELOPMENT

SANSA distributed more than 60,000 satellite images to entities in Government, science councils and universities. The distributed images covered a range of sensors and provided end users with a wide choice of spatial and spectral resolutions for the decision support applications.

The vast majority and most widely distributed images were from the high-resolution SPOT satellite. SPOT imagery was extensively used for agriculture, water and environmental planning and management, as well as developing an understanding of the characteristics and dynamics of human settlements. Major users included the Departments of Water and Sanitation, Agriculture, Forestry and Fisheries, Human settlements, Statistics South Africa, Eskom and provincial government and municipalities. MODIS data was used by the CSIR for the Advanced Fire Information System, which provided information to fire managers across the country.

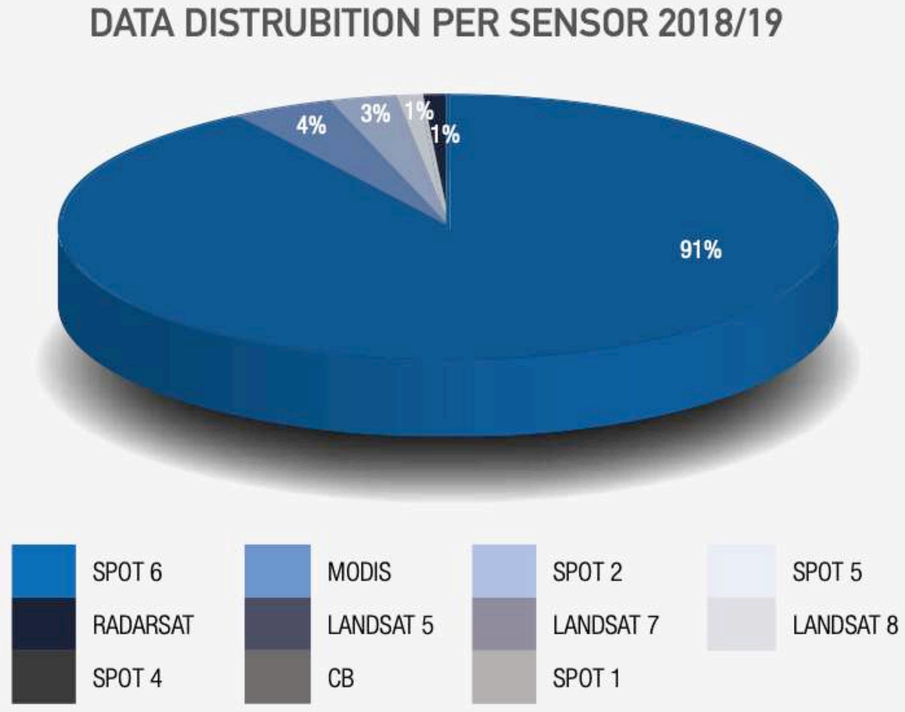


Figure 4: Data distribution per Sensor

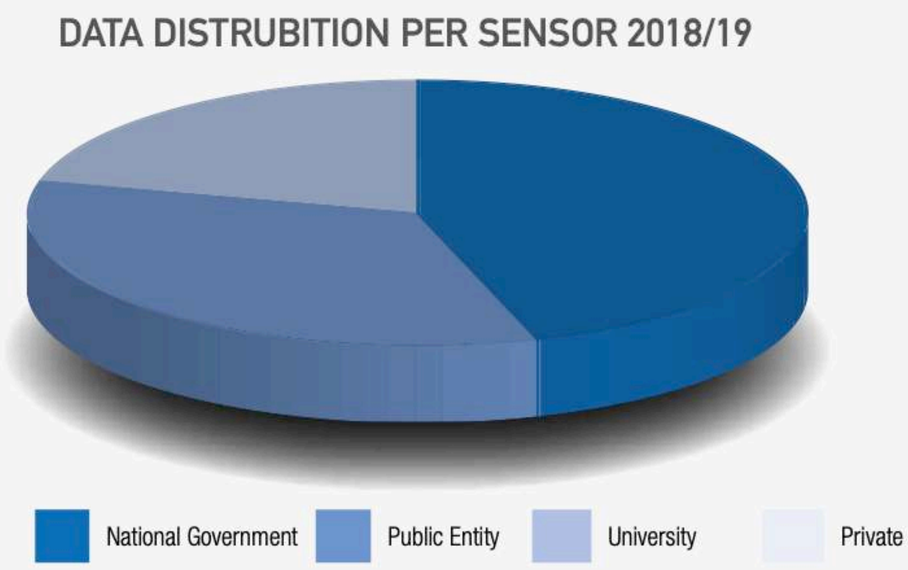


Figure 5: Data distribution per Sector

Synthetic Aperture Radar data, the only non-optical sensor data in SANSA's sensor portfolio, was used to support integrated vessel tracking and sea state applications of the Oceans and Coasts Management Information System (OCIMS). OCIMS is an information platform developed for Operations Oceans Phakisa and is used extensively by the Navy, Marine and Coastal Management, the Department of Transport and the South African Maritime Safety Authority for tracking vessels, such as illegal vessels, within South Africa's Extended Economic Zone. In 2018, for example, the integrated vessel tracking tool was used to track a vessel suspected of carrying drugs to South Africa. The vessel was seized near Port Elizabeth and found to be carrying approximately 700kg worth of cocaine with an estimated value of approximately R720 million.

In 2019, SANSA will introduce major changes to the way data is delivered to users and will fully implement a new high-resolution data acquisition model. This model will ensure the sustainable provision of high-resolution data from a suite of satellites to South African users and will replace the SPOT programme. The advantage will be greater efficiencies in the provision of data and a more cost effective programme that directly addresses user needs.

SANSA will leverage advances in cloud computing services, machine learning and Analysis Ready Data to deliver data and information through Digital Earth South Africa (DESA). DESA will build on Data Cube technology developed by Geoscience Australia and Analysis Ready Data standards developed by the Committee on Earth Observation Satellites (CEOS) to deliver a unique capability to store, manage, process, interrogate, and present Earth observation data in formats that further promote its usefulness to address societal challenges.

PRODUCTS THAT RESPOND TO PUBLIC INSTITUTIONS

During the financial year, SANSA produced geospatial base layers to support agricultural monitoring, surface water monitoring and spatial planning. Advanced geospatial methodologies were used to generate national base layers that included:

- Human settlements layer, mainly supporting spatial and human settlement planning;
- Water body layer that provided insight on the location and extent of surface water bodies in the country;
- National Vegetation Density (NVD) and Leaf Area Index layers, mainly supporting agriculture and rangeland monitoring; and
- Forest Layer, supporting forest management.

The main users of these base data layers include the Departments of Agriculture, Forestry & Fisheries (DAFF), Environmental Affairs (DEA), Human Settlement (DHS), Water and Sanitation (DWS), and Rural Development and Land Reform (DRDLR); the South African National Biodiversity Institute (SANBI), National Geo-spatial Information (NGI), Statistics South Africa, Eskom, and Municipalities such as, City of Tshwane and the City of Ekurhuleni.

Figure 6: Integrated Vessel tracking using SAR data

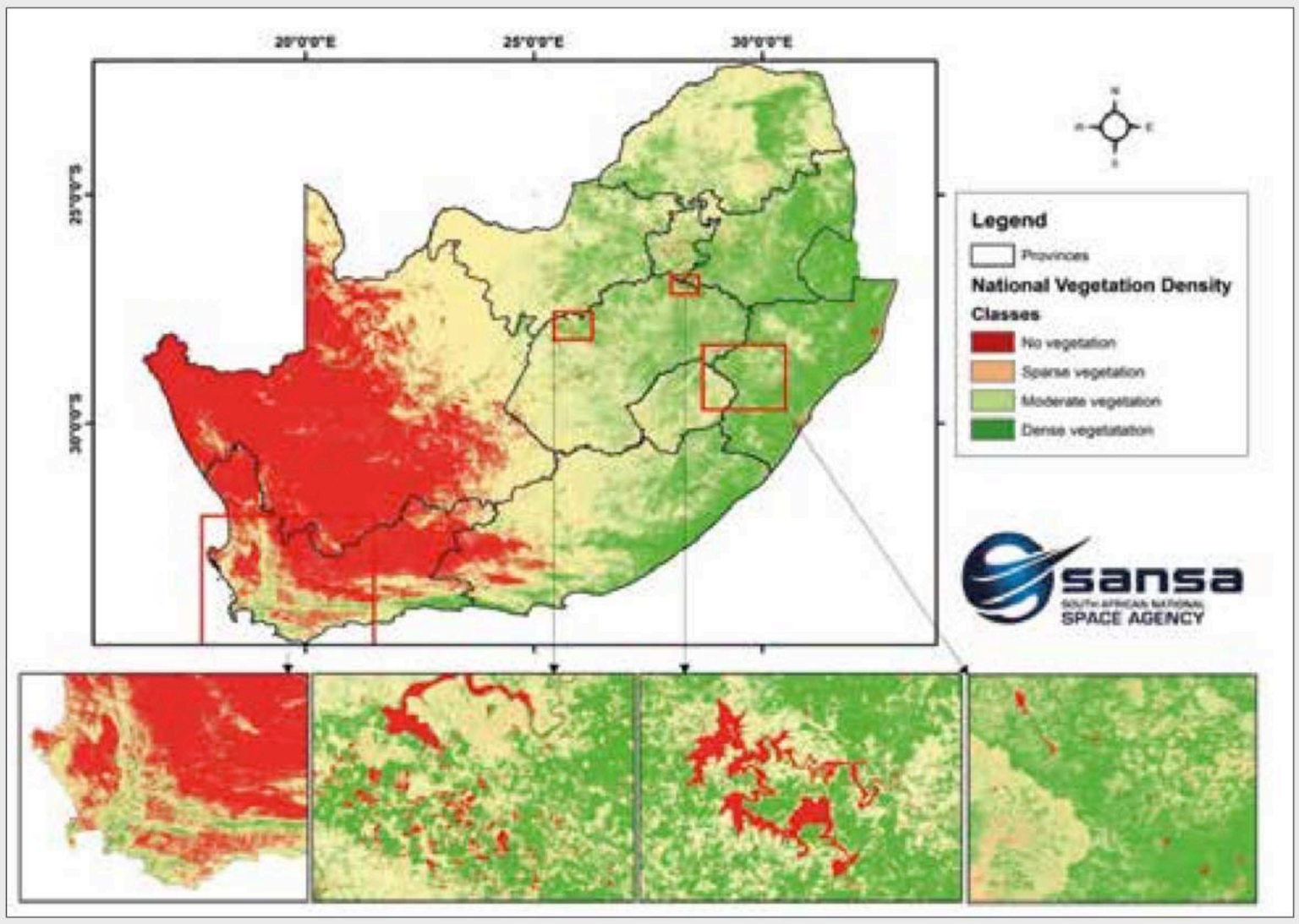


Figure 7: Final National Vegetation Density layer product for 2018's wet season

DAFF required the information on crop specific planted area, crop condition, harvested area, yield estimates, damage assessments due to flood, pests, frosts or droughts. DAFF and DWS also needed spatially explicit data on irrigation and rain fed production areas. The development of the biophysical parameters such Leaf Area Index (LAI), Fraction of Absorbed Photosynthetically Active Radiation (FAPAR) and Normalised Difference Vegetation Index (NDVI) base layers at a national scale assist the users with crop and rangeland monitoring. These layers were generated as composites of vegetation biophysical parameters that were indicative of vegetation stress, chlorophyll content and the general health condition of crops at a national scale. User entities benefitted from using the National Vegetation Density (NVD) layer for informing policy, supporting agriculture and natural resources decisions, and improving knowledge and the information base, i.e. addressing data gaps, improving the management of threatened ecosystems and protected areas, etc.

Furthermore, these base layers provide essential information for addressing the Sustainable Development Goals (SDGs), specifically:

- Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture;
- Goal 6: Ensure availability and sustainable management of water and sanitation for all;
- Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable;
- Goal 13: Take urgent action to combat climate change and its impacts; and
- Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

STRIVING TOWARDS SERVICE EXCELLENCE

The Independent Communication Authority of South Africa (ICASA) approved SANSA's application for an Individual Electronic Communications Network (IECN) licence and an Individual Electronic Communications Services (IECS) licence. The ICASA licence approval is a great milestone for SANSA Space Operations as this completes the dark fibre connection project. These licences allow SANSA to construct, operate and maintain an Electronic communications network within and across the provinces of South Africa. Furthermore, this will also allow SANSA to lease Electronic communications facilities to third parties.

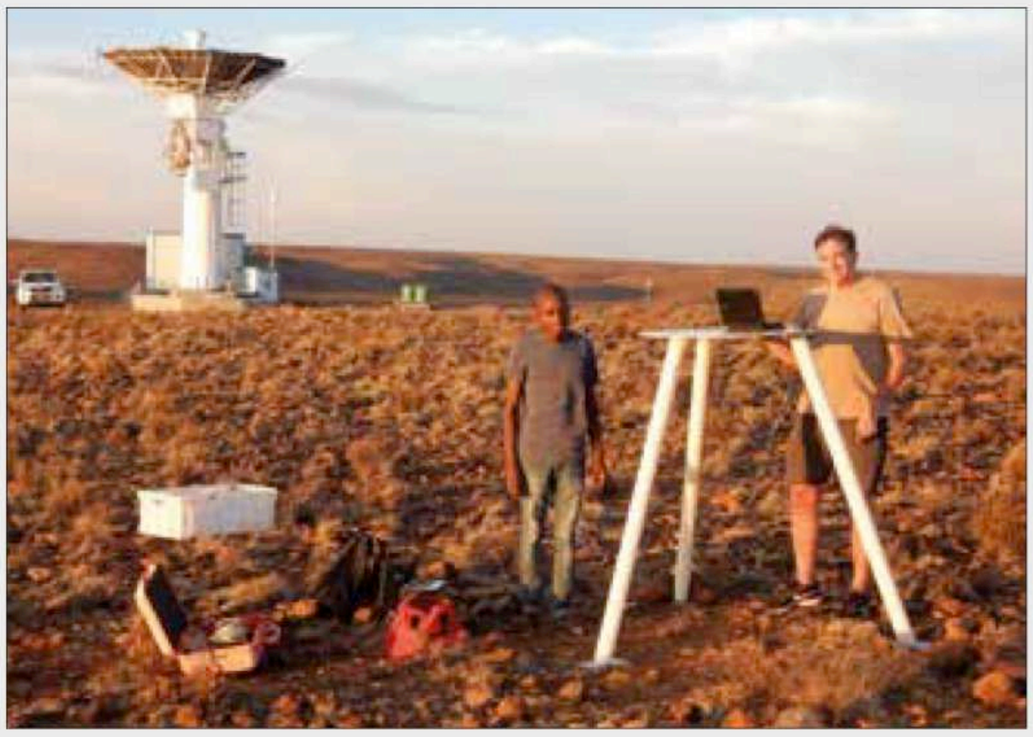


Figure 8: The SANSA 2018/19 Sprite Campaign in Carnarvon.

Figure 9: The SANSA 2018/19 Antarctic Team returned home in March 2019 after a successful expedition.

Both licences are considered as service licences and required in order to hold other licences like the licence we hold on behalf of customers or stakeholder antenna systems and the associated RF spectrum they utilise. The acquisition of the licences represents a significant milestone for SANSA toward achieving some of the SANSA and its Space Operations business growth strategy.

SANSA's Space Operations facility was certified on three new international standards, providing a healthy and safe working environment for employees, ensuring environmental and quality systems were met. SHEQ achievements for 2018/19:

- ISO 9001:2015(Quality Management System);
- ISO 14001: 2015 (Environmental Management System); and
- OHSAS 18001: 2007 (Occupational Health and Safety).

INCREASE NATIONAL RESEARCH OUTPUT IN SPACE SCIENCE AND TECHNOLOGY

DRIVING SCIENTIFIC EXCELLENCE

SANSA will be building their very own square kilometre array out in the Karoo, but rather than the radio waves the now-famous SKA will collect from outer space, this one will collect electrical field measurements from highveld thunderstorms. These electrical field measurements will help scientists better understand the elusive phenomenon known as sprites. Sprites are brief, beautiful flashes of light in the upper atmosphere, above thunderstorms, triggered by the huge electrical fields created when lightning strikes the ground. The 2019 sprite campaign was run from 28 January to 15 February, with cameras set up near the SKA site in Carnarvon, and at SANSA's newly-established Optical Space Research (OSR) Laboratory in Sutherland. The researcher team measured the electric fields of the sprites while simultaneously taking optical measurements from two locations – a novel approach for South Africa. Bi-static optical observations from two sites allow for unambiguous determination of the sprite geographic position and altitude relative to the parent lightning strike. Observations were coordinated with the ASIM experiment, which observes lightning and sprites from space and was installed aboard the International Space Station (ISS) in 2018. About 250 sprites were observed, an exceptional achievement, with data analysis still ongoing. The ground-work for the 2020 sprite campaign was also undertaken, which involved finding accessible open ground with low background interference. SANSA, in collaboration with the University of Bath in the UK, plans to deploy ten ELF receivers in an array to perform the first ever radio wave "imaging" of sprites.

The South African National Antarctic Program (SANAP) biennial workshop was hosted by SANSA in Hermanus during August 2018 and attracted 137 participants. The workshop was funded by the National Research Foundation (NRF) and co-organised by CPUT and SANSA. The program covered Earth Systems, Living Systems, Human Enterprise, as well as Innovation, Technology and Engineering. SANSA researchers, engineers and students delivered a total of 17 presentations. A well-attended evening public lecture entitled "South Africa's legacy in the Antarctic region" was delivered by multiple presenters during the workshop.

SANSA supported the annual relief voyage to Antarctica, Marion and Gough Islands. Gough Island is located close to the South Atlantic Magnetic Anomaly providing an optimal location for monitoring ionospheric scintillations. SANSA has two GNSS receivers located on the islands. The team collected vital data from these stations for inclusion in SANSA's geophysical database. The voyage was also the third campaign for the ASTRA GAMMA GNSS receiver, which is installed on the SA Agulhas II and is uniquely designed for use on moving platforms. The data from the voyage will be used for observing and studying ionospheric scintillations (disturbances in the ionosphere which affect satellite signals) from areas in the Southern Ocean where there is no land mass and therefore no permanent platform for gathering data.

DEVELOPMENT OF HIGH-END SKILLS AND EXPERTISE FOR THE SPACE SECTOR

In a rapidly-changing global economy, where many traditional occupations are being displaced by technology, South Africa is challenged to develop its scientific research capabilities and produce suitably skilled people to utilise technology to remain competitive and achieve socioeconomic growth and transformation.

This will require a significant increase in the uptake of science, technology, engineering and mathematics (STEM) qualifications and the development of rare and transferable skills to meet the national demand for a viable National Space Programme (NSP) that can deliver against its targets. Capacity development in space-related areas benefits not only space research but also other areas that require scientists, engineers and technicians. SANSA contributes towards skills development through a number of initiatives, such as offering summer and winter schools, supervising postgraduates, lecturing at partner universities and establishing a SET skills base for the country's space industry. Over the past three years, SANSA has funded the qualifications of over 150 students at various institutions, including four PhD students who graduated in 2018/19.

Figure 10: With support from the NRF and DSI, SANSA and CPUT hosted the 5th SANAP Symposium.

Figure 11: SANSA Researchers who received their Doctorates in Physics from Rhodes University on 9 April 2018.

POST GRADUATE STUDENT SUPPORT PROGRAMME

SANSA's Student Development Programme focuses on building a skills pipeline through the support of postgraduate students (Honours, Masters, Doctoral) within space related areas or fields that are required within the space programme. SANSA received student development funding through National Research Foundation (NRF) grants, and the Department of Science and Technology (DST) HCD grant. SANSA supported 42 postgraduate students.

Bursar conference/ workshop attendance

2018 CHPC workshop held from 2-6 December 2018 was attended by the SANSA's doctoral bursar and another masters' bursar attended the Society of South African Geographers (SSAG) Student Conference 2018 in Bloemfontein from 1-5 October 2018. A honours' bursar attended a Software Carpentry Workshop and Machine Learning Workshop. One doctoral bursar formed part of the 2018 Antarctic takeover team that departed in December 2018.

Bursars' publications

Doctoral - "Impact of artificial intelligence on the human aspects of cybersecurity" Journal published in Sept 2018: "Proceedings of the Twelfth International Symposium on Human Aspects of Information Security & Assurance (HAISA 2018)" and "Socio-technical systems cybersecurity framework". Journal published in, (accepted for publication in 2019): Emerald's International Journal of Information & Computer Security

Masters - "A novel approach to deriving land use productivity using Google Earth Engine" - Conference Proceedings for 7th Digital Earth Summit 2018 (DES-2018).

Masters co-author – "Mining surveillance application using a CubeSat constellation" (to be published in 2019).

Masters – "Compact finite difference relaxation method for chaotic and hyperchaotic initial value systems". Springer international publishing M.Comp.Appl.Math (2018) 37:5187.http://do I.org/10.1007/s40314-018-0624-4.

Bursar awards

Masters Best Paper in GIS/Remote Sensing (Masters Level) at the SSAG Student Conference 2018.

Honours International Society for Digital Earth (ISDE) Young Scientist Award 2018.

Thesis submissions

One master and two PhD's submitted their thesis.

A graphical representation of the supported student demographics for the 2018/2019 financial year is shown in the following figures to the right.

Training South Africans in key areas of national importance, developing scarce and transferable skills contribute to transforming the country into a knowledge-based economy.

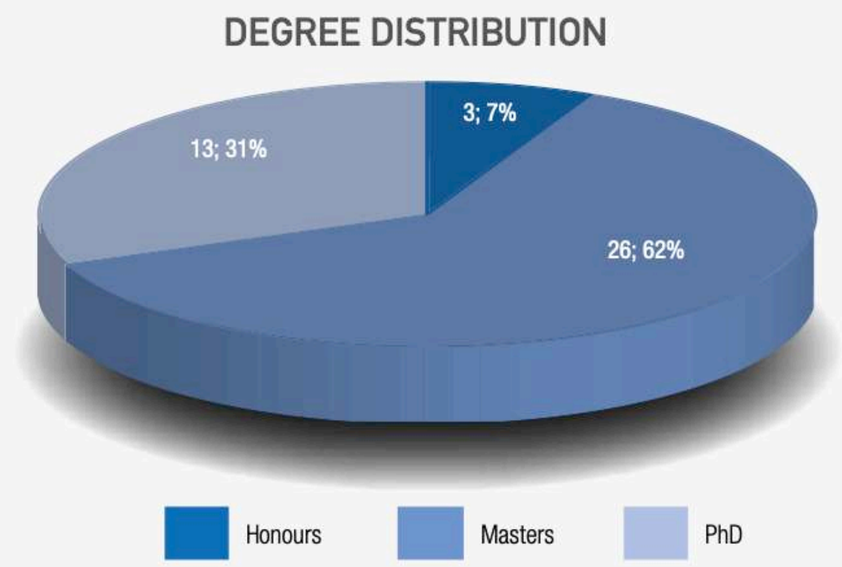


Figure 12: Degree distribution of supported students

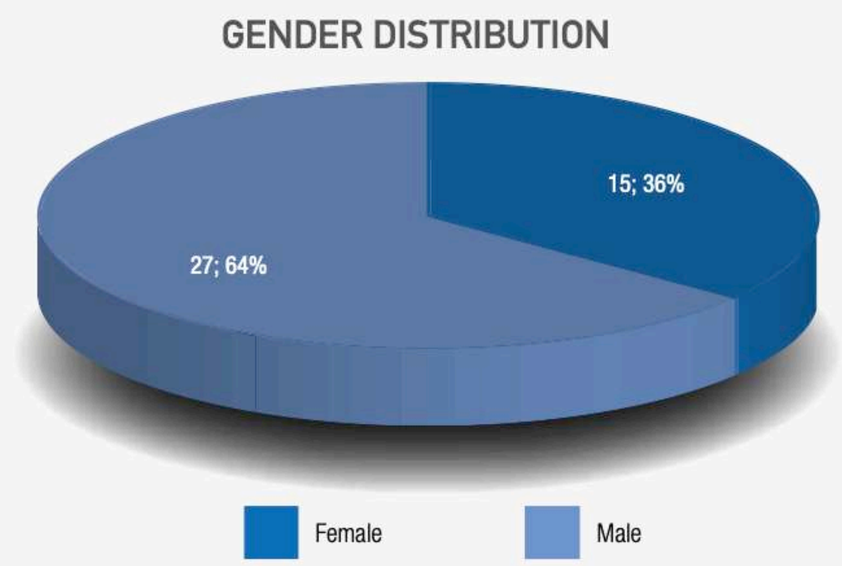


Figure 13: Gender distribution of supported students

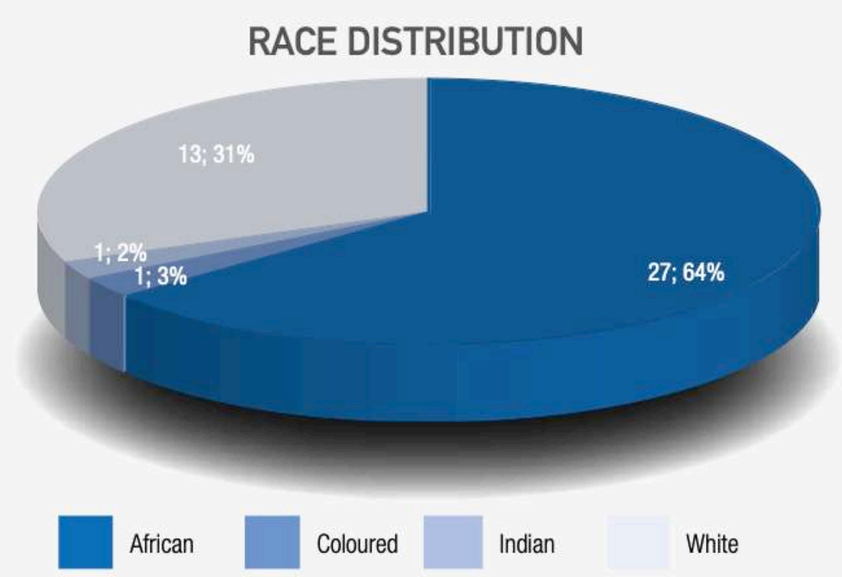


Figure 14: Race distribution of supported students

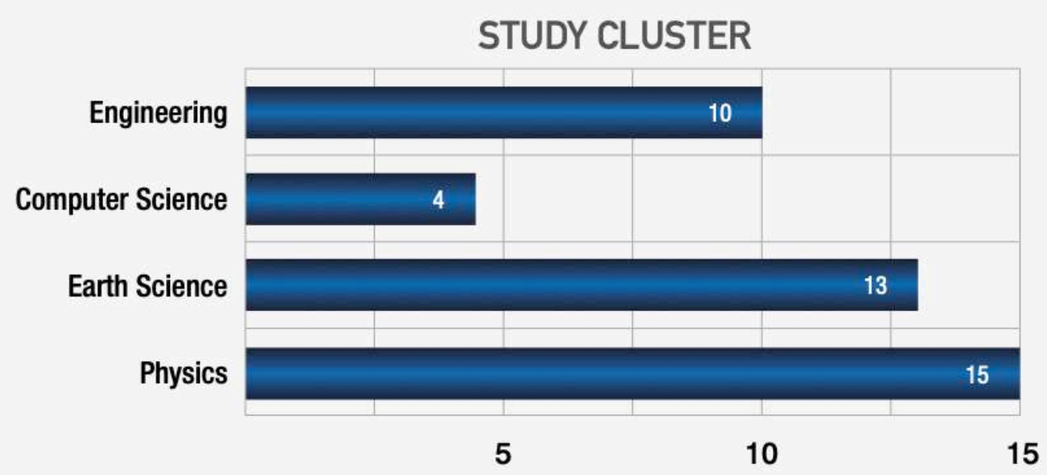


Figure 15: Study cluster distribution of funding

GROWING HIGH-END SKILLS

SANSA and the CSIR's Centre for High Performance Computing (CHPC) coordinated a five-day Linux and Python training school for SANSA students and team members. The course was facilitated by instructors from the CHPC and was held at SANSA. The Linux operating system and Python programming language are integral to many technical industries and various research fields throughout the world. These free and open source systems facilitate ease of collaboration, extension and agile improvement. Training staff and students to work with these systems is not only financially prudent, but also an investment into their futures, as these systems are widely used and in great demand even beyond the space physics research community. It is imperative that initiatives like these are conducted and developed to ensure South Africa builds the skills required for the 4th Industrial Revolution.

The second South African Superconducting Quantum electronic circuit design tools and Analysis workshop (SASQIA) 2019 was presented at SANSA from 4-8 March 2019 by SUN Magnetics, a Stellenbosch University company, with the support of the Embassy of France in South Africa. A wide range of topics were covered in lectures and tutorials with the 30 participants including international and local guest lecturers, international and

local researchers and students, as well as collaborators on the SANSA SQUID project.

SANSA joined an international network of instruments observing the Sun with the recent installation of a CALLISTO radio spectrometer. Developed in part by highly skilled SANSA engineers, the new instrument will expand the capacity of SANSA's Space Weather Station in Sutherland. CALLISTO radio spectrometers have been placed all over the globe to form the e-Callisto network, which monitors the Sun 24 hours a day. The instruments continuously record the Sun's radio spectrum and the data is sent to a central database, which is accessible through a public website interface.

The network will be a valuable new tool for South Africa and the rest of the world to monitor the solar radio spectrum. The main applications are the observation of solar radio bursts and RFI (radio frequency interference) - monitoring for astronomical science, education and outreach. While the project started in June 2014 at SANSA, the South African node of the e-Callisto network was finally installed in Sutherland and switched on in September 2018 after a lengthy process of design, implementation and site selection, which involved moving it from Hermanus due to high radio frequency interference (RFI). SANSA engineers developed the Sun-tracking antenna system, low noise amplifier, radio receiver and PC logger for the instrument.

The radio receiver and software were donated by the e-Callisto partner institution, Ethz in Zurich, and was integrated into the SANSA designed hardware to ensure compatibility with the e-Callisto network. Skills in the areas of RF and microwave systems, antenna systems, RFI and computing were developed during the design and implementation phases and the data will now be fed into the SANSA Space Weather Centre, in near real time, to detect and classify solar flares. This is an important addition to the operational space weather capability within Africa.

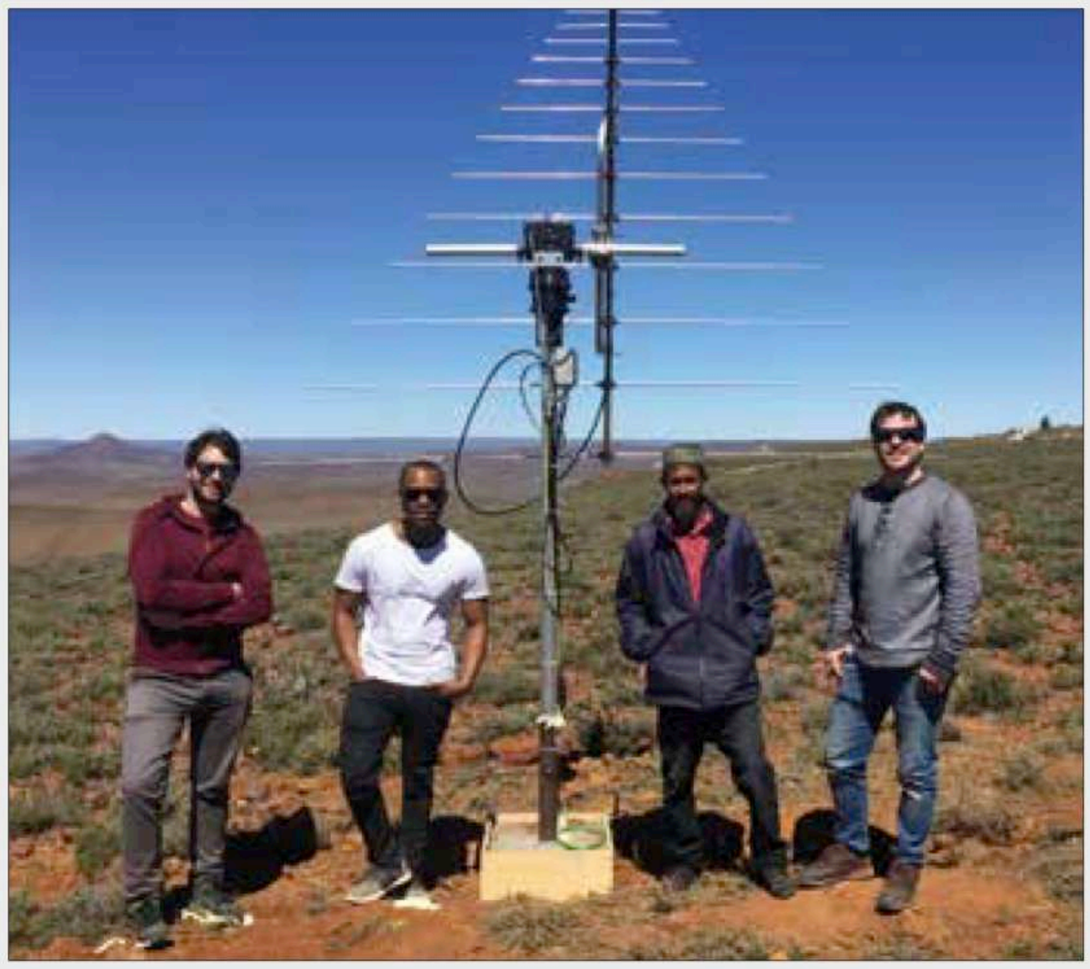


Figure 16: The SANSA team in Sutherland with the newly installed e-Callisto antenna system.

EMPOWERING OUR END USERS

A total of 11 magnetic technology related short courses were presented to members of the defence sector during 2018/19. This included three 5-day compass swing courses for the South African Air Force, five compass swing refresher courses and three magnetic awareness courses for the South African Navy. The compass swing courses, which are accredited by the Civil Aviation Authority (CAA), form part of a contract that SANSA has with the Air Force to provide magnetic technology services. SANSA successfully completed a CAA Audit on the aviation training courses which qualifies SANSA for a training certification for the next five years. The SANSA courses contribute significantly to the training of defence personnel in South Africa and ensures that the requisite knowledge and skills are developed for the security of the nation.

SANSA presents a number of Magnetic Awareness courses to the South African Navy and the Institute for Maritime Technology (IMT). The course content includes basic electromagnetism, magnetic measurements, magnetic applications in the SA Navy, Global Positioning System (GPS) theory, and maritime degaussing and deperming. The students also execute various practical experiments regarding the generation and measurement of magnetic fields, degaussing measurements and deperming of a small-scale vessel as well as the use and interpretation of GPS measurements. The course is held in Hermanus and is designed to meet the client's needs for developing a basic understanding of the impact of magnetism within the maritime environment.

Figure 17: Students from the SA Navy during a training course at SANSA.

DEVELOPING OUR NANO-SATELLITE ENGINEERING SKILLS BASE

The Postgraduate Programme in Satellite Systems Engineering was established at CPUT in 2008/9. It was made possible through seed funding from the DSI and collaboration with the University of Stellenbosch and the then Hermanus Magnetic Observatory, which is currently part of SANSA. It is located at CPUT, hosted by the French South African Institute of Technology (F'SATI), which has since grown to incorporate the African Space Innovation Centre (ASIC).

The Satellite Programme at CPUT has made a great impact on over 30 000 students through Science, Technology, Engineering, Mathematics and Innovation (STEMI) outreach initiatives since its inception. Furthermore, the programme has made significant strides in developing the next generation of skills required in the space industry and other high-tech industry sectors to support the country as it enters into the 4th Industrial Revolution. The programme boasts the following phenomenal successes to date:

Postgraduate Studies:

- Over 55 students currently registered, and
- More than 60 Masters and Doctoral students graduated.

Research and Innovation Output:

- 104 conference papers,
- 49 peer-reviewed journal papers, and
- 11 new innovative technology developments.

Professional Development

- 16 engineers-in-training.

STRENGTHENING OUR NANO-SATELLITE INDUSTRY BASE

The ZACube-i nanosatellite series started with ZACube-1, called TshepisoSat, Africa's first nano-satellite to be fully designed and built in South Africa. It was successfully launched into low Earth orbit on 21 November 2013 and is still operational today. The mission objectives of the ZACube-i nano-satellite mission series have since been strategically realigned and augmented to meet the technological development needs of a nano-satellite constellation purposed for Maritime Domain Awareness. The intention is to develop high-end technologies to be

integrated onto the various ZACube nano-satellite platforms and to demonstrate a wide range of satellite-based communication services.

ZACube-2 is the follow-on mission in the ZACube-i series. It is a technology demonstrator for high-speed communication subsystems developed by CPUT, as well as advanced ADCS subsystems developed by Stellenbosch University. It also hosts a secondary low resolution near-infrared imager payload, designed by the CSIR, for advanced fire detection capability. ZACube-2 was launched and successfully inserted into orbit on 27 December 2018 from the Vostochny Cosmodrome. ZACube-2 was developed with funding from the DST and supported by SANSA. It builds on the legacy technologies, infrastructure and skills that have been established at CPUT since the start of the human capital development programme in 2009.

The value chain incorporates satellite engineering and manufacturing, ground station operations and support, and data products for the end users. The participation of local industry currently is critical to developing space missions that support the requirements of the country. The development of ZACube-2 has further stimulated the South African space capability with a healthy nano-satellite ecosystem in place.

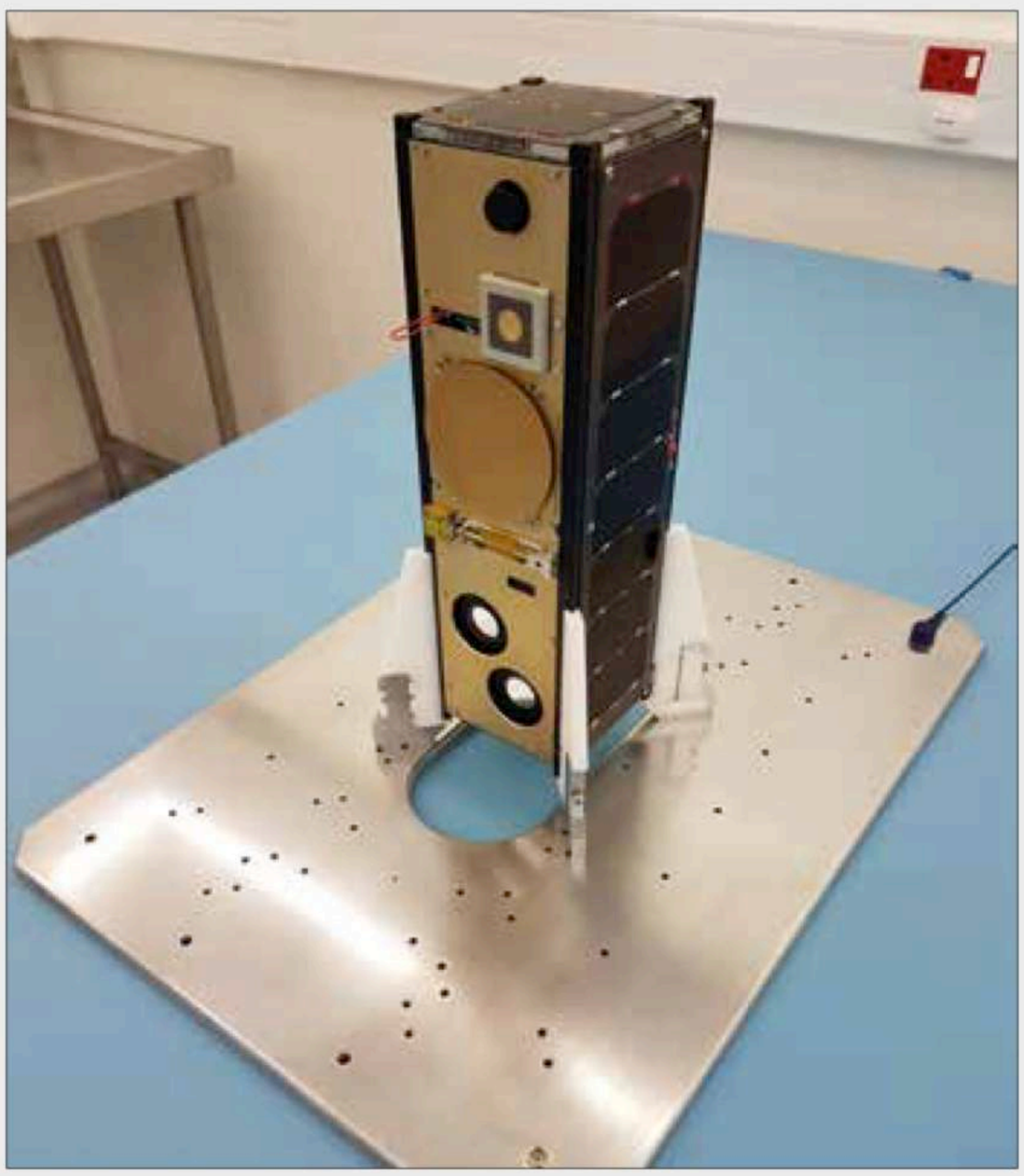


Figure 18: ZACube-2 ready for shipment and launch.

REACHING OUT TO OUR YOUTH TO PROMOTE STEMI

The urgent need to increase the uptake of STEMI subjects among our learners at primary and secondary education levels, is indisputable. Only in doing so can we develop and meet our country's national demand for skilled workers and ensure that the NSP delivers against its targets.

Since inception in 2010, SANSA has been involved actively in a variety of STEMI outreach programmes and its Science Advancement team continues to interact with learners in schools across the country to introduce them to the space-related fields of Earth observation, space science, space engineering and space operations, as well as the practical benefits of space exploration and the use of space technologies in our daily lives.

SANSA participated in the 10th annual Eding International Science Festival in Polokwane in April 2018 and engaged with 1500 learners. The festival aims to create an academic and career-advice orientated environment for learners from the deep rural areas in the Limpopo province. The team hosted learner workshops and highlighted careers in space science and technology.

The annual National Science Week (NSW) held from 30 July to 4 August 2018, was celebrated under the theme "Deepening our democracy through science". In celebration of NSW SANSA hosted their annual Open Day in Hermanus on 4 August 2018. The event-packed day attracted 463 visitors who participated in science engagement activities with a space science related theme. This included speed chat a scientist, space talks, robotics, satellite building and the inaugural space expo and science show. The public was able to learn more about SANSA's role at a local, national and international level.

Members of the CPUT F'SATI team were part of the space expo and shared information on the development of the recently launched ZACube-2 satellite. During the week long science celebration, the SANSA teams also took

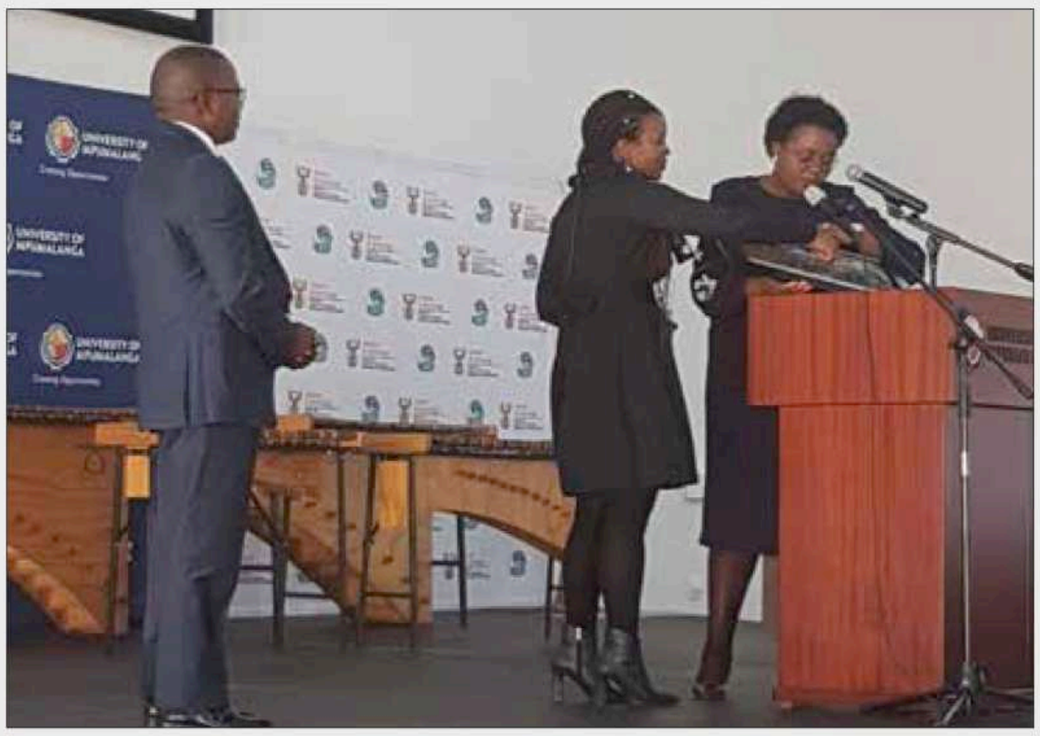
Figure 19: SANSA's National Science Week Open Day in Hermanus.

the excitement of space to schools and events across the country with a range of activities, from satellite-based applications in positioning and navigation to designing satellites and building circuit boards – all to create awareness about the benefits of science and technology in our daily lives. SANSA's participation in NSW events awakened an interest in STEMI subjects and careers amongst approximately 10 000 learners across the country.

During the NSW, SANSA teams also visited 43 schools across seven provinces, that is Mpumalanga, Free State, Limpopo, KwaZulu Natal, North West, Gauteng and the Eastern Cape and directly reached over 7600 public audiences through engagements at shopping centres and street corners, whilst reaching over 450 000 audiences through local radio interviews and newspaper articles. This was the first time this community and their schools were engaged with and the result was an influx of invitations for even more engagements with other grades and community members thus indicating the desire to learn more about space science and it applications as well as career opportunities for the youth.

The official NSW launch took place at the Mbombela campus of the University of Mpumalanga in Nelspruit and included visits to local schools over a duration of five days. During the launch event, Minister Mmamoloko Kubayi-Ngubane delivered a framed high-resolution satellite image of the Mpumalanga province to the Acting Premier of Mpumalanga, courtesy of SANSA. The image is aimed at assisting the provincial government in its planning, implementation and the monitoring of projects and policies. Further imagery was provided to the University of Mpumalanga to support their research activities.

SANSA hosted an educator workshop in February 2019 which was a collaboration between the Agency and the Western Cape Education Department. The workshop was attended by 31 Grade 4 - 7 natural science educators from the rural West Coast, Cape Winelands and Overberg districts. The workshop focused on the development of practical skills through hands on experiments. Educators were also exposed to the SANSA Science Centre and opportunities available for further engagement.



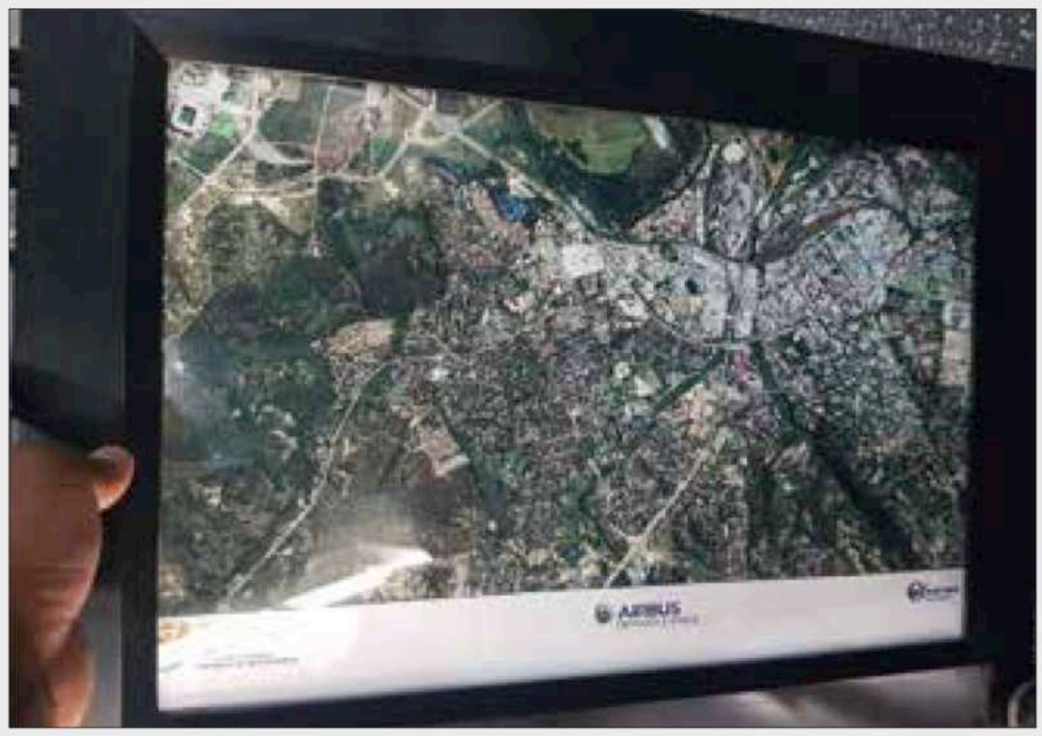


Figure 20: Minister hands over satellite imagery to the Acting Premier of Mpumalanga

The theme for the 23rd Annual Scifest Africa held in Grahamstown in March 2019 was "Discover your element", with reference to the International Year of the Periodic Table of Chemical Elements as proclaimed by the United Nations. SANSA presented learner workshops such as the Space Cube Element from 2D to 3D, which was developed to provide learners with the opportunity to learn about second and third dimensions using the ZACube-1 satellite paper model. They were exposed to concepts such as area of a square and how to move from area to volume by adding a third dimension of height. The grade 4-6 learners enjoyed the hands-on workshop which included educational insights into how South Africa's ZACube-2 satellite assists with tracking ships along the South African coast line. The SANSA team won the award for Best Workshop Presentation at SciFest Africa 2019 for this particular workshop.

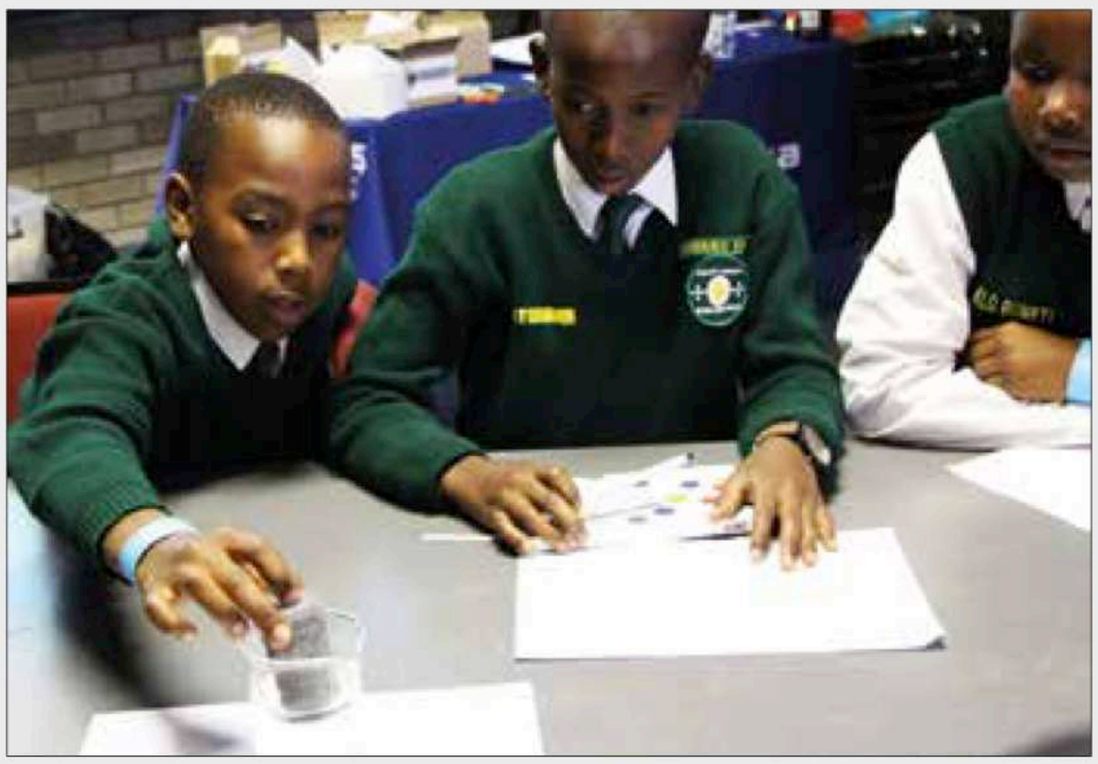


Figure 21: Learners attending SciFest Africa 2019 enjoyed the SANSA workshops that linked elements of the periodic table to aspects of space

The SANSA Mobile Space Lab travelled to the Eastern Cape during October 2018 to engage with school learners in Port Elizabeth and the surrounding areas. During a five day period the SANSA team engaged with 1351 learners from eight different schools. The learners were introduced to a wide range of concepts linked to the maths and science curriculum and were also inspired by fascinating careers in space science and technology. The Mobile Space Lab is an essential SANSA asset that is bringing space science and technology to rural and urban learners. SANSA's outreach initiatives are pivotal to capacity development in STEMI, generally, and in space-related areas, all of which contribute to creating and entrenching a knowledge-based economy in South Africa.

GROWING SOUTH AFRICA'S MARKET SHARE OF THE GLOBAL SPACE SECTOR

SANSA PROVIDES SPACE WEATHER INFORMATION TO THE AVIATION SECTOR IN AFRICA

SANSA's recently upgraded Space Weather Centre has been selected by the International Civil Aviation Organisation (ICAO) as one of two accredited regional warning centres world-wide to provide space weather service, in conjunction with three global centres, to the aviation sector. The three global centres are run by the USA,

the Pan-European Consortium for Aviation Space Weather User Services (PECASUS), and one by a consortium from Australia, Canada, France and Japan. SANSA's Space Weather Regional Warning Centre also forms part of the network of 19 regional warning centres world-wide under the International Space Environment Service (ISES). As the only regional warning centre for Africa this state-of-the-art facility plays a vital role in protecting satellites, national power grids, communication and navigation systems from the harmful effects of space weather.

The Space Weather Centre has been providing the defence and aviation sector as well as other stakeholders with vital early warnings and forecasts on space weather conditions since its establishment in 2010.

Space weather monitoring is essential for the improved understanding and forewarning of solar events that could lead to severe space weather on Earth. Although impending space weather cannot be halted, constant monitoring allows for industries that may be affected to go on standby and provides important scientific information to utilise in making necessary decisions.

SANSA will collaborate with PECASUS to provide benefit for the country through improved access to international models and expertise, as well as providing European space weather providers with an African perspective.

Former Minister of the Department of Science and Technology, Mmamoloko Kubayi-Ngubane unveiled the upgraded SANSA Space Weather Centre based in Hermanus in the Western Cape in April 2018. This centre has set the stage for SANSA's new role as a leader in space weather safety for the global aviation sector.

Over the next few years, SANSA will be working closely with the Air Traffic Navigation Service, the South African Weather Service, the Civil Aviation Authority and other applicable aviation partners to investigate the implications of the ICAO amendments to the South African aviation sector.

SUCCESSFUL SATELLITE PASS MONITORING RATE

This financial year proved productive for the space operations programme, as SANSA acquired new clients whilst growing the service offering amongst existing international clients. The installation of the dark fibre was completed and this investment will contribute immensely in enhancing the competitiveness of the South African space industry and increase the suite of services offered by SANSA.

SANSA operates, maintains and hosts over 20 antennas, this includes the full-motion Telemetry, Tracking and Command (TT&C) antennas and five remote sensing systems across all frequency bands.

Figure 22: SANSA team members and Minister Kubayi-Ngubane during the unveiling of the upgraded Space Weather Regional Warning Centre in April 2018.

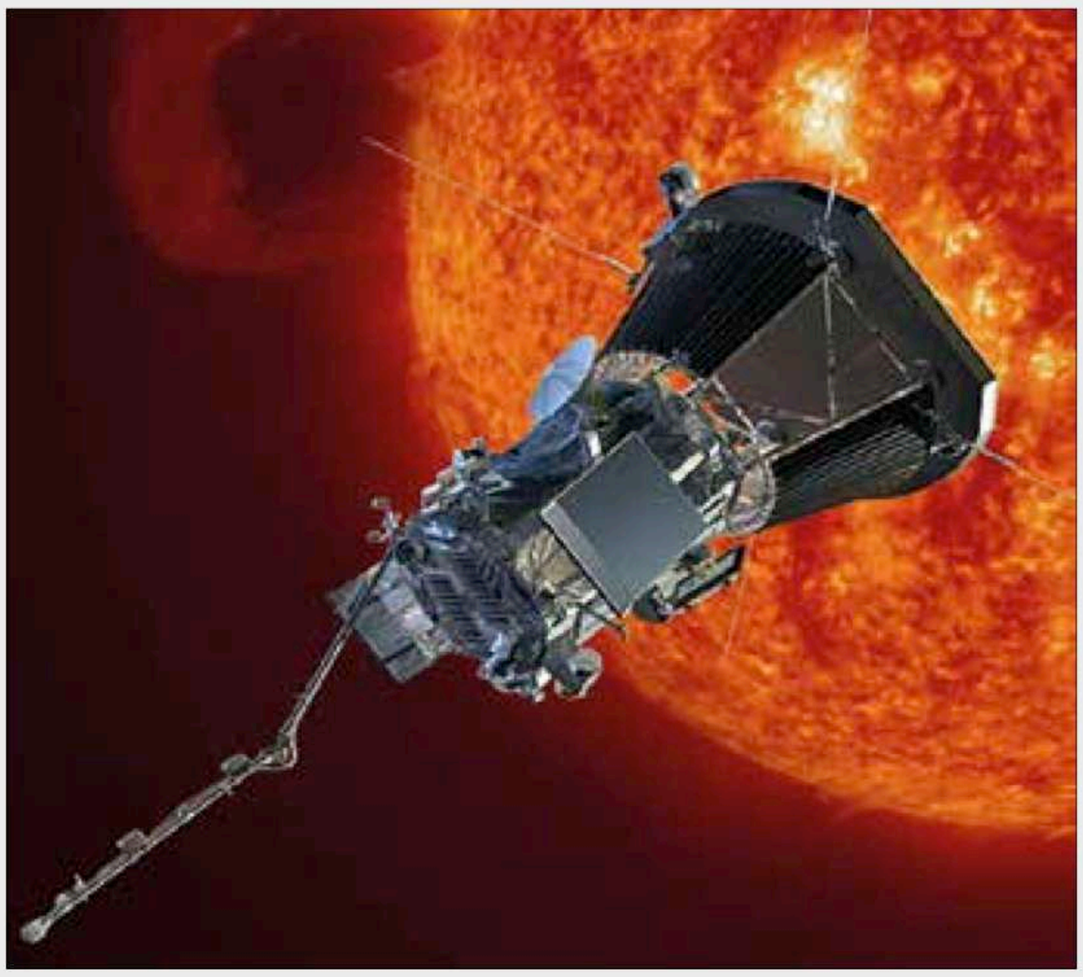


Figure 23: The Solar Parker Probe.

Figure 24: IS-39 Ground Station at Hartebeesthoek

SANSA supported the ULA delta 4 rocket carrying the Parker Solar Probe, which embarked on a landmark mission to the Sun. SANSA was critical in the success of the mission as it had to provide verification of the separation of the probe from the Delta 4 launch vehicle. Roughly the size of a small car, the spacecraft lifted off at 03h31 EDT on a United Launch Alliance Delta IV heavy rocket from Space Launch Complex-37 at Cape Canaveral Air Force Station. At 05h33 EDT, the mission operations manager reported that the spacecraft was healthy and operating normally. The mission's findings will help researchers improve their forecasts of space weather events, which have the potential to damage satellites and harm astronauts in orbit, disrupt radio communications and, at their most severe, overwhelm power grids. SANSA consistently provides clients with successful launch support, ensuring the Agency is a preferred supplier amongst global and local clients.

IS – 39 PROJECT

Mid 2018, SANSA was contracted to deliver civil works and install, integrate and test the Intelsat Furnished Equipment (IFE) necessary to support Intelsat TT&C, and RF Monitoring System (RMS) operations for Intelsat IS-39 satellite at our Space Operations facility.

Two antennas were assembled for this project, a 9m C-band antenna and a 3.7m Ka-band. While the 9m C-band antenna was built by the client, the 3.7m Ka-band antenna was assembled and installed by SANSA. Furthermore, SANSA provided services inside the antenna shelter and tested the communication interlink between the antenna and the main operations room. SANSA's ability to assemble and install the antenna for this project, showcases the capabilities of SANSA as an outstanding ground station in Africa.

UNLOCKING OPPORTUNITIES FOR THE NATIONAL SPACE SECTOR THROUGH INTERNATIONAL PARTNERSHIPS

DIGITAL EARTH AFRICA

In the same way that Digital Earth South Africa (DESA) builds on Australian and the Committee on Earth Observation Satellites (CEOS) efforts to establish open data cubes to

Figure 25: Satellite and Weather Information for Disaster Resillience in Africa (SAWIDRA) meeting hosted by SANSA

deliver Analysis Ready Data for decision support systems, Digital Earth Africa (DEA) is a collaborative effort between Geoscience Australia, Group on Earth Observations (GEO), SANSA, CEOS, Global Partnership for Sustainable Development Data (GPSDD), office of the Deputy Prime Minister of Kenya and Statistics Ghana, to leverage advances in information technology to provide fit for purpose data for a large number of users. The establishment of DEA will provide a game changing approach to the development of Earth observation products and services on the African continent. It would make vast volumes of satellite imagery available in readily usable formats using establish processing infrastructure.

SANSA's contribution to DEA is a manifestation of SANSA's commitment to implementing the African Space Strategy and developing the African space sector as a contributor to identifying solutions to the challenges such as climate change, water management, food security and disaster resilience. SANSA has already started initiatives towards building a South African component to DEA, DESA, and will see its completion in the following financial year.

SATELLITE AND WEATHER INFORMATION FOR DISASTER RESILIENCE IN AFRICA (SAWIDRA)

SANSA in partnership with the South African Weather Services (SAWS) is partnering with other African countries in the SAWIDRA Regional Advanced Retransmission System (SAWIDRA – RARS) Project. SAWIDRA - RARS aims to improve the core capacities of the specialised National and Regional Climate Centres (RCCs) to meet the needs for near real-time Early Warning Systems (EWS) based on the Numerical Weather Prediction (NWP). The specific aim is to improve the forecast and product production capacity of regional climate centres and national meteorological services in order to allow them to provide the proper inputs to disaster risk mitigation agencies for issuing of early warnings. Through this partnership with the African Development Bank, the African Centre of Meteorological Applications for Development (ACMAD, Niger), Agence d'études et d'observation spatiales en Afrique sub-saharienne – (AGEOS, Gabon), African Intergovernmental Authority on Development (IGAD) Climate Prediction and Application Centre – (ICPAC, Kenya), SAWS, and SANSA aim to contribute to improving the continental ability to address disaster risk reduction and management. Like the Digital Earth Africa project, SANSA's involvement stems from its commitment to the African space agenda.

Figure 26: Participants at the SANSA – ESA workshop held at SANSA

Figure 27: SANSA and INGV teams in the ionospheric weather laboratory at National Institute of Geophysics and Volcanology in Italy

DRIVING AGENCY TO AGENCY LEVEL PARTNERSHIPS

SANSA hosted the European Space Agency (ESA) Director-General and his team for a three-day workshop exploring "The path to South African – European space innovation partnerships". The workshop was held at SANSA in Hermanus and included sessions dedicated to space science, space applications, and the space industry. The space industry day was attended by various role players from the European and South African space industry sectors. An action plan for dedicated projects led by SANSA and ESA was an outcome from the workshop, and attendees found the engagements to be very productive.

EXPLORING JOINT COOPERATION ACTIVITIES

Members of the National Meteorological Space Weather Working Group visited SANSA in February 2019 in order to engage with the space weather team and visit the Space Weather Centre. The visit included participation from various aviation role players including Air Traffic Navigation Services (ATNS), the South African Weather Service (SAWS), the Pilots Association of South Africa, and airlines. Discussions were held on the actions needed to integrate space weather information into the air traffic management systems and the implications of this new information to the pilots and airlines. This was the first visit of the national working group to SANSA.

Within the framework of space weather, SANSA undertook a European tour to visit space weather centres, and role players in five countries, including Finland, Czech Republic, Austria, Italy and France. The tour ended in Belgium where the SANSA team attended the 15th European Space Weather Week. SANSA has been invited to collaborate with the Pan-European Consortium for Aviation Space Weather User Services (PECASUS), and a number of the institutions that hosted visits are members of this consortium. The visits were designed to expand SANSA's global partnership in view of the upcoming requirement to provide 24/7 operational space weather services for the aviation sector, and to also introduce SANSA as the regional space weather information provider for Africa.

PROGRESS ON ACHIEVEMENT OF STRATEGIC OUTCOME ORIENTED GOALS

SANSA's performance exceeded 85% for the four year's execution of the Strategic Plan. In areas where there has been overachievement, this was largely due to phenomenal effort on the part of staff rather than directly linked to the availability of funding. Funding constraints and at often times budget cuts, has impacted on how SANSA was able to deliver on its approved targets and indicators, resulting in either non-achievement of indicators or a downward reduction of certain indicators. A stable and long-term commitment to funding is the key to consistent and sustained delivery.

AUDITOR'S REPORT: PREDETERMINED OBJECTIVES

The external auditor currently performs the necessary audit procedures on the performance information to provide reasonable assurance in the form of an audit conclusion. The audit conclusion on the performance against predetermined objectives is included in the report to management, with material findings being reported under the Predetermined Objectives heading in the Report on other legal and regulatory requirements section of the auditor's report.

Refer to page 82 to 85 of the Report of the Auditors Report, published as Part E: Financial Information for futher information.

CONSOLIDATED PERFORMANCE INFORMATION

SANSA had 14 Key Performance Indicators (KPI's) for the 2018/19 financial year. For the year ending 31 March 2019, SANSA achieved 12 of the 14 KPI's. This indicates an 86% performance level for the year. Two of the targets relating to the growth of the national space programme were not met. Funding to complete the EOSat-1 satellite build programme was not received during the 2018/19 financial year, as a result, KPI's on the milestones for the EOSat-1 build programme and the total contract expenditure to the broad space related industry for core space projects were not met.

STRATEGIC GOAL	STRATEGIC OBJECTIVE	KEY PERFORMANCE INDICATOR/ MEASURE	ANNUAL TARGET	ACTUAL	REASON FOR VARIANCE
Goal 1: Address South Africa's challenges through space services and products	S1.1 Lead and facilitate the creation of high-impact applications to address society's needs and challenges	M1.1 The number of national high-impact applications	4	4	Target met and exceeded due to additional requests by users. A big effort to disseminate imagery was done in Q4 following resolution of image processing challenge during the course of the year.
			PS1 – 50 000 images distributed	60 637	
			PS2 – Five thematic categories for national base datasets	100% development of identified national base datasets	Target met
			PS3 – Space weather products and services	All required services were provided as requested and as per contracts	Target met
			PS4 – Magnetic Technology products and services	158 Compasses Calibrated and all requested services provided.	Target met and exceeded due to additional compasses from the private aviation sector received for calibration. This is as required by the clients
Goal 2: Lead high-impact collaborative R&D on a national scale	S2.1 Increase the national space research output	M2.1 The national research productivity score for space support R&D	1 300	1 835	YTD target was exceeded due to a higher than expected number of papers in high impact journals. The publication rate of the research papers is unpredictable due to different turnaround times by publications. In addition, a number of PhD students graduated in Q1, and the research funding received was high due to 2 SANAP grants that were received in the year. These all contributed to a higher than expected productivity rate

STRATEGIC GOAL	STRATEGIC OBJECTIVE	KEY PERFORMANCE INDICATOR/ MEASURE	ANNUAL TARGET	ACTUAL	REASON FOR VARIANCE
Goal 3: Develop national human capacity and ensure transformation	S3.1 Increase youth awareness of science	M3.1 The number of youth directly engaged	10 800	24 337	The target was exceeded due to the number of funded opportunities received to engage with learners, and the number of workshops presented at request of stakeholders.
	S3.2 Support students and interns	M3.2 The number of students and interns supported for formalised training	50	52	The annual target was exceeded due to the new students who were supported from Q2, and an increase in the number of interns
Goal 4: Enhance the competitiveness of the South African space industry	S4.1. Generate greater benefit for the space programme through space operations activities	M4.1.1 Successful satellite pass monitoring rate for Earth observation	98%	99.78%	Target exceeded due to efficiency and reliable maintenance
		M4.1.2 Total income generated from space operations activities	R58 million	R79.7 million	Target exceeded mainly due to the International projects being completed and made operational
	S4.2 Grow the national space industry	M4.2.1 The number of direct jobs supported externally through SANSA programme contracting	55	55	Denel Spaceteq, CPUT, Cybicom jobs supported on EOSat-1 contracting and ZACube- 2 contracting. Although no funding received during the year, there were still work packages carried forward from prior year contracting
		M4.2.2 The progress status on the EOSat-1 development	70% Critical Design Review (CDR) completed for the Space System Flight Model	0% progress	Target not met as funding for satelite build programme was not received. The Minister has requested that the Board review and provide options for completion to Minister.
		M4.2.3 The total contract expenditure to SMEs for core space projects	R11.9 million	R14 million	Target met and exceeded due to SME spend on SS Instrumentation network upgrade and SO dark fibre and antenna construction projects in addition to the satellite programme contracts (EOSat-1 and ZACube-2)
		M4.2.4 The total contract expenditure to the broad space related industry for core space projects	R50 million	R0	Target not met as funding for satelite build programme was not received. Denel contracting was put on hold pending outcomes of the project review.

STRATEGIC GOAL	STRATEGIC OBJECTIVE	KEY PERFORMANCE INDICATOR/ MEASURE	ANNUAL TARGET	ACTUAL	REASON FOR VARIANCE
Goal 4: Enhance the competitiveness of the South African space industry (continued)	S4.2 Grow the national space industry (continued)	M4.2.5 The progress status on the CubeSat Development	Completion of the qualification and flight models, and launch and commission	100% Completion of the qualification and flight models, and Launch and Commission Report Completed	Programme completed in the 2018/19 financial year.
Goal 5: Develop active global partnerships	S5.1 Leverage a significant benefit for the space programme through global partnerships	M5.1.1 Number of active formal oversees partnerships	5	15	International partnerships have increased with many requests for active projects due to the space weather projects
		M 5.1.2 Number of active formal African partnerships	5	9	A focus on regional partnerships has been successful resulting in the target being exceeded.
		M5.1.3 Number of active formal national partnerships	5	16	A focus on increasing national partnerships has led to additional partnerships for projects in science advancement

Table 2: Consolidated Performance Information 2018/19

PERFORMANCE INFORMATION BY PROGRAMME

PROGRAMME 1: ADMINISTRATION

PURPOSE

The Administration Programme provides management, administrative and technical support across all operating units. This facilitates operational efficiency and cost-effective management, alignment with sound governance principles and the seamless integration and collaboration between SANSA Programmes.

FINANCIAL SUSTAINABILITY

During the first six years of SANSA's operations, its Annual Performance Plans and Strategic Plans have been pragmatically aligned against the budgetary allocations made to it for both its internal business operations and broader support to the national space sector. This approach vis-à-vis the frugal budgetary allocations imposed a limitation on SANSA's scope of initiatives that were planned and implemented versus implementation of initiatives actually needed to achieve its full mandate. Moreover, SANSA's year-on-year operational and programmatic costs have been increasing and out pacing its source of funding and annual revenue stream.

The fiscal pressure highlighted above is untenable and a financial sustainability strategy is required to ensure that (i) the current suite of activities are optimally implemented and (ii) SANSA can embark on a growth trajectory that encompass those critical areas that are currently not being fully serviced. If due attention is not paid to these two attendant factors, SANSA faces the real risk of reducing its relevance and impact within the national socio-economic-environmental landscape. The financial sustainability strategy was drafted and approved for implementation over a five-year period starting in 2018. The aim was to contextualise the extent of the financial and mandate challenges, and thereby propose a funding strategy and implementation framework to be adopted in advancing the full scope of SANSA's core business.

Taking into account the aforementioned reflections, SANSA agreed to pursue two primary goals for its continued existence, namely:

a) To ensure that the current operations of SANSA are adequately budgeted for, and where shortfalls exist additional funding be secured for these.

b) To ensure implementation of the full mandate of SANSA, and this to be done in partnership with the relevant line departments and entities.

For SANSA to effectively respond to the two primary goals, four objectives were identified that needed to be achieved and these included:

1. Operational efficiencies that enable SANSA to conjointly make optimal use of its existing resources and deliver maximum value to its core business.
2. Investments for capital outlays and maintenance that extends the current asset base of SANSA, thus positioning it as the leader of the national space sector.
3. A continuous income generating revenue stream for SANSA that contributes to a long-term sustainable baseline of funding.
4. Strategic partnerships, both nationally and abroad, that translate into cost sharing benefits for SANSA and the broader national space sector.

Key Activities and Achievements

SANSA has identified four key performance measures, which are tracked quarterly and annually to drive financial sustainability:

Financial Stewardship and sustainability. This is measured as a percentage of income generated by SANSA in relation to the parliamentary grant. This has been averaging 30% to 35% over the past two years.

New funding streams identified. This is measured as the total amount expressed in Rands of proposals local and/or international that have been submitted for funding in a financial year and the Rand value of proposals and tenders that have been successful / awarded as a total value of the proposals. SANSA submitted proposals for budget support

facility and large infrastructure bids facility availed by National Treasury. In addition, SANSA responded to bids to secure contract revenue within the public sector and the international market and also applied for grant funding mainly in support of research and human capital development.

Stakeholder engagement. This is measured as the number of active joint international, national and regional partnerships per annum. SANSA has secured a total of 30 active partnerships with national, regional and international stakeholders.

Marketing and Communications. This is measured as a combined percentage of a marketing and communications action plan for 2018/19 that has been implemented. A number of activities took place during the year, which are outlined in the service delivery and impacts section of this annual report on the various science advancement engagements and forums SANSA participated in during the year.

HIGH PERFORMANCE CULTURE

As part of the SANSA Culture Change Project, one of the objectives was to create a high performance culture. The emphasis was embarking on initiatives to increase engagement, productivity and retention of high potentials. This was done through clear goal setting, regular check-in meetings, proper communication and structured development plans. SANSA encourages collaboration across the Agency where employees share knowledge and work well together as a team. It is encouraging to note that teamwork was seen as one of the top strengths measured recently. SANSA also ensures employees are well informed and able to understand the necessary information. Opportunities for dialogue were given through SANSA-wide CEO briefing sessions, roadshows and management meetings. Further to this SANSA also has policies, procedures and resources in place to assist employees monitor physical and mental health through its embedded Wellness Program. This contributes to enhanced productivity.

LEADERSHIP CULTURE

To show commitment to a solid and effective leadership culture a series of executive and leadership workshops were conducted. The aim was to build a strong and effective leadership team with a common identity and also to reflect on the values and beliefs of the leadership team. Through this the Executive team laid the groundwork for leading by example and modelling the behaviours desirable across SANSA.

BUILDING MANAGEMENT CAPACITY AND SKILLS

SANSA uses a balanced approach in its operational level effort to build management capacity. A leadership and management competency model was developed and implemented for recruitment and development purposes. Structured Management Development Programmes and various other ad hoc training initiatives were used to enhance and retain skills, improve knowledge and to ensure jobs were done more competently.

CUSTOMER FOCUS

Through SANSA's value of "Excellence" employees are encouraged to ensure excellent customer focus when delivering services. Customer Service training sessions were rolled out to enhance Customer Service skills at the Agency.

PERFORMANCE MANAGEMENT

SANSA is committed to ensuring the high performance of employees through building and maintaining the workforce needed to achieve mission success which allows for the management of good performance and remedial work for poor performance. The importance of every employee's individual contribution to the company's performance is recognised and in accordance to this principle SANSA has developed a Talent Management Framework (TMF) whereby all employees can partake in building future leaders. The TMF comprises of a number of important activities and will be implemented over a period of time. It provides managers with a structured approach to developing employee potential and retaining talent within SANSA. In order to enhance overall performance, the SANSA Performance Management System is currently under review in order to develop and implement a more suitable and robust approach in managing performance.

PROGRAMME 2: EARTH OBSERVATION

PURPOSE

The Earth Observations Programme is responsible for the collection, processing, archiving and distribution of Earth observation data, value-added data products and services for societal benefit. SANSA maintains an Earth observation portfolio of sensors, provides an R&D platform in Earth observation technologies, conducts satellite image processing and correction, and supports human capital development in Earth observation and science advancement.

EARTH OBSERVATION PROGRAMME PERFORMANCE OUTPUTS

STRATEGIC GOAL	STRATEGIC OBJECTIVE	KEY PERFORMANCE INDICATOR/ MEASURE	ANNUAL TARGET	ACTUAL	REASON FOR VARIANCE
Goal 1: Address South Africa's challenges through space products and services	S1.1 Lead and facilitate the creation of high-impact applications to address society's needs and challenges	M1.1 The number of national high-impact applications	1. 50 000 images distributed	60 637	Target met and exceeded as technical challenges in distributing SPOT data were resolved with Airbus. Images were disseminated in Q4.
			2. Five thematic categories for national base datasets	100% Development of identified national datasets	Target met.
Goal 2: Lead high-impact collaborative R&D on a national scale	S2.1 Increase the national space research output	M2.1 The national research productivity score for space supported R&D	300	375	Target met.
Goal 3: Develop national human capacity and ensure transformation	S3.1 Increase youth awareness of science	M3.1 The number of youth directly engaged	5400	16 497	The target was exceeded due to the number of funded opportunities received to engage with learners, and the number of workshops presented at request of stakeholders.
	S3.2 Support students and interns	M3.2 The number of students and interns supported for formalised training	15	15	Target met
Goal 4: Enhance the competitiveness of the South African space industry	S4.2 Grow the national space industry	M4.2.3 Total contract expenditure to SMEs for core space projects	R1.9 million	R705 563	Target not met due to EO projects in conceptual and approval stages. Contracting will only start in the next financial year.

STRATEGIC GOAL	STRATEGIC OBJECTIVE	KEY PERFORMANCE INDICATOR/ MEASURE	ANNUAL TARGET	ACTUAL	REASON FOR VARIANCE
Goal 5: Develop active global partnerships	S5.1 Leverage a significant benefit for the space programme through global partnerships	M5.1.1 Number of active overseas partnerships	2	6	International partnerships have increased with many requests for active projects due to active EO participation in international forums and platforms
		M5.1.2 Number of active African partnerships	2	4	A focus on regional partnerships has been successful resulting in the target being exceeded.
		M5.1.3 Number of active national partnerships	2	9	A focus on increasing national partnerships has led to additional partnerships for projects in science advancement.

Table 3: Earth Observation Programme Performance Information 2018/19

KEY ACTIVITIES AND IMPACTS

ADDRESS SOUTH AFRICA'S CHALLENGES THROUGH SPACE SERVICES AND PRODUCTS

SANSA continues to maintain the national sensor portfolio, enabling acquisition of satellite imagery from various satellites through direct and virtual reception. The data from various sensors is acquired daily through direct reception of CBERS4, Landsat 7 & 8, MODIS (Terra and Aqua), and SPOT 6/7 as well as virtual reception of Radarsat-2 (see Table 5).

SENSOR NAME	NO. OF IMAGES ACQUIRED
Landsat 8	450
MODIS - Terra and Aqua	533
CBERS-4	3150
RadarSAT-2	122
Totals	**4255**

Table 4: Data acquired through direct and virtual reception in 2018/19

During the 2018/19 financial year, a total of 18 344 new satellite images were acquired, adding to the over 1 million images within the 30-year old archive sensor portfolio SANSA manages. The Agency has initiated a project for direct reception of RadarSat-2, which will improve the timely provision of data to the CSIR for the operational Oceans and Coasts Management Information System (OCIMS) which supports Operations Phakisa: The Oceans Economy. The acquired data is discoverable through the SANSA EO Observations Online Catalogue, http://catalogue.sansa.org.za.

Data Dissemination

Over 60 000 satellite images from a range of sensors with a varied choice of spatial and spectral resolutions were distributed to all spheres of Government and entities, science councils and universities for decision support applications.

In addition, SANSA delivered 52 value added service reports to customers. Of the 52 reports, 40 were fire reports, eight were irrigation reports and four reports were for flooding, mining, hail storms and construction related damage respectively. In addition to the reports, SANSA produced 14 fire related maps that indicate the extent of fires. SANSA also served as an expert witness in five court cases.

LEAD HIGH-IMPACT COLLABORATION R&D ON A NATIONAL SCALE

Six journal papers, three book chapter, two conference papers 13 technical reports were produced covering thematic application areas of water, vegetation, human settlement, crop monitoring, and disaster management.

Development of automated processing chains for mosaicking methodology and the generation of biophysical products from Sentinel-2 data was undertaken. The National vegetation density (NVD) processing algorithm was developed and used for generating the NVD layers for 2018. Approximately 2000 Landsat scenes were processed in creating the two NVD layers for SANSA, one for the wet season and the other for the dry season. Another software module was successfully developed for the production of the Forest Canopy Density (FCD) layer over South Africa. The algorithm uses the Advanced Vegetation Density (VD) Shadow Index (SI) to calculate FCD. The FCD mapping model presents more accurate and quantitative forest stock than forest type map expressed with high, medium, and low resolution.

SANSA International collaborative research projects such as H2020 AfriCultuReS and GMES and Africa-Wetlands Monitoring Project continued with activities including a week-long field campaign in the Free State and KwaZulu-Natal provinces. The aim was to take measurements for spectral reflectance, leaf area index, chlorophyll content of the leaves and wet and dry biomass. The measurements were taken on soya and dry beans, maize and grassland from crop and livestock farms.

Research also focused on the development of a land consumption indicator, in partnership with StatsSA and UN Habitat, with the main objective of developing an indicator for reporting on the United Nation's Sustainable Development Goals (SDGs). The focus for the study was on goal 11, which is to make cities and human settlements inclusive, safe, resilient and sustainable. The indicator presented under this was 11.3.1, which focussed on the ratio of land consumption rate to population growth rate for the country. Analysis of this indicator was done across 33 metropolitan and secondary cities and towns, including Johannesburg, Tshwane, Rustenburg, Polokwane, Francistown and Gaborone.

SPACE AWARENESS AND HUMAN CAPITAL DEVELOPMENT

SANSA undertook space awareness and outreach activities through-out the year, targeting learners to promote the uptake of STEMI and raising science awareness with society in general.

Science Engagement with Youth

Over 16 480 youth, across all provinces of South Africa, were directly engaged through six main platforms of direct school visits, guided tours of SANSA facilities, World Space Week, National Science Week (NSW), science festivals and partnership events. The NSW being the major platform whereby over 9 200 learners were directly engaged.

Figure 28: Gauteng Education Department, Tshwane South District teacher training provided by SANSA and partners

> The fear of Earth and Beyond (and being) viewed as a difficult strand has changed because you guys made it interesting
>
> - Mudzhadzhi Ralethe, Gauteng Provincial Government

Science Engagement with Teachers

The training of 44 educators and seven district officials of the Tshwane South District of the Gauteng Education Department was held on 26th October 2018 at SANSA's Hartebeesthoek facility. This training, focusing on Planet Earth & Beyond, was conducted in cooperation with SARAO and NRF SAASTA.

Human Capital and Professional Development

Professional development is an important aspect of human capital development activities of SANSA, both for SANSA professionals and those of our stakeholders. Initiatives for professional development may be summarised as follows:

A total of six students were co-supervised for their Master's research, from the University of Pretoria, University of Free State, North West University and University of KwaZulu-Natal.

- A 5-day training on the applications of remote sensing and GIS in monitoring the Agenda 2063 goals was conducted in conjunction with NEPAD in Ekurhuleni in August 2018. The more than 20 participants were officials from Regional Economic Communities (RECs) that included SADC, IGAD, EAC and the African Union Commission (AUC).
- A theory and hands-on training in Niamey, Niger on the use of EO technologies for planning and tracking Agenda 2063 and SDGs was conducted. The training material developed included exercise data (Landsat and Sentinel 2). The feedback was positive and the training stimulated further discussions as well as commitment by CNESS to establish a Geospatial Centre in Niger.

Raising public awareness on space cannot be underestimated. In this regard, a number of engagements, in addition to the National Science Week activities, were undertaken:

- Exhibiting at the Meerkat launch and community engagement programme of SARAO at the Losberg site of the SKA during August 2018 where local communities were exposed to space science & technology;
- Radio interviews at various radio stations during NSW and interview by Moutse Community Radio Station on the ZACube-2 satellite in Sepedi language;
- GAU TV conducted interviews in December 2018 titled "You are the sought after" profiling space physics continues to be broadcast on the DSTV channel 265 and is still well received by audiences.

ENHANCE THE COMPETITIVENESS OF THE SOUTH AFRICAN SPACE INDUSTRY

In its efforts to develop the local space industry, particularly SMMEs, SANSA partnered with Digital Globe, the Technology Innovation Agency (TIA) and RISS to hold the 3rd South African Earth Observation Open Innovation Challenge. The challenge is aimed at unearthing innovative Earth observation applications to address societal challenges and stimulate SMME development in this sector. The challenge focussed on the Sustainable Development Goals relating to water and food security and culminated in 20 accepted submissions, 16 of which were showcased at a World Café event in Johannesburg in December 2018. Five prize winners (see figure 29) were each awarded three months' access to Digital Globes GBX platform, a cloud platform enabling online access and processing of satellite data.

Figure 29: SANSA, partners and winners of the SA EO Open Innovation Challenge

The Open innovation challenges aim to source potential solutions to problems or tap into a pool of talent that do not have the platform to engage with large stakeholders in the space industry. It also empowers entrepreneurs by giving them an entry to market, and in turn, contributes to job creation and a growing economy.

The first Earth Observation Business Breakfast was held in September 2018, a start of what will become a regular engagement between SANSA and the Earth observations commercial sector to ensure SANSA meets its mandate on industry development. Collaborations with the commercial sector on development of competitive products to take to Africa as well as supporting job creation in the country comprise the objectives within the mandate.

SANSA engaged with three small to medium enterprises namely Ontolligent Software Services (Pty) Ltd, Gemini GIS and Mobbisurance to assist and capacitate them with skills in Earth Observation. With respect to Ontolligent the work involved working together on a pilot project on deliverables requested by the City of Tshwane (CoT) resulting in a request by CoT to discuss MoU agreements with SANSA. The collaboration with Gemini GIS focused on crop monitoring using satellite imagery. SANSA worked with Mobbisurance to design insurance-aligned products for reducing costs related to field verifications, crop damage assessments, and crop anomalies. Ontoligent, Gemini GIS and Mobbisurance have all previously participated in the SANSA Innovation Challenge.

PARTNERSHIPS AND COLLABORATIONS

INTERNATIONAL PARTNERSHIPS

Beyond the continent of Africa, partnerships have been strengthened with:

i) the Committee on Earth Observations Satellite (CEOS) through participation in the various working groups as well at the high-level agency meetings such as the CEOS Plenary held in Brussels. SANSA has further setup a mechanism for other institutions such as CSIR and SanParks, in South Africa to participate in CEOS working groups to compliment SANSA's expertise and ensure South Africa fully benefits;

ii) the Group on Earth observations (GEO) activities, including provision of support to DST as Co-Chair of GEO and being a Member of the GEO Programme Board, responsible for ensuring an effective Work Programme for GEO;

iii) the United Kingdom National Center for Earth Observation (NCEO) on developing lasting scientific relations between EO research and operational institutions in South Africa and the UK, strategically linking experts, services, data and applications as well as skills development;

iv) the European Commission on the AfriCultuRes Project, where SANSA successfully convened the South African user's workshop and further hosted the international partners for the Project Progress and User Board meeting;

Figure 30 Participants of the AfriCultuRes project progress meeting held in Pretoria,

v) the implementation of Phase I of the Digital Earth Africa Project in partnership with Geosciences Australia, World Economic Forum, GEO Secretariat, the DST and the CSIR, amongst other African partners; and

vi) the International Space Education Board (ISEB) representing SANSA aimed at leveraging and implementing space education.

During the bilateral workshop between ESA and SANSA held at SANSA in Hermanus and under the theme "The path to South African – European Space Innovation Partnerships", opportunities for collaboration were identified. Earth Observations mutual thematic application areas of interest that were identified for collaboration included agriculture and food security, development of cities, water and hydrocarbons, health, mining and education. The objective of the collaboration aims to scale up and operationalise applications within identified thematic application areas. The workshop was also an opportunity to discuss industry development partnerships between SANSA and ESA. Using the experience of highly successful ESA Business Incubation Centre as a model SANSA and ESA explored the possibility of developing similar business incubation centres in South Africa. The discussions at the workshop were preceded by visits to the University of Stellenbosch's Launch lab and the emerging SEDA funded Africa focused incubation centre at Simera Technologies in Somerset West. The outcome of the discussions was an action plan to establish Space business incubation centres in South Africa, leveraging the ESA model, at existing incubation facilities. These incubation centres will form part of a broader initiative to develop a space cluster for downstream applications.

AFRICAN PARTNERSHIPS

At the continental level the SANSA Earth Observations Programme (EOP) has focused on strengthening partnerships with:

i) NEPAD through the development of a pilot GeoPortal in support of Agenda 2063 and SDGs, user requirements and training for SADC Member States and Niger officials as well as NEPAD's participation in Digital Earth Africa;

ii) Satellite and Weather Information for Disaster Resilience in Africa – Regional Advanced Retransmission System (SAWIDRA – RARS) Project aimed at improving the core capacities of the specialised National and Regional Climate Centres (RCCs) to meet the needs for effective near real-time data provision. SANSA in partnership with the South African Weather Service (SAWS) hosted the Project's Technical Workshop in Pretoria and contributed to the designing of the

communication network and finalisation of the RFQs for the antennae and evaluating the Radio Frequency Environment at the four sites;

iii) African Union Commission in the implementation of the African Union Commission GMES & Africa WeMast Project in a consortium with SASSCAL and other African entities. SANSA plays a pivotal role in the surface water body mapping, data storage, and data dissemination tasks. SANSA participated in the inception workshop held in Windhoek, Namibia and the first Forum of the GMES & Africa Support Programme held in Libreville, Gabon; and

iv) AfriGEOSS, a coordination mechanism of the African Member States and Earth observations organisations in GEO. SANSA leads two Coordination Teams of the AfriGEOSS Initiative, i.e. Data Infrastructure Coordination Team and Sustainable Urban Development and has participated in the annual AfriGEOSS Symposium held in Libreville, Gabon in June 2018. DST appointed SANSA to Project Manage the AfriGEOSS Secretariat, hosted by Regional Centre for Mapping Resources for Development (RCMRD) in Nairobi, Kenya, activities for 2019/2020.

NATIONAL PARTNERSHIPS

SANSA continued to strengthen and develop relations with national entities. New partnerships were formed with:

i) Operations Phakisa: The Oceans Economy initiative, whereby SANSA provides Synthetic Aperture Radar data to OCIMS;

ii) SARAO for the development of the concept note for Digital Earth Africa – a data cube platform – for Earth observations data management, dissemination and products development;

iii) CSIR collaboration on Digital Earth Africa and CEOS engagement;

iv) CHPC on high performance processing and systems environment as well as training of SANSA employees

v) Statistics South Africa for provision of data, value added products and training

vi) Department of Water and Sanitation whereby SANSA is servicing the second of the three year service level agreement

vii) NRF SAASTA space awareness such as the National Science Week and teacher training

viii) Gauteng Education Department focusing on teacher training in support of Planet Earth and Beyond aspects of the curriculum; and

ix) Committee on Spatial Information (CSI) with a charge to facilitate, promote and safeguard an environment for the efficient collection, management, distribution and utilisation of spatial information has appointed SANSA to be the Satellite Imagery Data Custodian Coordinator. SANSA is therefore, responsible for coordinating all data custodians contributing to Satellite imagery to ensure they adhere to all policies, standards and specifications and to report to the CSI on a quarterly bases.

In addition to the formal partnerships, the EOP engagement at national level to a large extent focused on communicating its new approach to commercial high-resolution image acquisition. The new approach has been necessitated by a larger number of high-resolution providers in the market, evolving user needs and demands and ensuring that the acquisition is affordable and sustainable for government. To this end, SANSA has interacted and had positive engagements with a number of stakeholders such as the City of Cape Town, the Disaster Management division of the Garden Route District Municipality, National Imagery and Mapping Advisory Committee (NIMAC), the Data Subcommittee of the Committee for Spatial Information (CSI), Departments of Agriculture Forestry and Fisheries, Environmental Affairs and Water and Sanitation to name but a few, as well as presenting the approach at the Environmental Affairs GIS Day and the GISSA Gauteng Annual General Meeting.

In promoting its broader data acquisition and dissemination mandate SANSA engaged with the South African Sea Ice Monitoring Community through a workshop organised by the South African Weather Services. This workshop aimed at initiating discussions for an operational Sea Ice Monitoring function and included representatives from academia, the science councils and international participants. SANSA's potential role, of satellite image provision, was acknowledged and will be included in further developments in this regard. SANSA was invited by the Department of Rural Development and Land Reform (DRDLR) to accompany them on a National Imagery and Mapping Advisory Committee (NIMAC) roadshow. The

objective of the roadshow was to engage Municipalities with respect to their requirements for aerial and satellite imagery. This partnership broadens SANSA's reach to the user community and provides a richer information base for it to manage its sensor portfolio and imagery order book, allowing for broader value-added services to be marketed to Municipalities.

Taking advantage of recent developments in big data analytics and building on experiences with Open Data Cube Technology and Analysis Ready Data in other parts of the world, SANSA outlined its plans to stakeholders to implement an Open Data Cube in South Africa with the potential to remove many of the stumbling blocks to data access and provide results orientated Earth observations. SANSA partnered with the SARAO to develop the Data Cube.

Further, efforts have been made to strengthen relations and collaboration with the DST through engagement with various programmes of DST such as the Chief Directorate Space Science and Technology, the Science Promotion Directorate and the International Cooperation Resources Programme towards the implementation of SAEOS and the African agenda.

CONFERENCES AND NETWORKING OPPORTUNITIES

The EOP team participated in local and international conferences, workshops and symposiums with an aim to share knowledge, keep abreast of current developments and the marketing of SANSA products and services. These included:

- Presentation at the International Day for Disaster Risk Reduction that was held in Upington in the Northern Cape Province in November 2018. The focus was on invasive species and climate change that contribute to the agricultural drought. Exploratory meetings were also held with the UN Food and Agriculture Organisation to identify possible areas of collaboration.
- Participated in the International Space Education Board (ISEB) programme held at the International Astronautical Congress during October 2018 in Bremen, Germany, in which SANSA contributed to the ongoing efforts of creating space awareness globally through leveraging global partnerships.
- Presented results of food security activities at the AfricaGeo conference in Johannesburg and in the Agribusiness Grain workshop held in Pretoria.

PROGRAMME 3: SPACE SCIENCE

PURPOSE

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

SPACE SCIENCE PROGRAMME PERFORMANCE OUTPUTS 2018/19

STRATEGIC GOAL	STRATEGIC OBJECTIVE	KEY PERFORMANCE INDICATOR/ MEASURE	ANNUAL TARGET	ACTUAL	REASON FOR VARIANCE
Goal 1: Address South Africa's challenges through space services and products	S1.1 Lead and facilitate the creation of high-impact applications to address society's needs and challenges	M1.1 Number of national high-impact applications	**Space weather products and services** 1) HF Propagation Prediction Services 2) Space Weather Bulletins & Alerts 3) Space Weather Course 4) Space Weather Support Tools	All required HF Propagation and Space Weather services were provided as requested and as per contracts	No Variance
			Magnetic Technology products and services 1) Compass Calibrations 2) Magnetic Navigation Ground Support Services 3) Magnetic Field Model Maps 4) Magnetic Sensor Sourcing 5) Aircraft Swing Courses	158 Compasses Calibrated	Additional compasses from the private aviation sector were received for calibration. This is as required by the clients activity
				All requested services were provided	No Variance
				All requested aircraft swing courses were provided	No Variance

STRATEGIC GOAL	STRATEGIC OBJECTIVE	KEY PERFORMANCE INDICATOR/ MEASURE	ANNUAL TARGET	ACTUAL	REASON FOR VARIANCE
Goal 2: Lead high-impact collaborative R&D on a national scale	S2.1 Increase the national space research output	M2.1 The national research productivity score for space supported R&D	1000	1460	YTD target exceeded due to significant increase in publications.
Goal 3: Develop national human capacity and ensure transformation	S3.1 Increase youth awareness of science	M3.1 The number of youth directly engaged	5400	7840	The target was exceeded due to the number of funded opportunities received to engage with learners, and the number of workshops presented at request of stakeholders.
	S3.2 Support students and interns	M3.2 The number of students and interns supported for formalised training	20	28	No Variance
Goal 5: Develop active global partnerships	S5.1 Leverage a significant benefit for the space programme through partnerships	M5.1.1 Number of active formal oversees partnerships	2	8	International partnerships have increased with many requests for active projects due to the space weather projects
		M5.1.2 Number of active formal African partnerships	2	4	A focus on regional partnerships has been successful resulting in the target being exceeded.
		M5.1.3 Number of active formal national partnerships	2	6	A focus on increasing national partnerships has led to additional partnerships for projects in science advancement

Table 5: Space Science Program Performance Table

KEY ACTIVITIES AND IMPACTS

SPACE SCIENCE RESEARCH

SANSA researchers are investigating all aspects of the near Earth space environment from the background plasma to the impact that solar storms can have on ground and space based technological systems. This research is important as it provides the knowledge foundation that assists in protecting technology on Earth such as power grids, communication and navigation systems. The impact of SANSA's research is measured through a research productivity score, which encompasses high impact internationally reviewed journal papers, contributions to expert textbooks, research rating of individual researchers, and the number of research students graduated through this programme. During 2018/2019, the Space Science programme contributed 1460 points towards SANSA's research productivity KPI. This contribution included 32 research papers published in high impact internationally reviewed research journals, equating to an average of 4.6 papers per permanent researcher in 2018/19 within the Space Science Programme.

STUDYING VOLCANOES AND CLIMATE CHANGE

In a paper published in the South African Geographical Journal, SANSA researchers investigated the impact of changing levels of SO2 gas over South Africa. They discovered that airborne SO2 can be found in the Mpumalanga region due to the high density of power stations. However, in 2015 they noticed that airborne SO2 had spread out to other parts of the country, which were exhibiting unusually high amounts of the gas. Using a backward trajectory model, SANSA researchers surmised that the SO2 gas originated on the other side of the Atlantic Ocean in South America. Together with researchers from the University of KwaZulu-Natal, SANSA researchers traced the path of the SO2 gas and other volcanic aerosols using data from a variety of satellites and ground-based instruments, including a special kind of LIDAR called CALIPSO. The team showed that the sudden increase of SO2 over South Africa in April 2015 was a direct result of a volcanic eruption in Chile. The Calbuco volcanic eruption of April 2015 released volcanic aerosols (including SO2 gas) into the stratosphere. The properties of these aerosols, such as reflectivity, can have direct impacts on the global climate; for instance, they can increase cloud seeding. This kind of research is important for understanding the effects of such eruptions in other regions of the world, even where there are no volcanoes and how these eruptions can impact the global climate.

SIGHTINGS IN SPACE SCIENCE

SANSA researchers ran a campaign to observe and collect data from sprites. Sprites are brief, beautiful flashes of light in the upper atmosphere, above thunderstorms, triggered by the huge electrical fields created when lightning strikes the ground. The sprite campaign took place from January to February 2019 in Sutherland and Carnarvon in the Northern Cape. Bi-static optical observations from two sites allowed for unambiguous determination of the sprite geographic position and altitude relative to the parent lightning strike. Two cameras were fitted with filters to isolate the nitrogen optical emissions in red and blue. In addition to fielding five night-vision cameras, an ELF (less than 400 kHz) electric field receiver from University of Bath was also fielded. The ELF receiver can uniquely identify the signature of sprites, which will be determined for the different optical morphologies of sprites. Observations were coordinated with the ASIM experiment, which observes lightning and sprites from space and was installed aboard the International Space Station (ISS) in 2018. About 250 sprites were observed, an exceptional achievement, with data analysis ongoing. Such knowledge is important for researchers to gain greater insight into the dynamics of the Earth's middle atmosphere. SANSA, in collaboration with the University of Bath in the UK, plan to deploy ten ELF receivers in an array to perform radio wave "imaging" of sprites for the first time.

SPACE SCIENCE RESEARCH EXCELLENCE

SANSA researcher, Dr Zama Katamzi-Joseph, received the prestigious American Geophysical Union (AGU) 2018 Sunanda and Satimay Basu International Early Career Award in Sun-Earth Systems Science. Dr Katamzi-Joseph leads a team of researchers using thermospheric winds to study gravity waves in the thermosphere. This award recognises her outstanding contributions to Sun–Earth systems research that ultimately benefits society.

The award was presented to Dr Katamzi-Joseph at a ceremony held during the AGU 2018 Fall Meeting in Washington, USA in December 2018. This is a prestigious

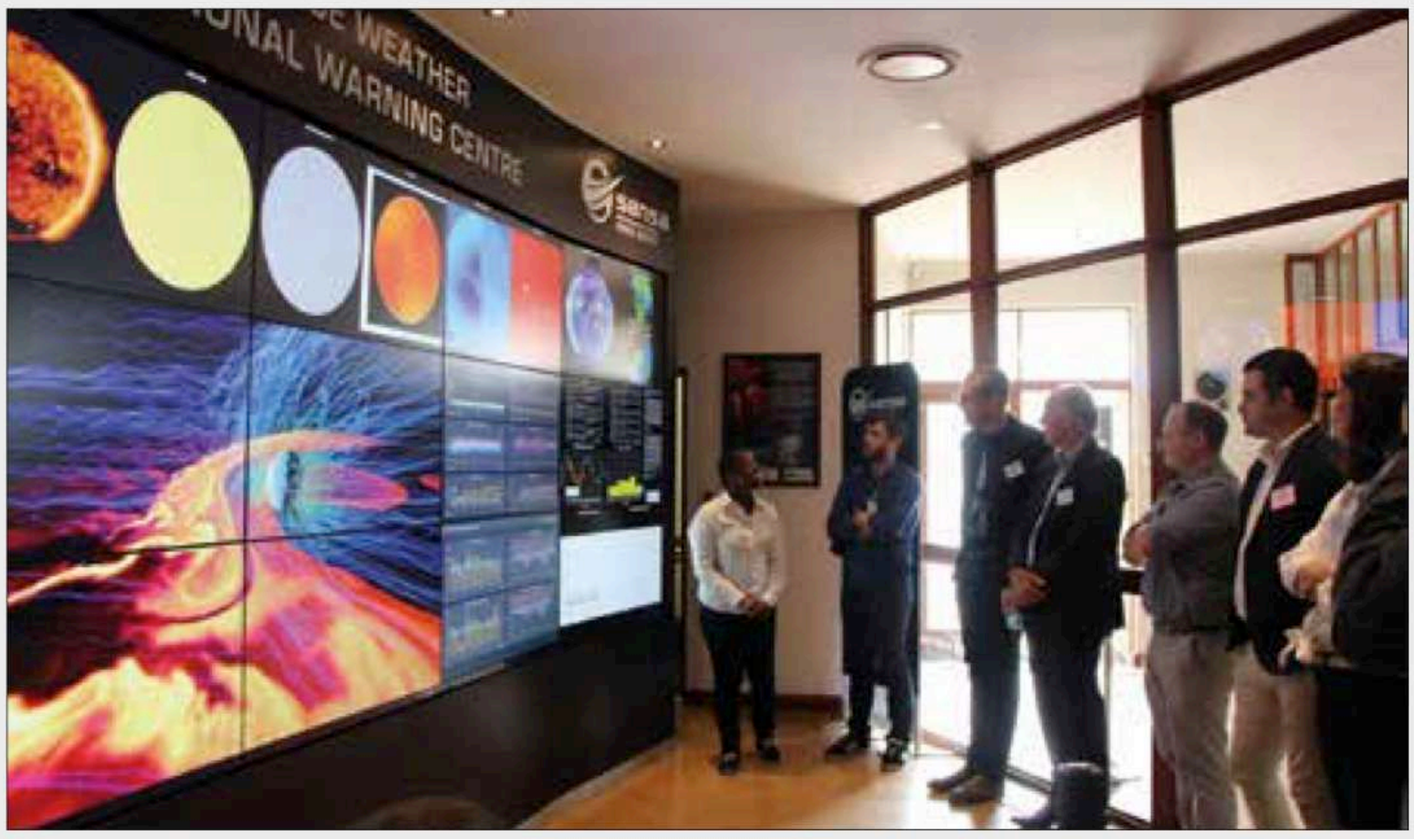


Figure 31: Space Industry stakeholders visited the space weather facility during the space science showcase day where the SANSA Space Weather Practitioner explained the importance of understanding the impacts of space weather on satellite technology

accolade for a SANSA researcher and demonstrates the international ranking of the research undertaken in South Africa. Dr Katamzi-Joseph has also been selected to participate in the prestigious Fulbright

Visiting Research Scholar Programme – an opportunity to conduct research at a U.S. institution. Dr Katamzi-Joseph is the second SANSA researcher in a five-year period to receive this particular award. Dr John Bosco Habarulema received the early career award in 2014 and the AGU Africa Awards for Research Excellence in Space Science in 2016.

SANSA researchers are making waves with their research internationally and putting South Africa on the space science research map.

EXPANDING SPACE SCIENCE APPLICATIONS

Space Industry Showcase

SANSA hosted an exclusive showcase day for the South African space industry in February 2019. The aim of the day was to provide SANSA's space industry stakeholders with an opportunity to view the unique space facilities that SANSA operates in Hermanus, which are beneficial to the industry.

The event attracted high level representatives from 10 different companies within the space industry sector. The format for the day included a short introductory presentation on SANSA's industry capabilities, followed by hands on demonstrations and viewing of the facilities on site in Hermanus. Feedback was extremely positive with an acknowledgement of the need for further engagements of this nature between SANSA and the industry.

Magnetic Technology for SA Safety

Despite the rise of modern navigation systems such as GPS and radio aids, compasses are still an essential component of aircraft navigation equipment. Electrical systems may fail, but the Earth's magnetic field never does. However, it is continuously changing and that requires constant monitoring to determine the degree of compass variation at any specific place. All aircraft compasses must therefore be swung at predetermined intervals, usually at the annual Mandatory Periodic Inspection or at any time when the magnetic properties of an aircraft have changed, by for instance the installation of new equipment or a direct lightning strike. SANSA's facility in Hermanus is the only Civil Aviation Authority (CAA) accredited South African facility that offers this type of service with the necessary expertise and facilities to perform training in the compass swing procedure on-site.

A total of 11 magnetic technology related short courses were presented to members of the defence sector during 2018/19. This included three 5-day compass swing courses for the South African Air Force, five compass swing refresher courses and three magnetic awareness courses for the South African Navy. The compass swing courses, which are accredited by the CAA, form part of a contract that SANSA has with the Air Force to provide magnetic

technology services. SANSA successfully completed a CAA Audit on the aviation training courses which qualifies SANSA for a training certification for the next five years. The SANSA courses contribute significantly to the training of defence personnel in South Africa and ensures that the requisite knowledge and skills are developed for the security of the nation.

New HF Tool to Improve SANDF Secure Communications

SANSA continues to contribute to the safety and security of the nation through the High Frequency (HF) Propagation service that is provides to the South African National Defence Force (SANDF) from the SANSA Space Weather Regional Warning Centre. HF signal propagation is sensitive to the volatile changes in space weather that occurs in the ionosphere, the SANDF require accurate forecasts of the conditions that might affect usable frequencies for HF communications. SANSA has thus been providing space weather data to the SANDF for better HF signal propagation forecasts for several years. During 2018/19 SANSA developed a visual, intuitive HF prediction tool called Ionospheric Characterisation, Analysis and Prediction (IOCAP) to ensure the services and solutions offered to the SANDF are utilised effectively. The tool was designed to assist the SANDF in communications planning and consists of a central core with modules customised to the needs of the Army, AirForce and Navy. An IOCAP evaluation version was rolled out in August 2018 to identified potential users. All indications are that this will become a sought after tool within the defence, aviation and other sectors where communications planning is a high priority.

Space weather monitoring for global aviation sector

SANSA is the key custodian of two essential aspects of aviation – the 'standard reference' compass against which all aircraft compasses are calibrated, and the provision of space weather forecasts and warnings.

In 2018 SANSA was appointed by the International Civil Aviation Organisation (ICAO) to provide vital space weather services to enable the aviation industry to comply with crucial recommendations.

Ground based support and aircraft are vulnerable to space weather impacts, primarily in four key areas: communication, navigation, aircraft avionics and radiation exposure. Recognising the need to mitigate space weather impacts on aviation, ICAO passed a recommendation in 2014 regarding the development of space weather information and its integration into global air traffic environment information systems. Such information can only be acquired from designated space weather information providers, which now includes SANSA. This means that every aircraft flying across the continent's airspace will rely on SANSA for space weather information as part of its flight planning.

The SANSA Space Weather Regional Warning Centre has been providing the national aviation sector and other stakeholders with vital early warnings and forecasts on space weather conditions since its establishment in 2010.

Space weather monitoring is essential for the improved understanding and forewarning of solar events that could lead to severe space weather on Earth. Although impending space weather cannot be halted, constant monitoring allows for industries that may be affected to go on standby and provides important scientific information to utilise in making necessary decisions.

Former Minister of the Department of Science and Technology, Mmamoloko Kubayi-Ngubane unveiled the upgraded SANSA Space Weather Centre based in Hermanus in the Western Cape in April 2018. This centre has set the stage for SANSA's new role as a leader in space weather safety for the global aviation sector.

Over the next few years, SANSA will be working closely with the Air Traffic Navigation Service, the South African Weather Service, the Civil Aviation Authority and other applicable aviation partners to investigate the implications of the ICAO amendments to the South African aviation sector.

Space Monitoring Instrumentation Network

The SANSA instrumentation networks that operate from Antarctica, Marion Island and Gough Island contribute important data for investigating the near-Earth space environment, and thus the South African National Antarctic Programme (SANAP) is a critical programme within which SANSA participates. Through this network SANSA is able to provide a state-of-the-art platform for space science research to take place nationally and internationally, further enhancing South Africa as a global space player.

SANSA deploys overwintering engineers on an annual basis to Antarctica and Marion Island to upgrade and maintain SANSA's space monitoring instrumentation network throughout the harsh winter. The team ensures high quality space science data is available to SANSA researchers and the operational Space Weather Centre. The Marion Island relief voyage took place from April to May 2018. The SANSA team included the SANSA Chief Scientist, the relief voyage engineer, the 2017 overwinter returning engineer, and the new 2018 overwinter engineer. The tasks were fairly ambitious as the team aimed to use the window of being at Marion to get some new installations in place. In spite of extreme weather and challenging base conditions, a MOSAIC Ozone Radiometer and two wide angle Riometers were successfully installed. The team also prepared the site for a new 3-axis Fluxgate Magnetometer with temperature controlled housing, which will be installed at a later date. The Antarctic summer relief voyage departed from Cape Town on the SA Agulhas II in December 2018. SANSA bid farewell to seven team members including the SANSA team lead engineer, two 2019 overwintering engineers, and four volunteers who assisted with maintenance to the HF radar and space weather instrumentation during the 95-day expedition. The SANSA team lead engineer was appointed by the DEA as the South African Chief land based scientist for the entire 2018/19 Antarctic expedition. The SA Agulhas II returned to Cape Town in March 2019 with SANSA's takeover team and returning overwintering engineers after a successful summer maintenance season.

LEADING THE WAY ON A GLOBAL PLATFORM

SANSA is a sought after host to regional and international research visitors. During 2018/19 SANSA hosted: two African PhD students, from Entoto Observatory and Research Centre, Ethiopia, and Mbarara University of Science and Technology, Uganda, who spent three months working at SANSA in order to complete aspects of their research projects; a researcher from Lancaster University in the UK, visited SANSA on a three-month postdoctoral fellowship funded by the National Research Foundation (NRF); a researcher from KTH Royal Institute of Technology, School of Electrical Engineering in Sweden, spent a 10-month research sabbatical at SANSA; and a researcher from Czech Technical University (CTU) in Prague, spent a seven-month postdoctoral fellowship at SANSA specialising in coils and magnetometry. SANSA also hosted the University of Bath in the UK, the Czech Technical University, and the National Institute for Geophysics and Volcanology (INGV) in Italy. SANSA and INGV are collaborating on modelling the impact of space weather events on navigation applications utilising Global Navigation Satellite System (GNSS) networks in Europe and South Africa. These research visitors bring important international expertise to SANSA and spend valuable time collaborating with SANSA researchers and engineers on a range of important research projects.

SANSA hosted seven undergraduate students from the University of Michigan in the USA for two months. These students visited under a grant funded by the National Science Foundation (NSF) in the USA, which aims to build capacity in space weather research. SANSA and the University of Michigan have partnered together for the past three years to ensure this capacity building initiative. Each student was given a data analysis or software project under the supervision of a SANSA researcher. Projects included analysing ionosonde and SuperDARN radar data, SQUID magnetometer data, producing TEC maps, and writing diagnostic software for the MOSAIC ozone radiometer. The students presented their work alongside the SANSA researchers at the South African institute of Physics (SAIP) annual conference held in Bloemfontein in June 2018.

SANSA researchers, engineers and students participated in conferences and/or workshops during 2018/19 including the summer school on Superconducting Electronics, Menorca, Spain; the TechTide Project Meeting, Athens, Greece; the American Geophysical Union (AGU) Fall Meeting, Washington, USA; the Society of Geomagnetism and Earth, Planetary and Space Sciences (SGEPSS) Conference, Nagoya, Japan; the CTR Wilson Meeting on Atmospheric Electricity, Bath, UK; the European Space Weather Week, Leuven, Belgium; the Science and Technology Subcommittee of United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS), Vienna, Austria; the International Civil Aviation Organisation (ICAO) Met Panel on Information Systems and Development Space Weather Workshop and Stream meeting; and the Annual African Geophysical Society (AGS) Conference on Space Weather, Cairo, Egypt. A SANSA Postdoctoral Fellow specialising in Navigation Applications attended the Training Research and Applications Network to Support the Ultimate Real-Time high accuracy EGNOS solution (TREASURE) School in Bath, UK. The SANSA Research Administration

team attended the National Research Foundation (NRF) annual Research Administrators Workshop (RAW) in Johannesburg, and the Science Advancement team participated in the annual Southern African Association of Science and Technology Centres (SAASTEC) Conference in Polokwane. SANSA's participation ranged from presenting research posters and papers, to chairing sessions, coordinating side meetings, representing South Africa and SANSA, and giving invited presentations on space science research topics.

SANSA researchers visited research institutions and universities such as the Laboratório de Física e Astronomia Universidade do Vale do Paraiba, São José dos Campos, Brazil; Finnish Meteorological Institute, Helsinki, Finland; Institute for Atmospheric Physics, Prague, Czech Republic; Siebersdorf Laboratories, Vienna, Austria; National Institute of Geophysics and Volcanology (INGV), Rome, Italy; French Meteorological Institute, Toulouse, France; Nagoya University, Japan; National Institute of Polar Research in Tachikawa, Japan; Lancaster University in the UK; the Institute for Space-Earth Environment Research, Nagoya University, Japan; Helwan University, Egypt; and Bath University, UK. These visits provided valuable opportunities for research collaboration and data sharing. SANSA has a number of bilateral projects through which research visits are facilitated. SANSA researchers are setting a high standard, and have become sought after international research partners.

SANSA was selected as a candidate site for the provision of regional space weather information to international air traffic. SANSA was assessed and audited by the World Meteorological Organisation (WMO) on behalf of the International Civil Aviation Organisation (ICAO) to a set international standard for space weather information provision. The audit was conducted on-site and aimed to determine if SANSA's capability and ability to provide space weather information that meets the set standard for the aviation industry. In November 2018 the ICAO Council announced the designated regional and global centres for space weather information provision, SANSA was listed as one of the two designated regional space weather information centres. This is a significant achievement for SANSA, providing an opportunity to expand the products and services offered by the Space Weather Centre, while enhancing SANSA's global and regional partnerships and developing unique capability and know-how within the field of operational space weather.

SCIENCE AWARENESS FOR A BRIGHTER FUTURE

Various engagements with South African learners and the public were undertaken by SANSA teams to increase the uptake and appreciation of STEM among the youth as well as to improve the overall scientific literacy of the public. These space science initiatives reach over 8000 learners and members of the public and included events such as: National school visits; guided tours of SANSA facilities; National Science Week and World Space Week activities; SciFest Africa and Teacher Workshops; among various other career showcasing outreach and awareness programmes. Several successful public "Open Days" were hosted by the SANSA Science Centre in Hermanus with the aim of showcasing the Agency's impact on the daily lives of South Africans. The SANSA Science Centre also hosts regular holiday programmes and science clubs for learners within the local community.

Through the SANSA Mobile Space Lab, our teams take science to remotely located schools that do not have the privilege of permanent laboratory facilities. Some of these include the rural areas around Oudtshoorn; George; Mosse Bay; and Ceres in the Western Cape Province as well as Mdantsane in the Eastern Cape.

Through these service offerings, SANSA has contributed to significantly increasing the practical understanding of science and mathematics among learners in these areas.

SANSA's Space Talk series is a popular public engagement opportunity presented at SANSA Hermanus regularly throughout the year. During 2018/19, SANSA hosted six public lectures in the Space Talk series all of which drew significant public interest. Included in the series were talks by The Director-General of the European Space Agency (ESA), who presented on "Space Tackling Global Challenges", and Italian Researcher, Dr Lucilla Alfonsi, who presented on "Electrons in the Atmosphere: Useful or Harmful". These talks are always fully booked and the audience feedback is extremely positive.

SANSA researchers hosted winter & summer schools for undergraduate students. As a result, there was an invaluable increase in the volume of bursary applications for further study in space science and engineering disciplines.

PROGRAMME 4: SPACE OPERATIONS

PURPOSE

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

Space Operations is uniquely positioned geographically as a ground-receiving station and TT&C service provider on the African continent, providing the ground station with a competitive advantage to cover various frequency bands. The ground station has both operational and technical excellence to serve local and international markets.

SPACE OPERATIONS PROGRAMME PERFORMANCE OUTPUTS 2018/19

STRATEGIC GOAL	STRATEGIC OBJECTIVE	KEY PERFORMANCE INDICATOR/ MEASURE	ANNUAL TARGET	ACTUAL	REASON FOR VARIANCE
Goal 4: Enhance the competitiveness of the South African space industry	S4.1 Generate greater benefit for the space programme through space operations activities	M4.1.1 Successful satellite pass monitoring rate for Earth Observation	Proportion: 98%	99.78%	Target exceeded due to efficiency and reliable maintenance
		M4.1.2: Total income generated from space operations activities	R58 million	R80 million	Target exceeded mainly due to the International projects being completed and made operational

Table 6: Space Operations Programme Performance Information 2018/19

KEY ACTIVITIES AND IMPACTS

SUCCESSFUL SATELLITE PASS MONITORING RATE

SANSA operates, maintains and hosts over 20 antennas, this includes the full-motion TT&C (telemetry, tracking and command) antennas and five remote sensing systems across all frequency bands. SANSA successfully provided a total of 40 telemetry, tracking and command supports for the financial year 2018/19. Table 7 illustrates the completed schedule and the interactions that were completed in this 2018/19 period.

SANSA Space operations had a very interesting mission of supporting both the ULA delta 4 rocket carrying the probe as well as Parker Solar Probe, which embarked on a landmark mission to the Sun. SANSA was critical in the success of the mission as it had to witness the separation of the probe from the Delta 4 launch vehicle.

TT&C SUPPORT 2018-2019	NUMBER OF SUPPORTS
TOSS Supports	10
Launch Supports	16
IOT Supports	1
EOR	2
Verification	2
LEOP	6
Supports	3
ESVA certifications	0

Table7: Number of launches supported

Roughly the size of a small car, the spacecraft lifted off at 03H31 EDT on a United Launch Alliance Delta IV Heavy rocket from Space Launch Complex-37 at Cape Canaveral Air Force Station. At 05H33, the mission operations manager reported that the spacecraft was healthy and operating normally.

The missions finding will help researchers improve their forecasts of space weather events that have the potential to damage satelites and harm astronauts in orbit, disrupt radio communications and, at theiur most severe, overwhelm power grids.

DARK FIBRE PROJECT COMPLETE – TELEPORT NOW POSSIBLE

In order to fulfil one of its strategic objectives, the team at SANSA embarked on project to install its own dark fibre connection, from SANSA Space Operations premises (Hartebeesthoek) to the Teraco Data Environments (Isando). The dark fibre installed spans a distance of approximately 118km.

The dark fibre network will provide an added advantage for SANSA and South Africa by allowing satellite Earth Observation data and other Telemetry to be transferred reliably in the near real-time to stakeholders. The network will also enable SANSA to provide reliable, high bandwidth and low latency space data transmission in real-time or near real-time to back-up ground-stations locally or internationally for conducting nominal or emergency satellite operations.

This fibre connection will enable the provision of space operations services (mission control, launch and early-orbit operations, housekeeping or lifecycle support) for the national satellite program. The project has been completed and the fibre will go live at the end of April 2019.

IS – 39 PROJECT

SANSA was contracted to deliver civil works and install, integrate and test the Intelsat Furnished Equipment (IFE) necessary to support Intelsat Tracking, Telemetry and Command (TT&C), and RF Monitoring System (RMS) operations for Intelsat IS-39 satellite at the Space Operations facility.

Two antennas were assembled for this project, the 9m C-band antenna and 3.7m Ka-band. While the 9m C-band antenna was built by the client, the 3.7m Ka-band antenna was assembled and installed by SANSA as opposed to a third party supplier. Furthermore, SANSA provided services inside the antenna shelter and tested the communication interlink between the antenna and the main operations room.

ICASA APPROVES SANSA LICENCES

The Independent Communication Authority of South Africa (ICASA) approved SANSA's application for an Individual Electronic Communications Network (IECNS) licence and an Individual Electronic Communications Services (IECS) licence.

The ICASA licence approval is a great milestone for SANSA Space Operations as this completes the dark fibre connection project. These licences allow SANSA to construct, operate and maintain an Electronic communications network within and across the provinces of South Africa. Furthermore, this will also allow SANSA to lease Electronic communications facilities to third parties.

Both licences are considered as service licences and are required in order to hold other licence, like the licences we hold on behalf of customers or stakeholder antenna systems and the associated RF spectrum they utilise.

The acquisition of these licences represents a significant milestone for SANSA toward achieving some of the SANSA strategic objectives.

SO HOSTS FORMER NASA ADMINISTRATOR, CHARLES BOLDEN

SANSA hosted General Charles Bolden, the United States Science Envoy and former NASA Administrator at the ground station in Hartebeesthoek. The visit was arranged by the Embassy of the United States of America in Pretoria as part of General Bolden's visit to South Africa.

Figure 32: Visit to SANSA by Former NASA Administrator, Charles Boldin

PROGRAMME 5: SPACE ENGINEERING

PURPOSE

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

SPACE ENGINEERING PROGRAMME PERFORMANCE OUTPUTS 2018/19

STRATEGIC GOAL	STRATEGIC OBJECTIVE	KEY PERFORMANCE INDICATOR/ MEASURE	ANNUAL TARGET	ACTUAL	REASON FOR VARIANCE
Goal 3: Develop national human capacity	S3.2 Support students and interns	M3.2 Number of students and interns supported for formalised training	**15**	9	No funding for additional students
Goal 4: Enhance the competitiveness of the South African space industry	S4.2 Grow the national space industry	M4.2.1 The number of direct jobs supported externally through SANSA programme contracting	55	51	Denel Spaceteq, CPUT, Cybicom jobs supported on EOSat- 1 contracting and ZACube-2 contracting. Although no funding received during the year, there were still work packages carried forward from prior year contracting
		M4.2.2 The progress status on the EOSat-1 development	70% Critical Design Review (CDR) completed for the space system flight model	Project on hold	Programme on hold until Ministerial decision on the future of the Satellite development
		M4.2.3 The total contract expenditure to SMEs for core space projects	R10 million	R13 million	Target met and exceeded due to SME spend on SS Instrumentation network upgrade and SO dark fibre and antenna construction projects in addition to the satellite programme contracts (EOSat- 1 and ZACube-2)
		M4.2.4 The total contract expenditure to the broad space related industry for core space projects	R50 million	R0	Programme on hold until Ministerial decision on the future of the Satellite development
		M4.2.5 The progress status on the CubeSat development	100% Completion of the qualification and flight models, and Launch and Commission	Programme completed in the 2018/19 financial year.	Programme completed in the 2018/19 financial year.

STRATEGIC GOAL	STRATEGIC OBJECTIVE	KEY PERFORMANCE INDICATOR/ MEASURE	ANNUAL TARGET	ACTUAL	REASON FOR VARIANCE
Goal 5: Develop active global partnerships	S5.1 Leverage a significant benefit for the space programme through global partnerships	M5.1.1 Number of active overseas partnerships	1	1	ESA engagement on Industry Development and BIC
		M5.1.2 Number of active African partnerships	1	1	Discussion with Angola on cooperation in Space
		M5.1.3 Number of active national partnerships	1	1	Development of ZACube -2 programme with CPUT

Table 8: Space Engineering Programme Performance Information 2018/19

KEY ACTIVITIES AND IMPACTS

SATELLITE DEVELOPMENT

Progress on EOSat-1 Development

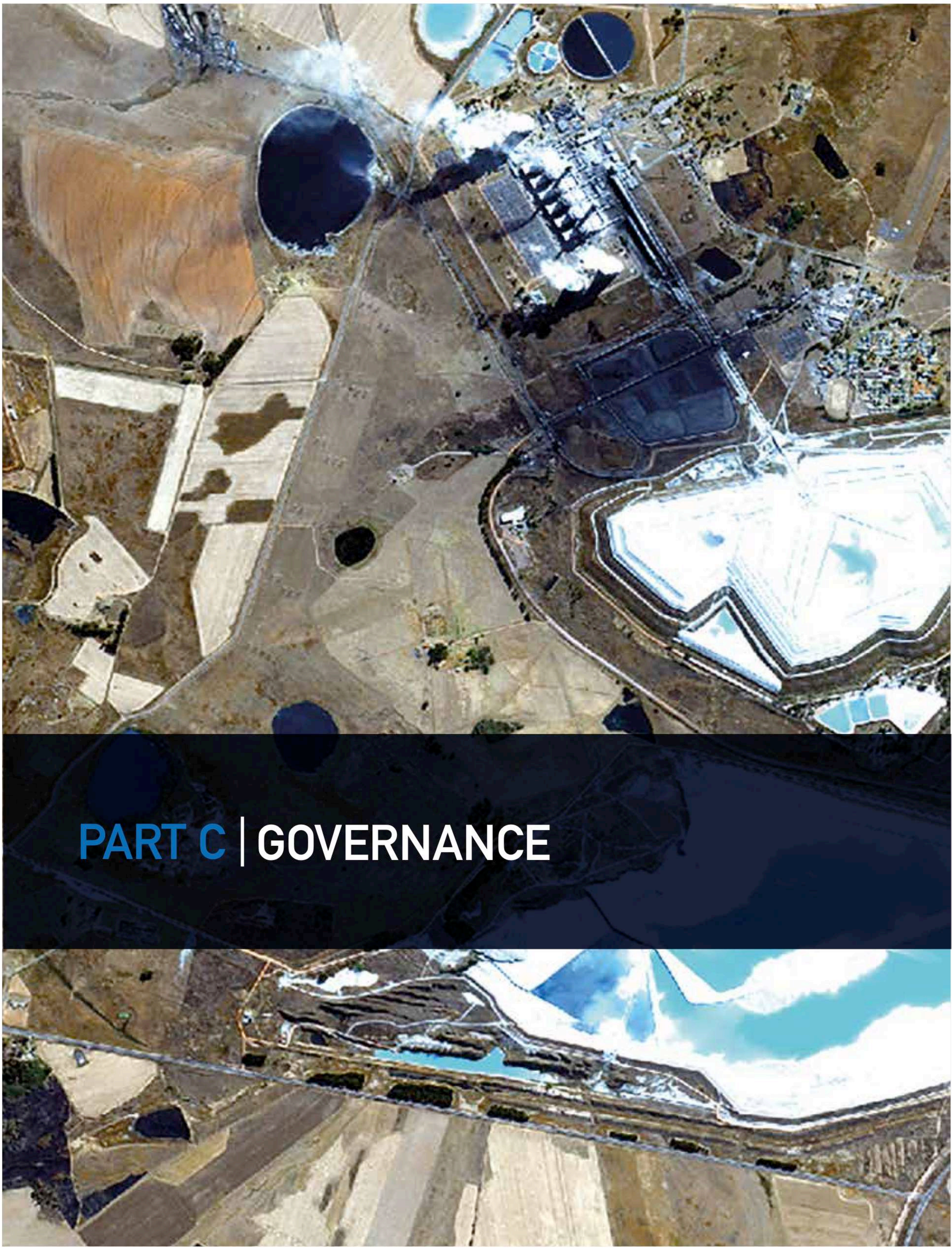
To meet the objectives of Government, the primary purpose of the proposed EOSat-1 mission is to develop space infrastructure that will service Governments' needs through various application products and services through the use of an optical sensing platform. Through the EOSat-1 project, South Africa will be able to respond to its foreign African policy directive by providing geospatial data for the African continent, in keeping with our commitment to the African Resource Management Constellation (ARMC). The current satellite development has been put on hold in order to determine a more optimal approach considering the current socio-economic situation. The Board was presented with several options for the continuation of the programme and this is currently being reviewed by the DST.

Progress on ZACUBE 2

CPUT is leading a consortium with industry partners that proposes the development of a South African constellation of low cost nano-satellites to facilitate South African Marine Domain Awareness (MDA) in support of Operation Phakisa. Specifically, the Phakisa "MDASat" constellation will provide international maritime communications services, which will initially include the current Automated Information Service (AIS) standard, followed by the evolving VHF Data Exchange System (VDES) standard. The MDASat constellation will provide South Africa with security and control of its AIS and VDES maritime data with associated improved control over data cost and access. In addition, with its flexible communications platform, the MDASat will also enable various other satellite-based services for South Africa and the greater continent.

ZACube-2 was launched on 27 December 2018 from Vostochny, Russia aboard a Soyuz launch vehicle. Ground stations at CPUT and at Denel at Houwteq (near Grabouw) provided tracking of the satellite. Radio beacon messages with essential telemetry messages were immediately received by the Houwteq station upon each of the overpasses of the satellite. Telemetry indicated that the batteries were fully charged and that the satellite was in a nominal, healthy state. Contact has been made with the satellite on every pass since.

On 1 January 2019 the AIS receiver payload was switched on for approximately one minute for a status check. The receiver began receiving AIS packets and these were processed and plotted on a map to show the locations of the beacons. The programme allowed for the development of students at a postgraduate level and contributed towards HCD.



PART C | GOVERNANCE

10. BOARD, MANAGEMENT STRUCTURES AND GOVERNANCE

INTRODUCTION

SANSA was established in terms of the SANSA Act (Act 36 of 2008, as amended), and forms part of the portfolio of entities reporting to the Department of Science and Technology (DST). The Agency is governed by the Public Finance Management Act (PFMA, Act 1 of 1999) and related National Treasury Regulations, and is a Schedule 3A entity. SANSA furthermore strives to abide by the highest standards of governance and best practice and through the financial year ended 31 March 20192019 adopted principles of the King Report on Governance (King IV Report) where feasible.

PORTFOLIO COMMITTEES

Parliament exercises its role through evaluating the performance of the public entity by interrogating their annual financial statements and other relevant documentations, which are required to be tabled, in addition to any other documentation tabled from time to time.

The Standing Committee on Public Accounts (SCOPA) reviews the annual financial statements and the audit reports issued by the external auditor.

The Portfolio Committee on Science and Technology exercises oversight over the service delivery performance of public entities and, as such, reviews the non-financial information contained in the annual reports of public entities. The Portfolio Committee is concerned with service delivery and enhancing economic growth. SANSA furthermore, presents the Performance Plan and any amendments made to the Strategic Plan to the Portfolio Committee.

EXECUTIVE AUTHORITY

Oversight by the Executive Authority rests by and large on the prescripts of the PFMA. The PFMA governs, and provides oversight authority to, the Executive Authority.

The Executive Authority has the power to appoint and dismiss the Board of a public entity. The Executive Authority must ensure that the appropriate mix of executive and non-executive members are appointed and that members have the necessary skills to guide the public entity.

SANSA presents the Annual Report, Annual Performance Plan and any amendments made to the Strategic Plan to the Minister of DST. SANSA furthermore submits quarterly reports to the Department. Further submissions were made during the year for reporting and concurrence purposes, including the submission of Board Members' declarations of interest.

BOARD

The Board is the Accounting Authority in terms of the PFMA and reports to the Minister of Science and Technology. The Board is responsible for providing SANSA with strategic direction and leadership and ensuring that the Agency abides by good corporate governance principles. The role of the Board is prescribed by the PFMA, SANSA Act and the Board Charter.

THE ROLE OF THE BOARD

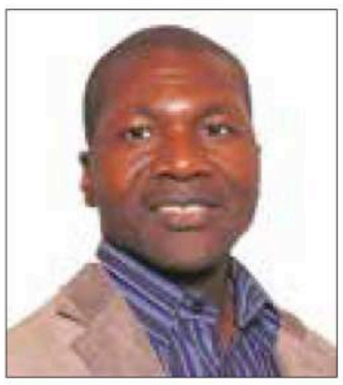
The responsibilities of the Board are dictated primarily by the SANSA Act and the PFMA. According to its legislative powers, specifically as stipulated in Section 9 of the SANSA Act, the Board's main function and responsibility are to add significant value to SANSA by:

- Performing any function imposed upon it in accordance with the policy issued by the Minister and in terms of the SANSA Act;
- Overseeing the functions of the Agency;
- Monitoring the research priorities and programmes of the Agency;
- Giving effect to the strategy of the Agency in the performance of its functions;
- Notifying the Minister immediately of any matter that may prevent or materially affect the achievement of the objectives of the Agency; and
- Establishing or disbanding the Agency's organisational divisions, as appropriate, after consultation with the Minister.

COMPOSITION OF THE BOARD

As at 31 March 2019 the Board consisted of fourteen non-executive members and the Chief Executive Officer (CEO) as an ex officio member of the Board.

In terms of the SANSA Act, Board members are appointed for a term not exceeding four years, and may be appointed for one further term thereafter. The term of the outgoing Board members came to an end on 31 August 2018. The Minister proceeded to appoint Board members, reconstituting the SANSA Board, with effect from 1 September 2018. Please refer to the tables below for further information on the SANSA Board.

	DATE APPOINTED	QUALIFICATIONS	AREA OF EXPERTISE	ACTIVE DIRECTORSHIPS OUTSIDE SANSA	OTHER COMMITTEES AS AT 31 MARCH 2019
MS XOLISWA KAKANA, Board Chairman					
	01/09/2018	BSc (Maths and Applied Science); MSc (Electronic Engineering); MBA; MS, Global Leadership and Innovation Programme; Masters in Public Administration	Innovation and technology service and business development	ICT-Works (Pty) Ltd; University of Johannesburg (Council Member); Concilium Technologies (Pty) Ltd; ZACR - ZA Central Registry (NPC)	Board Chairs Committee
Mr Ashley Naidoo, Board Member					
	01/09/2014 reappointed 01/09/2018	BSc (Paed), Bsc (Hons); MSc (Marine Zoology)	Environmental affairs, ocean sciences and Government	N/A	Audit and Risk Committee
PROF AZWINNDINI MURONGA, Board Member					
	01/09/2018	PhD (Physics); MSc (Physics); BSc (Mathematics and Physics); University Education Diploma	Physics and education	N/A	Strategy and Investment Committee
MR EUGENE JANSEN, Board Member					
	01/09/2014 reappointed 01/09/2018	MSc (Eng); BEng (Electronic Engineering); MBA	Technology and investment	VAV Investment Holdings (Pty) Ltd; Stone Three Holding (Pty) Ltd; Acorn Venture Technology (Pty) Ltd; Acorn Venture Partners (Pty) Ltd; Acorn Private Equity (Pty) Ltd; Stone Three Venture Technology (Pty) Ltd; Halotype Investments (Pty) Ltd; Stone Three Mining Solutions (Pty) Ltd; Stone Three Mining Holding (Pty) Ltd; Stone Three Mining Investments (Pty) Ltd; Empiric Technologies (Pty) Ltd	Audit and Risk Committee; Strategy and Investment Committee

	DATE APPOINTED	QUALIFICATIONS	AREA OF EXPERTISE	ACTIVE DIRECTORSHIPS OUTSIDE SANSA	OTHER COMMITTEES AS AT 31 MARCH 2019
ADV ICHO KEALOTSWE-MATLOU, Board Member					
	01/09/2018	LLB; LLM	Space law	N/A	Human Resources, Social and Ethics Committee
MS INNOCENTIA PULE, Board Member and Audit and Risk Committee Chairperson					
	08/06/2016 reappointed 01/09/2018	CA(SA); GEDP; TGM	Finance	M-Care Operating Holdings (Pty) Ltd; M-Care Property Holdings (Pty) Ltd Global Wheel (Pty) Ltd	Audit and Risk Committee Board Chairs Committee
MR JOHAN PRINSLOO, Board Member and Strategy and Investment Committee Chairperson					
	01/09/2014 reappointed 01/09/2018	BEng (Electronic Engineering)	Satellite and telecommunications technology, and business development	N/A	Strategy and Investment Committee Board Chairs
MS LUMKA MSIBI, Board Member					
	01/09/2018	BSc (Aeronautical Engineering)	Aerospace engineering, satellites, innovation and technology.	N/A	Strategy and Investment Committee
MS MARIAM PAUL, Board Member					
	01/09/2018	MIng (Electrical and Electronics); B.Tech (Electrical and Electronics); MBA	Telecommunications and technology	N/A	Human Resources, Social and Ethics Committee; Strategy and Investment Committee

	DATE APPOINTED	QUALIFICATIONS	AREA OF EXPERTISE	ACTIVE DIRECTORSHIPS OUTSIDE SANSA	OTHER COMMITTEES AS AT 31 MARCH 2019
MS MATSIE MATOOANE, Board Member					
	01/09/2014 reappointed 01/09/2018	MBA; MSLIS	Human Resources	Tshepa Modu (Pty) Ltd; NovaChill (Pty) Ltd	Human Resources, Social and Ethics Committee
MS NOMFUNEKO MAJAJA, Board Member and HR, Social and Ethics Committee Chairperson					
	01/09/2018	BCom (Hons); MA (Development Econ)	Government, policy and industry development including space affairs, and aerospace and defence.	Ubuntu's Guest House; Poz Perfect Pampering	Human Resources, Social and Ethics Committee
MR SIMPHIWE HAMILTON, Board Member					
	01/09/2014 reappointed 01/09/2018	B Mil; B Mil Hons (Politics) and MDA (RMCS - UK)	Aerospace and maritime defence	AMD; NPC; SA Air Force Reseve Council; CAV; JASC (Consultative and Advisory); AMD Export Council; NDIC; Zalisa Investments (Pty) Ltd	Audit and Risk Committee
MR WILLIE VAN BILJON, Board Member					
	01/09/2014 reappointed 01/09/2018	BSc Eng (Mech); M Eng (Mech)	Aerospace engineering and business development	N/A	Human Resources, Social and Ethics Committee
MS MBALI MFEKA, Board Member					
	01/09/2014 reappointed 01/09/2018	BCom (Hons); MBL; MDP; GEDP	Finance	Gammatec NDT Suppliers SOC Ltd	Audit and Risk Committee

	DATE APPOINTED	QUALIFICATIONS	AREA OF EXPERTISE	ACTIVE DIRECTORSHIPS OUTSIDE SANSA	OTHER COMMITTEES AS AT 31 MARCH 2019
DR VAL MUNSAMI, Chief Executive Officer and ex officio Board Member					
	01/01/2017	PhD (Physics); MBL	N/A	N/A	Strategy and Investment Committee

Table 9: Board Members with effect from 1 September 2018

OUTGOING SANSA BOARD

The table below reflects the Board membership prior to the end of the term of appointment on 31 August 2018.

NAME	DESIGNATION (IN TERMS OF THE PUBLIC ENTITY BOARD STRUCTURE)	DATE APPOINTED AND REAPPOINTMENT WHERE APPLICABLE	DATE BOARD TERM ENDED WITHOUT REAPPOINTMENT	QUALIFICATIONS	OTHER COMMITTEES AS AT 31 AUGUST 2018
Ms Joy-Marie Lawrence	Board Chairperson until 31/08/2018	01/06/2010 extended and reappointed 01/09/2014	31/08/2018	LLM (Masters in Law); Executive MBA with distinction; Chartered Director CD(SA)	Board Chairs Committee
Mr Ashley Naidoo	Board Member	01/09/2014 reappointed 01/09/2018	N/A	BSc (Paed); Bsc (Hons); MSc (Marine Zoology)	Human Resources, Social and Ethics Committee
Mr Eugene Jansen	Board Member	01/09/2014 reappointed 01/09/2018	N/A	MSc (Eng); MBA	Strategy and Investment Committee
Ms Gaborekwe Khambule	Board Member	01/05/2013 extended and reappointed 01/09/2014	31/08/2018	MBA; DMS; MAP; NHDP (Meteorology)	Human Resources, Social and Ethics Committee
Ms Innocentia Pule	Board Member	08/06/2016 reappointed 01/09/2018	N/A	CA(SA); BCom; Global Executive Development Programme (GEDP); TGM	Audit and Risk Committee
Mr Johan Prinsloo	Board Member	01/09/2014 reappointed 01/09/2018	N/A	BEng (Electronic Engineering)	Strategy and Investment Committee
Mr Marius Rezelman	Board Member and Strategy and Investment Committee Chairperson until 31/08/2018	01/05/2013 extended and reappointed 01/09/2014	31/08/2018	BCom (Hons)	Strategy and Investment Committee Board Chairs Committee

NAME	DESIGNATION (IN TERMS OF THE PUBLIC ENTITY BOARD STRUCTURE)	DATE APPOINTED AND REAPPOINTMENT WHERE APPLICABLE	DATE BOARD TERM ENDED WITHOUT REAPPOINTMENT	QUALIFICATIONS	OTHER COMMITTEES AS AT 31 AUGUST 2018
Ms Matsie Matooane	Board Member and HR, Social and Ethics Committee Chairperson until 31/08/2018	01/09/2014 reappointed 01/09/2018	N/A	MBA; MSLIS	Human Resources, Social and Ethics Committee Board Chairs Committee
Ms Mbali Mfeka	Board Member and Audit and Risk Committee Chairperson until 31/08/2018	01/09/2014 reappointed 01/09/2018	N/A	BCom (Hons); Masters in Business Leadership (MBL); Management Development Programme (MDP); GEDP	Audit and Risk Committee Board Chairs Committee
Mr Mmuso Riba	Board Member	01/09/2014	31/08/2018	BSc (Math, Chem); BSc (Surveying)	Strategy and Investment Committee
Dr Nozi Mjoli	Board Member	01/09/2014	31/08/2018 (Was not available for reappointment)	BSc (Hons); MSc (Microbiology); PhD (Microbiology)	Strategy and Investment Committee
Mr Potlaki Maine	Board Member	01/06/2010 extended and reappointed on 01/09/2014	31/08/2018	BSc (Hons) (Mathematics) (Magna-cum-laude); MSc (Information Science); CAIB (SA)	Audit and Risk Committee
Prof Ramesh Bharuthram	Board Member	01/09/2014	31/08/2018 (Was not available for reappointment)	PhD (Theoretical Plasma Physics)	Strategy and Investment Committee
Mr Simphiwe Hamilton	Board Member	01/09/2014 reappointed 01/09/2018	N/A	B Mil; B Mil Hons (Politics); MDA (RMCS - UK)	Audit and Risk Committee
Mr Vincent Gore	Board Member	01/06/2010 extended and reappointed on 01/09/2014	31/08/2018	BSc (Eng) (Elec)	Human Resources, Social and Ethics Committee
Mr Willie van Biljon	Board Member	01/09/2014 reappointed 01/09/2018	N/A	BSc Eng (Mech); M Eng (Mech)	Human Resources, Social and Ethics Committee

Table 10: Board membership prior to the end of the term of appointment on 31 August 2018

BOARD MEETINGS AND ATTENDANCE

During the twelve months ended 31 March 2018, the Board convened ten meetings, four of which were convened for a special purpose. All ten meetings were quorate and Board member attendance was as shown in table below:

MEMBER	MEETING 10/04/2018	MEETING 29/05/2018	SPECIAL MEETING 21/06/2018	SPECIAL MEETING 20/07/2018	SPECIAL MEETING 27/07/2018	MEETING 20/08/2018	SPECIAL MEETING 30/08/2018	MEETING 30/10/2018	MEETING 14/01/2019	MEETING 20/02/2019
A Muronga	•	•	•	•	•	•	•	✓	✓	✓
A Naidoo	✗	✓	✗	✗	✗	✓	✗	✗	✓	✓
E Jansen	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓
G Khambule	✗	✓	✓	✓	✗	✓	✓	•	•	•
I Kealotwse-Matlou	•	•	•	•	•	•	•	✓	✓	✗
I Pule	✗	✗	✗	✗	✓	✓	✓	✓	✓	✓
J Lawrence	✓	✓	✓	✓	✓	✓	✓	•	•	•
J Prinsloo	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
L Msibi	•	•	•	•	•	•	•	✓	✓	✓
M Matooane	✓	✓	✓	✓	✓	✓	✗	✓	✗	✗
M Mfeka	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓
M Paul	•	•	•	•	•	•	•	✓	✓	✗
M Rezelman	✓	✓	✗	✓	✓	✓	✓	•	•	•
M Riba	✗	✗	✗	✗	✗	✗	✗	•	•	•
N Majaja	•	•	•	•	•	•	•	✓	✗	✓
N Mjoli	✓	✓	✗	✓	✓	✓	✗	•	•	•
P Maine	✓	✓	✓	✓	✓	✗	✓	•	•	•
R Bharuthram	✓	✗	✓	✓	✓	✓	✗	•	•	•
S Hamilton	✓	✓	✓	✓	✗	✓	✓	✓	✓	✗
V Gore	✓	✗	✓	✓	✓	✓	✓	•	•	•
W van Biljon	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗
X Kakana	•	•	•	•	•	•	•	✓	✓	✓
V Munsami	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓

Table10: Board Attendance ✓ Present ✗ Apology • Not a member (please refer to the information on Board Membership)

Figure 33: Board and standing Committees structure

BOARD COMMITTEES

Three standing Board Committees support the Board in discharging its functions. The responsibilities and functions of Board Committees are set out in respective Board-approved charters which are reviewed annually. The Committees were reconstituted by the Board at the first meeting of the reconstituted Board held on 30 October 2018.

AUDIT AND RISK COMMITTEE

The establishment of the Audit and Risk Committee complies with Sections 76(4)(d) and 77 of the PFMA (1999) and Section 3 of the National Treasury Regulations. As at 31 March 2019, the Committee consisted of five non-executive members as indicated in table below. Ms Mbali Mfeka served as Committee Chairperson until 31 August 2018 and Ms Innocentia Pule was thereafter appointed as Committee Chairperson, subsequent to the reconstitution of the SANSA Board.

The Audit and Risk Committee provides independent oversight of:

- The effectiveness of SANSA's internal control systems and functions, including the audit function:
- The management of SANSA's risks: and
- The adequacy, reliability and accuracy of the financial information.

The Audit and Risk Committee convened three ordinary meetings and two special meetings during the twelve months ended 31 March 2019.

MEMBER	SPECIAL MEETING 18/04/2018	MEETING 14/05/2018	MEETING 18/07/2018	SPECIAL MEETING 23/07/2018	MEETING 06/02/2019
A Naidoo	•	•	•	•	•
E Jansen	•	•	•	•	✓
I Pule	✓	✓	✓	✓	✓
J Prinsloo	✓	✓	✓	✓	•
M Mfeka	✓	✓	✓	✓	✓
P Maine	✓	✓	✓	✓	•
S Hamilton	✓	×	✓	×	✓

Table11: Audit and Risk Committee Membership and attendance ✓ Present × Apology • Not a member

MEMBER	MEETING 16/05/2018	MEETING 20/07/2018	SPECIAL MEETING 21/11/2018	MEETING 05/02/2019
A Muronga	•	•	✓	✓
E Jansen	✓	✓	✓	✓
J Prinsloo	•	•	✓	✓
L Msibi	•	•	✓	✓
M Paul	•	•	✓	✓
M Rezelman	✓	✓	•	•
M Riba	×	×	•	•
N Mjoli	✓	✓	•	•
R Bharuthram	×	✓	•	•
B Pono	✓	×	✓	✓
A Khatri	✓	✓	✓	✓
V Munsami	✓	✓	✓	✓

Table12: Strategy and Investment Committee Membership and attendance ✓ Present × Apology • Not a member

STRATEGY AND INVESTMENT COMMITTEE

As at 31 March 2019, the Strategy and Investment Committee consisted of five non-executive Members, the CEO and CFO as executive Members. As ex-officio Board Member, the CEO held voting rights while the CFO did not have any voting rights. Mr Marius Rezelman served as Chairperson of the Committee until 31 August 2018 after which Mr Johan Prinsloo was appointed as the Committee Chairperson.

The Committee assists the Board in discharging its responsibilities to, among others:

- Facilitate and oversee the strategic planning process;
- Ensure that the Strategic Plan sets out performance priorities; and
- Ensure relevant resourcing of SANSA's strategic initiatives.

As shown in Table below, the Strategy and Investment Committee convened three ordinary and one special meeting during the twelve months ended 31 March 2019.

HUMAN RESOURCES, SOCIAL AND ETHICS COMMITTEE

The Human Resources, Social and Ethics Committee consisted of five non-executive Members and the Executive Director: Enterprise Services as an ex-officio member as at 31 March 2019. Ms Matsie Matooane served as the Chairperson of the Committee until 31 August 2018 after which Ms Nomfuneko Majaja was appointed as Committee Chairperson.

The Committee assists the Board with oversight of matters relating to human resources, remuneration, code of conduct and social and ethics. The Committee is responsible to, among others:

- Ensure that the Human Resources strategy supports the Agency's vision, mission and associated activities; and
- Oversee human resource-related issues, including employee benefits, succession planning, organisational design and talent management.

During the twelve months ended 31 March 2019, the Human Resources, Social and Ethics Committee convened three ordinary and one special meeting.

MEMBER	MEETING 08/05/2018	MEETING 13/07/2018	SPECIAL MEETING 27/11/2018	MEETING 01/02/2018
A Naidoo	✗	✗	•	•
G Khambule	✓	✓	•	•
I Kealotswe-Matlou	•	•	✓	✓
M Matooane	✓	✓	✓	✓
N Majaja	•	•	✓	✓
M Paul	•	•	✓	✓
V Gore	✓	✗	•	•
W van Biljon	✓	✓	✓	✓
A Slavin*	✓	✓	✓	✓

Table13: Human Resources, Social and Ethics Committee Membership and attendance ✓ Present ✗ Apology • Not a member

*Ms Ann Slavin was appointed as the Executive Director: Enterprise Services with effect from 9 April 2018.

BOARD MEMBER REMUNERATION

Board Member remuneration is aligned with National Treasury guidelines as set out in the Annual Financial Statements. The Board is categorised at level A2 and Board members are paid to prepare for and attend meetings. Board members are paid per hour for the actual event. Board members are furthermore covered for travel costs (airfares, car hire and accommodation) and reimbursed for incidental expenses such as parking, train fares and the use of personal vehicles (reimbursed per kilometre as per the SANSA travel policy).

Board members who represent other government departments or institutions are not remunerated unless proof of permission to do remunerative work outside their normal official duties is submitted.

EXECUTIVE COMMITTEE

The CEO and the executive management are responsible for ensuring effective and efficient management of SANSA's operations and driving the achievement of SANSA's mandate. The management structure was designed to meet SANSA's needs towards attaining its goals. The Executive Management team includes the CEO, CFO, Executive Directors: Enterprise Services and Space Programme and the Managing Directors: Earth Observation, Space Science and Space Operations.

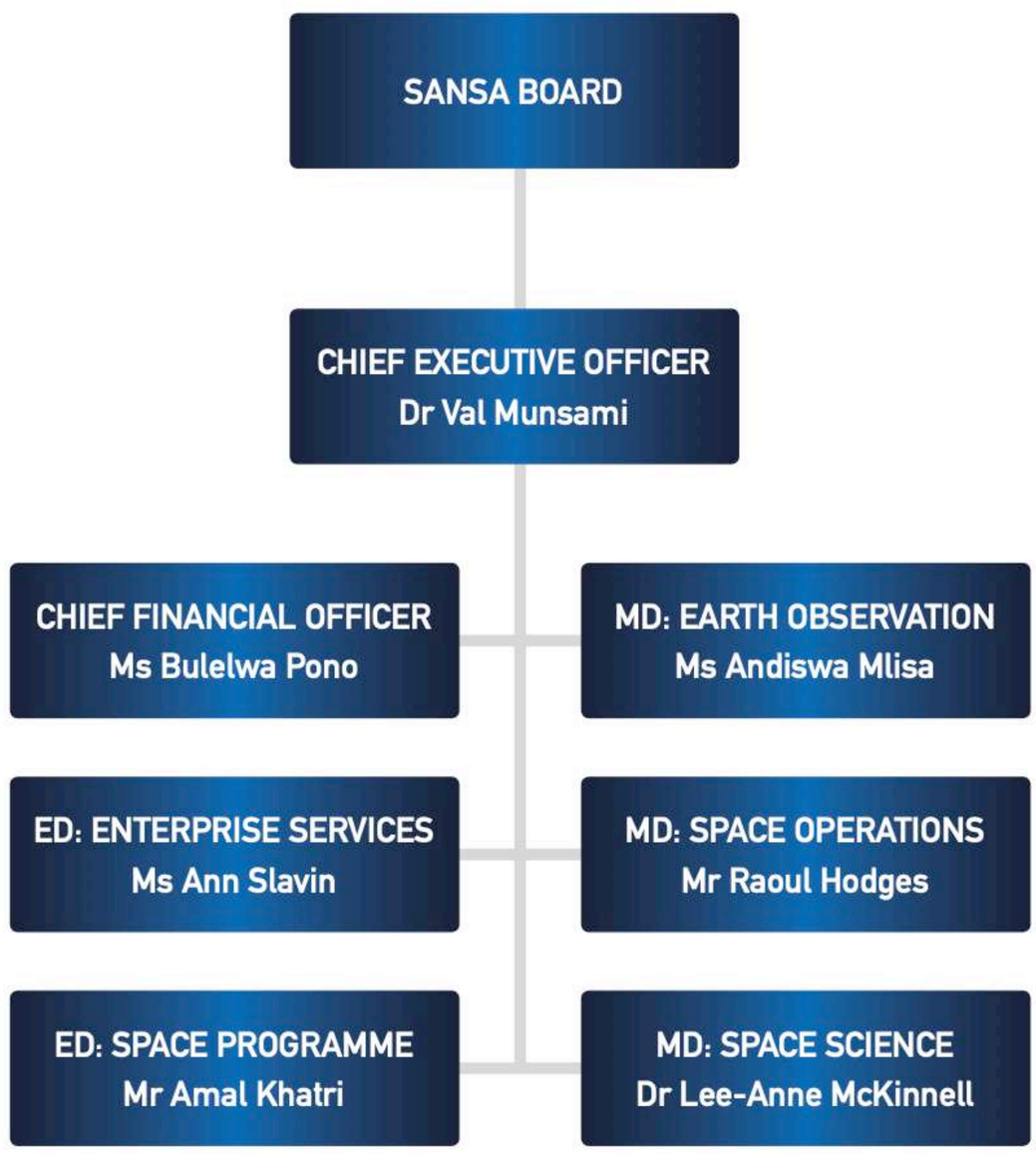


Figure 34: SANSA Executive Structure

Dr Val Munsami
Chief Executive Officer

Lorraine Harrison
Board Secretary

Ms Bulelwa Pono
Chief Financial Officer

Mr Amal Khatri
ED: Space programme

Ms Ann Slavin
ED: enterprise services

Mr Raoul Hodges
MD: Space operations

Ms Andiswa Mlisa
MD: Earth observation

Dr Lee-Anne McKinnell
MD: Space science

Figure 35: Executive Management Team

ENTERPRISE RISK MANAGEMENT

Enterprise risk management (ERM) is an integral part of SANSA's business strategy and planning and is applied across the organisation through a robust ERM Policy and Framework.

In line with the integrated risk management methodology, risks are continuously reviewed with a focus on effectiveness of controls. Regular risk assessments on both operational risk and strategic risk registers are conducted on a continuous basis in order to embed risk management principles with SANSA.

A revised ERM Policy for the organisation was approved by the Board and the key objectives of the ERM process included:

- Identification, assessing, mitigating and monitoring of risk;
- Risk awareness and training sessions with management and staff;
- The use of the implemented key risk indicators, which enable ongoing monitoring of risk to reduce both impact and likelihood of the occurrences;
- Quarterly monitoring and review of the risk registers (strategic and operational); and
- Quarterly monitoring and review of risk management activities by the SANSA's executive management, the Audit and Risk Committee and the Board.

The enterprise-wide risk assessment process included the identification, prioritisation and mitigation of material risks that could significantly impact SANSA's strategic objectives.

The overall effectiveness of the mitigating measures ranges between unsatisfactory and good.

FRAUD RISK MANAGEMENT

There is an Anti-Fraud Management Policy and Fraud Prevention Plan in place which provides guidelines to management on how to deal with and manage fraud, corruption and any unethical behaviour. The Fraud Prevention Plan seeks to address the following, among others:

- Early detection and prevention of fraud;
- Investigate fraud to minimise any negative impact;
- Raise fraud awareness within SANSA;
- Encourage a culture within and for SANSA where all employees, public and other stakeholders behave ethically in dealings with or on behalf of SANSA; and
- Report fraud, corruption or any other unethical behaviour that could have an undesirable impact on SANSA through the fraud hotline.

The fraud hotline is functional and there have been incidents reported via the hotline. All incidents have been investigated and closed for the 2018/19 financial year.

SAFETY, HEALTH, ENVIRONMENT AND QUALITY (SHEQ)

The implementation of the planned SHEQ management activities identified and mitigated SHEQ risks effectively and ensured that SANSA continues to comply with SHEQ training and certification. Quarterly SHEQ meetings are held at all SANSA worksites and attention is paid to maintaining a safe and healthy working environment as well as delivering quality outputs.

SAFETY AND HEALTH

In ensuring the health and safety environment, the SANSA Hartebeesthoek worksite was certified on OHSAS 18001: 2007, ISO 14001:2004 and ISO 9001:2008 Standards in October 2017 by DQS (Deutsche Quality Systems).

There have been no major incidents and the SANSA Disabling Injury Frequency Rate (DIFR) remains at 0.

ENVIRONMENT

SANSA is committed to minimising its impact on the environment and maximising its responsible use of natural resources. Activities in this regard included controlled waste disposal and recycling, as well as ongoing communication and awareness creation about managing the available energy resources, such as electricity and water consumption. The removal of invasive species at both the Hermanus and Hartebeesthoek worksites continues.

QUALITY

The focus of SANSA's quality activities is to:

- establish and maintain a certified Quality Management System and SHE Management System according to ISO 9001:2008, ISO 14001:2004 and OHSAS 18001:2007;
- maintain accreditation for focused courses such as compass swing training; and
- communicate quality procedures, best practices and knowledge throughout the Agency.

SOCIAL RESPONSIBILITY

BBBEE LEVEL AND ACTION PLANS

SANSA has been issued with a non-compliant contributor BBBEE certificate as the minimum points required for the lowest level - 8, which is 55 points were not achieved. The verification standard applied was based on the Amended Generic Codes Gazette no 29618, 2013 and Amended Generic ICT Sector Code Gazette no. 40407, 07 Nov 2016. The verification process covered information as presented in the SANSA annual report for the 2016/17 financial year.

The following non-compliant elements are as follows:

ELEMENTS	WEIGHTING	SCORE
Management	20	13.27
Skills Development	25	4.13
Enterprise & Supplier Development	50	9.54
Socio-Economic Development	5	0.00
BBBEE Score	**100**	**26.94**

Table14: Non-compliant elements

The SANSA Executive committee approved a strategy to improve the current non-compliant BBBEE status level, by approaching each of the four elements strategically through target setting and providing appropriate evidence to support the verification of activities that qualify for points.

AUDIT AND RISK COMMITTEE REPORT

We are pleased to present our report for the financial year ended 31 March 2019.

AUDIT AND RISK RESPONSIBILITY

The purpose of the SANSA Audit and Risk Committee is to assist the Board in fulfilling its oversight responsibility on the system of internal financial control; the governance of risk; internal and external audit functions and SANSA's processes for monitoring statutory and regulatory compliance.

The Audit and Risk Committee adopted its formal Terms of Reference in its Audit and Risk Charter, which are updated annually and approved by the Board. During the past financial year, the Committee has carried out its duties in accordance with its terms of reference, the Public Finance Management Act, the National Treasury Regulations 3.1.13 and King IV report on Corporate Governance.

COMMITTEE MEMBERS AND ATTENDANCE

The Audit and Risk Committee consists of the members as stated on page 68 of this report. In accordance with its approved Terms of Reference, the Committee convened at least four meetings during the year under review. The meetings and schedule of attendance is shown on page 68 of this report.

The Chief Executive Officer, the Chief Finance Officer, senior executives and management of SANSA and representatives of the external and internal auditors attend the committee meetings by invitation. The committee also periodically meets separately with external auditors and internal auditors. The internal and external auditors have unrestricted access to the audit committee.

EXTERNAL AUDITORS

In execution of its statutory duties during the past financial year, the audit committee:

- Determined the fees to be paid to external auditors as disclosed in note 27 of the annual financial statements;
- Determined the terms of engagement with external auditors;
- Supported the reappointment of Nexia SAB&T in terms of section 4(3) of the Public Audit Act; which was duly approved by the Board and authorised by the AGSA.

Based on processes followed and assurances received, nothing has come to our attention with regard to the external auditors' independence.

RISK MANAGEMENT

The Committee has received assurances that SANSA has risk management processes focused on identifying, assessing, managing and monitoring significant risks across all operations. This has been in place for the year under review.

INTERNAL AUDIT

The Audit and Risk Committee is satisfied as to the effectiveness of the internal audit function during the year and that the internal audit activity has addressed the risks pertinent to SANSA. The Committee approved the Internal Audit Charter and the three-year rolling strategic plan inclusive of a one-year operational audit plan.

Internal Audit provided assurance that SANSA operates in a responsibly governed manner by performing the following functions:

- objectively assuring effectiveness of risk management and the internal control framework;
- analysing and assessing business processes and associated controls; and reporting audit findings and recommendations to management and the Audit and Risk Committee.

In addition, the committee has:

- evaluated the independence, effectiveness and performance of the internal audit function and compliance with its mandate;

- satisfied itself that the internal audit function has the necessary resources, budget, standing and authority within SANSA to enable it to discharge its functions;
- encouraged co-operation between external and internal audit.

The internal audit manager reported functionally to the audit and risk committee and had unrestricted access to the audit committee chairperson. The internal audit function is subject to independent quality review every five years or as an when the committee determines appropriate. The next independent quality review of the function will be conducted during the 2019/20 financial year.

THE EFFECTIVENESS OF INTERNAL CONTROLS

The Audit and Risk Committee has reviewed:

- the effectiveness of the entity's internal financial control systems, including receiving assurance from management, internal audit and external audit;
- significant issues raised by the internal and external audit process, including the manner in which they were resolved.

Based on the processes and assurance obtained, we believe that the significant internal financial controls that were in place were effective.

FINANCE FUNCTION

The Committee believes that Ms Bulelwa Pono CA (SA), the Chief Financial Officer, possesses the appropriate expertise and experience to meet her responsibilities in that position. The committee is further satisfied with the expertise and adequacy of resources within the finance function.

In making these assessments, the committee obtained feedback from management as well as from both external and internal audit.

GOING CONCERN

The Committee concurs with the Executive Management that the adoption of the going concern premise in the preparation of the Annual Financial Statements is appropriate.

EVALUATION OF THE FINANCIAL STATEMENTS

In terms of SANSA's Annual Financial Statements, the Committee has:

- Reviewed and discussed the Audited Annual Financial Statements, to be included in the Annual Report, with the external auditors.
- Reviewed the Agency's management letter and management's response to it.
- Reviewed information on predetermined objectives to be included in the Annual Report.
- Considered the applicability of the going concern assumption.
- Reviewed the Agency's compliance with legal and regulatory provisions.
- Reviewed significant adjustments resulting from the audit.

The Committee has evaluated the Annual Financial Statements for the year ended 31 March 2019 and, based on the information provided, the Committee considers that it complies, in all material respects, with the requirements of the various acts governing disclosure and reporting on the Annual Financial Statements.

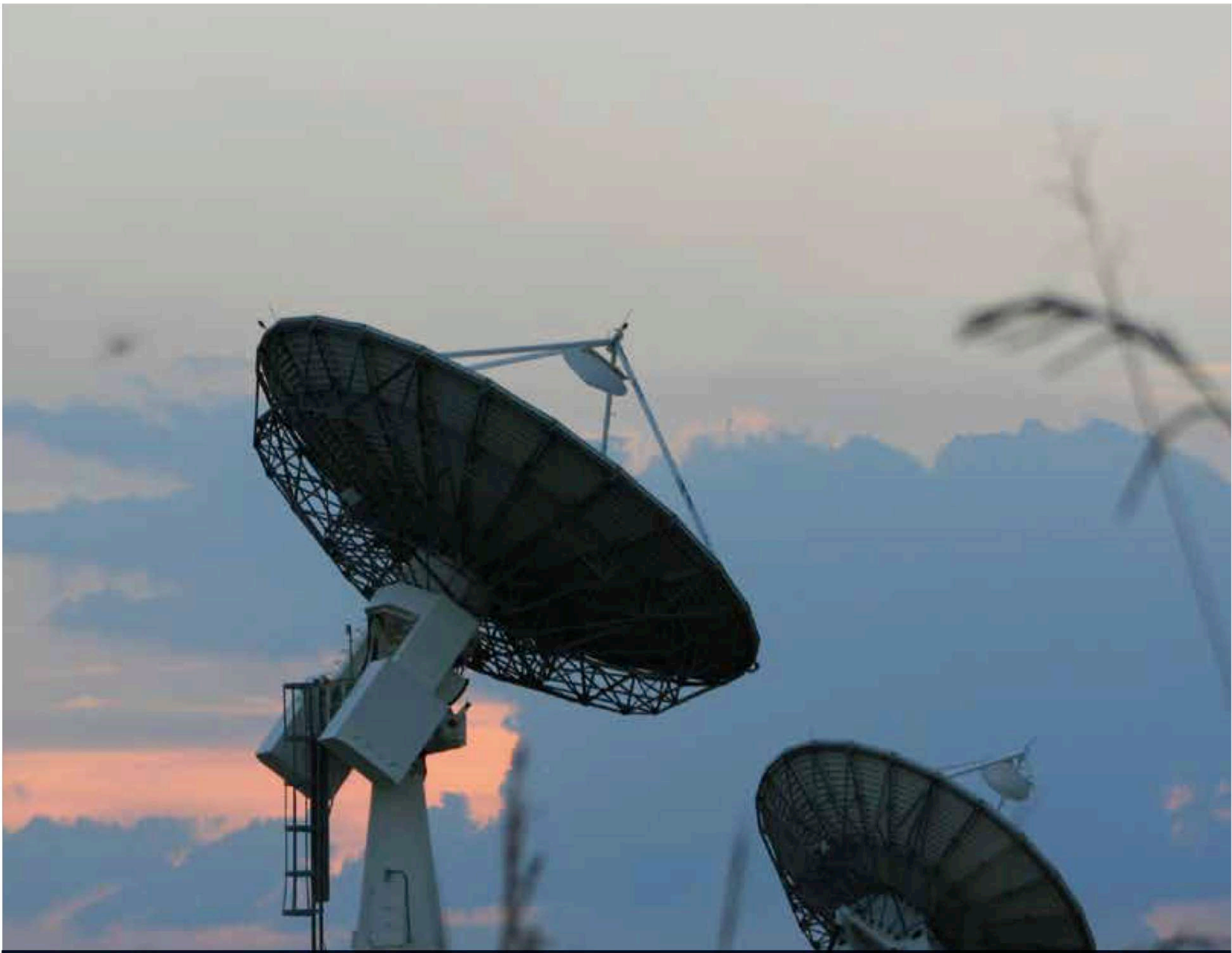
AUDITORS' REPORT

The Audit and Risk Committee concurs and accepts the conclusions of the external auditor on the Annual Financial Statements and is of the opinion that the audited Annual Financial Statements be accepted and read together with the report of the auditor.

ANNUAL REPORT

Based on processes and assurances obtained, we recommend the annual report to the Board for approval.

Ms Innocentia Pule
Chairperson of Audit and Risk Committee



PART D | HUMAN RESOURCE MANAGEMENT

11. HUMAN RESOURCE MANAGEMENT

KEY ACTIVITIES

During the year under review, the main focus at the Human Resources Management unit was on fostering capabilities that will enable the organisation to deliver on its mandate. This included enhancing and improving organisational performance and people management practices. The focus on entrenching a performance management culture in SANSA was an important driver and during the year under review, a number of roadshows and workshops were facilitated to improve goalsetting and employees' understanding of the workplace and the role each employee plays in turning the vision of the organisation into a reality. Skills development stayed on the radar although financial constraints hindered some of the initiatives.

Most of the training needs as per the consolidated SANSA Annual Training Plan however, has been addressed. A structured management development program was also launched and six critical modules were included in building management capability. Another priority was to implement a SANSA Training & Development Committee with the aim to act as a centralised repository for employee training and development needs and to identify and make recommendations for SANSA-wide training initiatives.

During this period a stronger and more open relationship with the NEHAWU trade union was prioritised through the development of consultation structures. Another focus area was the enablement of the SAGE Employee Self Service Portal. However, due to supplier technical challenges this has been re-looked for implementation in the next financial year.

A number of Wellness initiatives were implemented during the period. The contract with ICAS (Employee Assistance Program) ended and a new service provider, Careways has been contracted for a period of three years.

In order to ensure better control and standardisation across SANSA, a number of Policies were reviewed. Emphasis was placed on the Study Assistance and Leave policies in particular. Talent attraction has changed considerably in recent years. The growing popularity of advanced recruitment software, coupled with instantly accessible talent pools on various social media sites, means that companies no longer have to rely on recruitment agencies and costly offline advertising to find candidates. In order for SANSA to keep up definite and urgent attention will be given to the SAGE recruitment portal as well as social media accessibility for attracting purposes.

Important future plans and goals for the Human Capital Unit is to embark on a robust workforce plan to ensure optimal use of the workforce and to assist in employee forecasting derived from the strategy. Further to this a comprehensive Skills Audit, a Salary Parity exercise and the development of a SANSA Employee Value Proposition (EVP) are on the cards.

HUMAN RESOURCES OVERSIGHT STATISTICS

PERSONNEL COST BY PROGRAMME

PROGRAMME	TOTAL EXPENDITURE FOR THE ENTITY (R'000)	PERSONNEL EXPENDITURE (R'000)	PERSONNEL EXP. AS A % OF TOTAL EXP. (R'000)	NO. OF EMPLOYEES
Administration & Space Engineering	51 683 317	33 767 594	66%	37
Earth Observation	66 300 403	22 645 100	34%	31
Space Science	44 041 580	25 638 717	54%	55
Space Operations	76 513 855	33 648 936	46%	54
TOTAL	**238 539 155**	**115 700 348**	**48,6%**	**177**

Table 15: Personnel cost by programme

TRAINING COSTS

PROGRAMME	PERSONNEL EXPENDITURE (R'000)	TRAINING EXPENDITURE (R'000)	TRAINING EXPENDITURE AS A % OF PERSONNEL COST	NO. OF EMPLOYEES TRAINED
Administration & Space Engineering	33 767 594	211 781	0.68%	74
Earth Observation	22 645 100	524 316	0.78%	13
Space Science	25 638 717	380 705	1.44%	53
Space Operations	33 648 936	251 001	0.75%	26
TOTAL	**115 700 348**	**1 367 802**	**0.89%**	**166**

Table 16: Training costs by programme

EMPLOYMENT AND VACANCIES BY PROGRAMME

PROGRAMME	2017/18 NO. OF EMPLOYEES	2018/19 APPROVED POSTS	2018/19 NO. OF EMPLOYEES	2018/19 VACANCIES	% OF VACANCIES
Administration & Space Engineering	42	41	37	4	9.8%
Earth Observation	36	37	31	6	16.2%
Space Science	51	62	55	7	11.3%
Space Operations	54	63	54	9	14.3%
TOTAL	**183**	**203**	**177**	**26**	**12.8%**

Table 17: Employment and vacancies by programme

EMPLOYMENT AND VACANCIES - LEVELS

LEVELS	2017/18 NO. OF EMPLOYEES	2018/19 APPROVED POSTS	2018/19 NO. OF EMPLOYEES	2018/19 VACANCIES	% OF VACANCIES
Top Management	1	1	1	0	0%
Senior Management	5	6	6	0	0%
Professional qualified	61	62	56	7	11.3%
Skilled	94	107	93	15	14.1%
Semi-skilled	19	26	20	4	15.4%
Unskilled	4	1	1	0	0%
TOTAL	**183**	**203**	**177**	**26**	**12.8%**

Table 18: Employment and vacancies by salary levels

EMPLOYMENT CHANGES

SALARY BAND	EMPLOYMENT AT BEGINNING OF PERIOD 01 APRIL 2018	APPOINTMENTS	TERMINATIONS	EMPLOYMENT AT END OF THE PERIOD 31 MARCH 2019
Top Management	1	0	0	1
Senior Management	5	1	0	6
Professional qualified	61	4	9	56
Skilled	94	6	7	93
Semi-skilled	19	1	0	20
Unskilled	4	0	3	1
TOTAL	**184**	**12**	**19**	**177**

Table 19: Employment changes by salary levels

REASONS FOR EMPLOYEES LEAVING

REASON	NUMBER	% OF TOTAL NO. OF EMPLOYEES LEAVING
Death	0	0%
Resignation	9	5%
Dismissal	1	0.6%
Retirement	2	1%
Ill health	0	0%
Expiry of contract	7	4%
Other	0	0%
Total	**19**	**10.7%**

Table 20: Reasons for Employees leavingLabour Relations: Misconduct and disciplinary action

LABOUR RELATIONS: MISCONDUCT AND DISCIPLINARY ACTION

NATURE OF DISCIPLINARY ACTION	NUMBER
Verbal Warning	None
Written Warning	3
Final Written warning	3
Dismissal	1

Table 21: Labour relations matters

EMPLOYMENT EQUITY

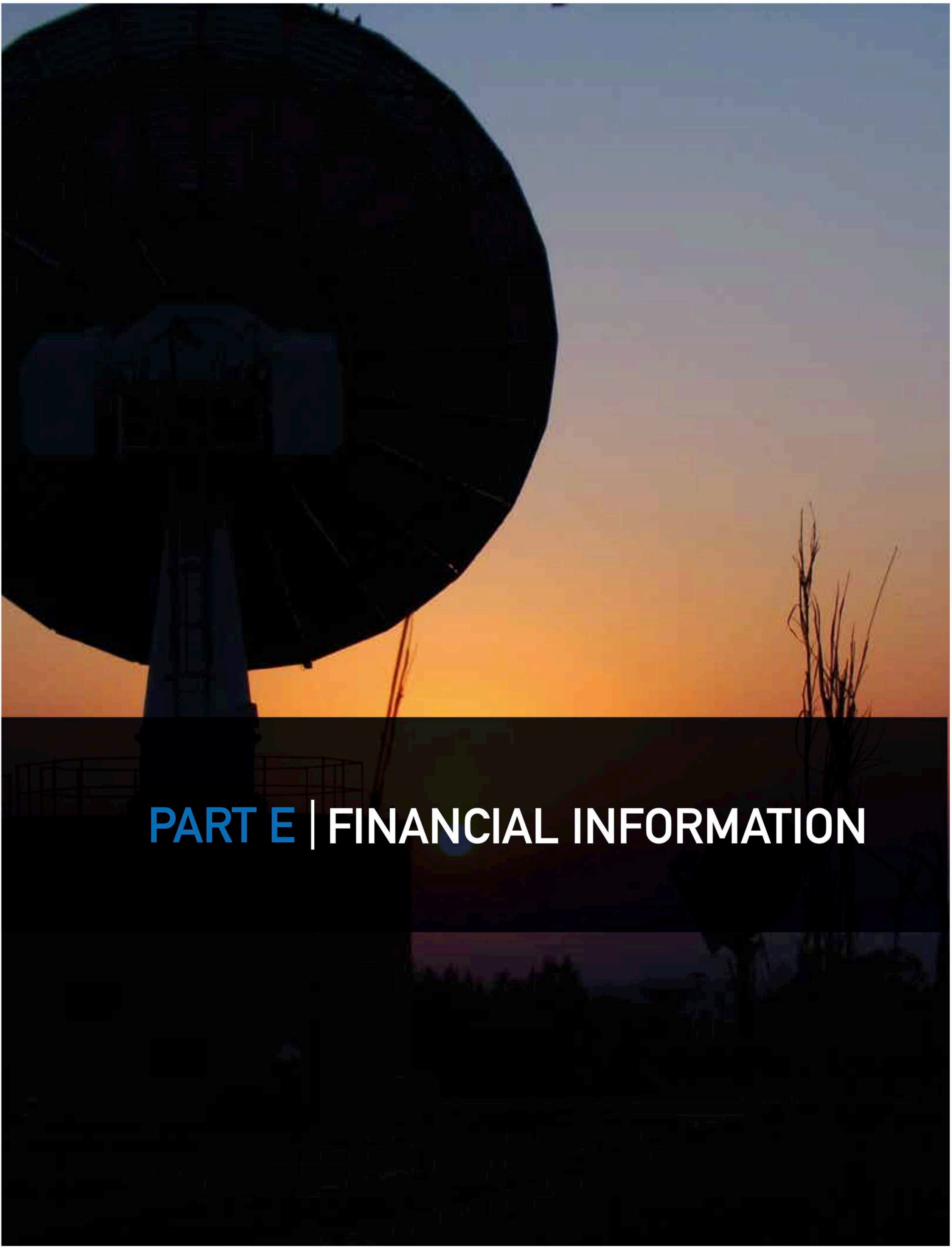
LEVELS	EMPLOYMENT EQUITY BY SALARY LEVELS							
	AFRICAN		COLOURED		INDIAN		WHITE	
	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
Top Management	0	0	0	0	1	0	0	0
Senior Management	0	2	0	0	1	0	1	2
Professional qualified	17	10	2	1	4	2	14	6
Skilled	39	28	3	4	3	0	8	7
Semi-skilled	7	8	4	2	0	0	0	0
Unskilled	1	0	0	0	0	0	0	0
TOTAL	**64**	**48**	**9**	**7**	**9**	**2**	**23**	**15**

Table 22: Employment equity by salary levels

DISABLED EMPLOYEES

LEVELS	DISABLED EMPLOYEES	
	MALE	FEMALE
Semi-skilled	0	1
TOTAL	**0**	**1**

Table 23: Disabled employee by salary levels



PART E | FINANCIAL INFORMATION

12. INDEPENDENT AUDITOR'S REPORT

INDEPENDENT AUDITOR'S REPORT TO PARLIAMENT ON THE SOUTH AFRICAN NATIONAL SPACE AGENCY

REPORT ON THE AUDIT OF THE FINANCIAL STATEMENTS

OPINION

1. We have audited the financial statements of the South African National Space Agency set out on pages 87 to 141, which comprise the statement of financial position as at 31 March 2019, the statement of financial performance, statement of changes in net assets and cash flow statement and statement of comparison of budget and actual amounts for the year then ended, as well as the notes to the financial statements, including a summary of significant accounting policies.

2. In our opinion, the financial statements present fairly, in all material respects, the financial position of the South African National Space Agency as at 31 March 2019, and its financial performance and cash flows for the year then ended in accordance with South African Standards of Generally Recognised Accounting Practice (GRAP) and the requirements of the Public Finance Management Act of South Africa, 1999 (Act No.1 of 1999) (PFMA).

BASIS FOR OPINION

3. We conducted our audit in accordance with the International Standards on Auditing (ISAs). Our responsibilities under those standards are further described in the auditor's responsibilities for the audit of the financial statements section of this auditor's report.

4. We are independent of the entity in accordance with section 290 and 291 of the Independent Regulatory Board for Auditors' Code of professional conduct for Registered Auditors (Revised January 2018), parts 1 and 3 of the Independent Regulatory Board for Auditors' Code of Professional Conduct for Registered Auditors (Revised November 2018) (together the IRBA Codes) and other independence requirements applicable to performing audits of financial statements in South Africa. We have fulfilled our other ethical responsibilities, as applicable in accordance with the IRBA Codes and in accordance with other ethical requirements applicable to performing audits in South Africa. The IRBA Codes are consistent with the corresponding sections of the International Ethics Standards Board for Accountants' Code of Ethics for Professional Accountants and the International Ethics Standards Board for Accountants' International Code of Ethics for Professional Accountants (including International Independence Standards) respectively.

5. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

RESPONSIBILITIES OF THE ACCOUNTING AUTHORITY FOR THE FINANCIAL STATEMENTS

6. The Board, which constitutes the accounting authority is responsible for the preparation and fair presentation of the financial statements in accordance with SA Standards of GRAP and the requirements of the PFMA and for such internal control as the accounting authority determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

7. In preparing the financial statements, the accounting authority is responsible for assessing the entity's ability to continue as a going concern, disclosing, as applicable, matters relating to going concern and using the going concern basis of accounting unless the accounting authority either intends to liquidate or to cease operations, or has no realistic alternative but to do so.

AUDITOR'S RESPONSIBILITIES FOR THE AUDIT OF THE FINANCIAL STATEMENTS

8. Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance but is not a guarantee that an audit conducted in accordance with the ISAs will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

9. A further description of our responsibilities for the audit of the financial statements is included in the annexure to this auditor's report.

REPORT ON THE AUDIT OF THE ANNUAL PERFORMANCE REPORT

INTRODUCTION AND SCOPE

10. In accordance with the Public Audit Act of South Africa, 2004 (Act No. 25 of 2004) (PAA) and the general notice issued in terms thereof, we have a responsibility to report material findings on the reported performance information against predetermined objectives for the selected programmes presented in the annual performance report. We performed procedures to identify findings but not to gather evidence to express assurance.

11. Our procedures address the reported performance information, which must be based on the approved performance planning documents of the entity. We have not evaluated the completeness and appropriateness of the performance indicators included in the planning documents. Our procedures also did not extend to any disclosures or assertions relating to planned performance strategies and information in respect of future periods that may be included as part of the reported performance information. Accordingly, our findings do not extend to these matters.

12. We evaluated the usefulness and reliability of the reported performance information in accordance with the criteria developed from the performance management and reporting framework, as defined in the general notice, for the following selected programmes presented in the annual performance report of the entity for the year ended 31 March 2019:

PROGRAMMES	PAGES IN THE ANNUAL PERFORMANCE REPORT
Strategic Goal 1 - Address South Africa's challenges through space services and products.	39-55
Strategic Goal 4 - Enhance the competitiveness of the South African space industry.	39 – 59

13. We performed procedures to determine whether the reported performance information was properly presented and whether performance was consistent with the approved performance planning documents. We performed further procedures to determine whether the indicators and related targets were measurable and relevant, and assessed the reliability of the reported performance information to determine whether it was valid, accurate and complete.

14. We did not raise any material findings on the usefulness and reliability of the reported performance information for the following programmes:

    - Strategic Goal 1 - Address South Africa's challenges through space services and products.
    - Strategic Goal 4 - Enhance the competitiveness of the South African space industry.

OTHER MATTERS

We draw attention to the matters below.

ACHIEVEMENT OF PLANNED TARGETS

15. Refer to the annual performance report on pages 35 to 59 for information on the achievement of planned targets for the year and explanations provided for the under/ over achievement of a number of targets.

REPORT ON THE AUDIT OF COMPLIANCE WITH LEGISLATION

INTRODUCTION AND SCOPE

16. In accordance with the PAA and the general notice issued in terms thereof, we have a responsibility to report material findings on the compliance of the entity with specific matters in key legislation. We performed procedures to identify findings but not to gather evidence to express assurance.

17. We did not raise material findings on compliance with the specific matters in key legislation set out in the general notice issued in terms of the PAA.

OTHER INFORMATION

18. The accounting authority is responsible for the other information. The other information comprises the information included in the annual report, which includes the accounting authority's reports and the audit committee report. The other information does not include the financial statements, the auditor's report and those selected programmes presented in the annual performance report that have been specifically reported in this auditor's report.

19. Our opinion on the financial statements and findings on the reported performance information and compliance with legislation do not cover the other information and we do not express an audit opinion or any form of assurance conclusion thereon.

20. In connection with our audit, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial statements and the selected programmes presented in the annual performance report, or our knowledge obtained in the audit, or otherwise appears to be materially misstated.

21. We did not receive the other information prior to the date of this auditor's report. After we receive and read this information, and if we conclude that there is a material misstatement, we are required to communicate the matter to those charged with governance and request that the other information be corrected. If the other information is not corrected, we may have to retract this auditor's report and re-issue an amended report as appropriate. However, if it is corrected this will not be necessary.

INTERNAL CONTROL DEFICIENCIES

22. We considered internal control relevant to our audit of the financial statements, reported performance information and compliance with applicable legislation; however, our objective was not to express any form of assurance on it. We did not identify any significant deficiencies in internal control.

OTHER REPORTS

23. We draw attention to the following engagements conducted by various parties that have or could potentially have an impact on the public entity's financial statements, reported performance information and compliance with applicable legislation and other related matters. The reports noted do not form part of our opinion on the financial statements or our findings on the reported performance information or compliance with legislation.

AUDIT-RELATED SERVICES AND SPECIAL AUDITS

24. An agreed-upon procedures engagement was performed on donor funding concerning the application of grant funding received from the National Research Foundation (NRF) for the period 1 January 2018 to 31 December 2018 and was issued to the South African National Space Agency management on the 14 June 2019.

AUDITOR TENURE

25. In terms of the IRBA rule published in Government Gazette Number 39475 dated 4 December 2015, we report that Nexia SAB&T has been the auditor of the South African National Space Agency for 2 years.

Nexia SAB&T

Nexia SAB&T
Per: A Darmalingam
Director
Registered Auditor
5 August 2019

ANNEXURE – AUDITOR'S RESPONSIBILITY FOR THE AUDIT

1. As part of an audit in accordance with the ISAs, we exercise professional judgement and maintain professional scepticism throughout our audit of the financial statements, and the procedures performed on reported performance information for selected programmes and on the entity's compliance with respect to the selected subject matters.

FINANCIAL STATEMENTS

2. In addition to our responsibility for the audit of the financial statements as described in this auditor's report, we also:

   - identify and assess the risks of material misstatement of the financial statements whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
   - obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control.
   - evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the accounting authority.
   - conclude on the appropriateness of the accounting authority's use of the going concern basis of accounting in the preparation of the financial statements. We also conclude, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the South African National Space Agency's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements about the material uncertainty or, if such disclosures are inadequate, to modify the opinion on the financial statements. Our conclusions are based on the information available to me at the date of this auditor's report. However, future events or conditions may cause an entity to cease continuing as a going concern.
   - evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

COMMUNICATION WITH THOSE CHARGED WITH GOVERNANCE

3. We communicate with the accounting authority regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

4. We also confirm to the accounting authority that we have complied with relevant ethical requirements regarding independence and communicate all relationships and other matters that may reasonably be thought to have a bearing on our independence and, where applicable, related safeguards.

STATEMENT OF FINANCIAL POSITION
FOR THE YEAR ENDED 31 MARCH 2019

	NOTE	2019 R	2018 R
ASSETS			
Current Assets		**157 788 864**	**123 125 425**
Cash and Cash Equivalents	5	121 113 842	97 223 484
Receivables from exchange transactions	6	36 385 386	25 393 824
Inventory	7	289 636	508 117
Non-Current Assets		**438 702 085**	**447 518 708**
Property, Plant and Equipment	8	428 726 776	431 423 674
Intangible Assets	9	9 975 309	16 095 034
Total Assets		**596 490 949**	**570 644 133**
LIABILITIES			
Current Liabilities		**70 205 219**	**86 201 490**
Trade and Other Payables from Exchange Transactions	10	17 531 849	22 108 665
Provisions	11	8 242 115	6 005 146
Committed Conditional Grant Liability	12	44 285 178	58 087 679
Operating Lease Liability	13	146 077	-
Total Liabilities		**70 205 219**	**86 201 490**
NET ASSETS		**526 285 730**	**484 442 643**
Accumulated Surplus	15	526 285 730	484 442 643
Total Net Assets		**526 285 730**	**484 442 643**

STATEMENT OF FINANCIAL PERFORMANCE
FOR THE YEAR ENDED 31 MARCH 2019

	NOTE	2019 R	2018 R
REVENUE			
REVENUE FROM NON-EXCHANGE TRANSACTIONS			
Transfers and Subsidies Received	14	179 897 340	218 951 382
REVENUE FROM EXCHANGE TRANSACTIONS			
Interest Income	16	7 808 821	8 310 533
Rendering of Services	17	90 416 060	87 810 375
Other Income	18	672 062	4 776 010
Net Gains on Foreign Exchange Transactions	28	1 587 960	-
Total Revenue		**280 382 243**	**319 848 300**
EXPENDITURE			
Employee and Employee Related Costs	19	115 700 348	110 474 811
Board Member Remuneration	20	1 002 124	1 170 199
Depreciation and Amortisation	21	27 611 037	25 399 526
Repairs and Maintenance	22	10 902 220	10 533 545
Data Licence fees	23	28 737 479	34 451 213
Student Bursaries and Research Grants Paid	24	4 636 566	5 620 792
Antenna Infrastructure Services	25	3 271 263	3 270 496
Training Expenses	26	1 367 802	1 226 374
General Expenses	27	44 512 270	48 596 577
Net Losses on Foreign Exchange Transactions	28	-	1 861 044
Net Losses on Disposal of Property, Plant and Equipment	29	750 519	96 109
Irrecoverable Sundry Debtors	31	47 528	8 916
Total Expenditure		**238 539 156**	**242 709 601**
SURPLUS FOR THE YEAR		**41 843 087**	**77 138 699**

STATEMENT OF CHANGES IN NET ASSETS

FOR THE YEAR ENDED 31 MARCH 2019

	NOTE	ACCUMULATED SURPLUS R	TOTAL R
2018			
Balance at 1 April 2017		407 303 944	407 303 944
Surplus for the year		77 138 699	77 138 699
Balance as at 31 March 2018	15	**484 442 643**	**484 442 643**
2019			
Balance at 1 April 2018		484 442 643	484 442 643
Surplus for the year		41 843 087	41 843 088
Balance at 31 March 2019	15	**526 285 730**	**526 285 730**

CASH FLOW STATEMENT
FOR THE YEAR ENDED 31 MARCH 2019

	NOTE	2019 R	2018 R
CASH FLOWS FROM OPERATING ACTIVITIES			
RECEIPTS			
Transfers and Subsidies	14	166 094 836	189 213 350
Sales of goods and services		79 424 498	87 810 375
Interest Income		7 808 821	8 310 533
Other Receipts		672 062	4 776 010
PAYMENTS			
Employee Costs		(115 700 348)	(110 474 811)
Suppliers		(94 809 263)	(110 374 003)
Payments on behalf of principal		-	(8 258 803)
NET CASH FLOWS FROM OPERATING ACTIVITIES	**30**	**43 490 606**	**61 002 652**
CASH FLOWS FROM INVESTING ACTIVITIES			
Purchase of Property, Plant and Equipment	8	(19 167 565)	(106 462 290)
Purchase of Intangible Assets	9	(432 683)	(2 652 008)
NET CASH FLOWS (USED IN) INVESTING ACTIVITIES		**(19 600 248)**	**(109 114 298)**
CASH FLOWS FROM FINANCING ACTIVITIES			
Movement in Long term liability		-	(5 422 550)
NET CASH FLOWS (USED IN)/ FROM FINANCING ACTIVITIES		**-**	**(5 422 550)**
NET INCREASE (DECREASE) IN CASH AND CASH EQUIVALENTS		**23 890 358**	**(53 534 196)**
Cash and Cash Equivalents at the beginning of the year		97 223 484	150 757 680
Cash and Cash Equivalents at the end of the year	5	121 113 842	97 223 484

STATEMENT OF COMPARISON OF BUDGET AND ACTUAL AMOUNTS

FOR THE YEAR ENDED 31 MARCH 2019

	NOTE	APPROVED BUDGET 2018/19 R	FINAL BUDGET 2018/19 R	ACTUAL AMOUNTS ON A COMPARABLE BASIS 2018/19 R	DIFFERENCE 2018/19 R
REVENUE					
Revenue from Non-exchange Transactions		**144 907 500**	**207 111 082**	**224 182 515**	**17 071 433**
Operational Transfers		138 036 000	138 036 000	138 036 000	-
Ring Fenced Transfers	4.3.1	-	57 384 062	72 404 062	15 020 000
Research Grants	4.3.2	1 581 500	6 590 461	8 599 668	2 009 207
Post graduate student bursary support		5 290 000	5 100 559	5 142 785	42 226
Revenue from Exchange Transactions	**4.3.3**	**76 286 596**	**95 641 979**	**90 416 060**	**(5 225 919)**
Contract Income: Public		25 927 128	35 895 725	27 992 476	(7 903 249)
Contract Income: Private		2 611 833	9 559 977	10 238 068	678 091
Contract Income: Foreign		47 747 635	50 186 277	52 185 516	1 999 239
Other Income	4.3.4	370 000	5 648 455	8 480 883	2 832 428
Prior years Surplus Retained		-	36 407 032	36 407 032	-
Total Revenue		**221 564 096**	**344 808 548**	**359 486 490**	**14 677 943**
EXPENDITURE					
CURRENT PAYMENTS					
Employee and Employee Related Costs	4.3.5	123 983 457	125 470 913	115 700 348	9 770 565
Board Member Remuneration		877 200	1 177 200	1 002 124	175 076
Repairs and Maintenance	4.3.6	6 294 141	20 302 443	10 902 220	9 400 223
Finance Costs		-	-	-	-
Data Licence fees	4.3.7	24 199 000	52 807 205	28 737 479	24 069 726
Student Bursaries and Research Grants Paid		7 179 920	7 334 159	4 636 566	2 697 593
Antenna Infrastructure Services	4.3.8	-	5 094 716	3 271 263	1 823 453
Training Expenses		1 784 296	2 599 739	1 367 802	1 231 937
General Expenses	4.3.9	51 858 983	75 128 894	44 512 270	30 616 624
Net Losses on Foreign Exchange Transactions		-	100 000	-	100 000
Net Losses on Disposal of Property, Plant and Equipment		-	-	750 519	(750 519)
Impairment of Receivables		-	-	47 528	(47 528)
		216 176 997	**290 015 269**	**210 928 119**	**79 087 150**

	NOTE	APPROVED BUDGET 2018/19 R	FINAL BUDGET 2018/19 R	ACTUAL AMOUNTS ON A COMPARABLE BASIS 2018/19 R	DIFFERENCE 2018/19 R
PAYMENTS FOR CAPITAL ASSETS					
Machinery and equipment	4.3.10	2 787 100	21 271 768	6 611 455	14 660 313
Software and intangible assets		600 000	2 785 592	432 683	2 352 909
Vehicles		-	617 487	524 996	92 491
Computer Equipment	4.3.11	2 000 000	21 386 369	5 524 958	15 861 411
Satellite Development	4.3.12	-	8 732 062	4 739 018	3 993 044
		5 387 100	**54 793 278**	**17 833 110**	**36 960 168**
Total Expenditure		**221 564 097**	**344 808 547**	**228 761 229**	**116 047 320**
Surplus/Deficit				**130 725 261**	**130 725 261**

RECONCILIATION OF ACTUAL AMOUNTS ON A COMPARABLE BASIS AND ACTUAL AMOUNTS ON THE ANNUAL FINANCIAL STATEMENTS

NET CASH FLOWS FROM	OPERATING ACTIVITIES R	FINANCING ACTIVITIES R	INVESTING ACTIVITIES R	TOTAL R
Actual Amount on Comparable Basis as Presented in the Budget and Actual Comparative Statement	**148 558 372**	**-**	**(17 833 111)**	**130 725 261**
Basis Differences	(105 067 766)	-	(1 767 137)	(106 834 903)
Actual amount in Cash Flow Statement	**43 490 606**	**-**	**(19 600 248)**	**23 890 358**

ACCOUNTING POLICIES
FOR THE YEAR ENDED 31 MARCH 2019

1. BASIS OF PRESENTATION

The annual financial statements have been prepared using the accrual basis of accounting, in terms of which items are recognised as assets, liabilities, net assets, revenue and expenses when they satisfy the definitions and recognition criteria for those elements, which in all material aspects are consistent with those applied in the previous year, except where a change in accounting policy has been recorded. The historic cost convention has been used, except where indicated otherwise

The Annual Financial Statements are prepared in South African Rand (R) and have been prepared on a going concern basis.

1.1 STATEMENT OF COMPLIANCE

The Annual Financial Statements have been prepared in accordance with the Standards of Generally Recognised Accounting Practice (GRAP), including any interpretations and directives issued by the Accounting Standards Board (ASB) and the Public Finance Management Act (PFMA).

The presented Annual Financial Statements have been rounded to the nearest Rand value. The impact that the rounding will have on the disclosed numbers in the Annual Financial Statements, will not be material and should not significantly understate nor overstate the reported numbers.

1.2 CRITICAL JUDGEMENTS, ESTIMATIONS AND ASSUMPTIONS

1.2.1 Going concern assumption

The Annual Financial Statements have been prepared on a going concern basis. This basis presumes that funds will be available to finance future operations and that the realisation of assets and settlement of liabilities, contingent liabilities and commitments will occur in the ordinary course of business.

1.2.2 Judgements and estimations

In the application of the entity's accounting policies, which are described below, management is required to make judgements, estimates and assumptions about the amounts of assets, liabilities, revenue and expenses that are not readily apparent from other sources. The estimates and associated assumptions are based on historical experience and other factors that are considered to be relevant. Actual results may differ from these estimates.

These estimates and underlying assumptions are reviewed on an on-going basis. Revisions to accounting estimates are recognised in the period in which the estimate is revised if the revision affects only that period, or in the period of the revision and future periods if the revision affects both current and future periods.

The following are the critical judgements that management have made in the process of applying the entity's Accounting Policies and have the most significant effect on the amounts recognised in the Annual Financial Statements:Significant accounting policies, which have been consistently applied, are disclosed below. Details of any changes in accounting policies are explained in the relevant policy.

1.2.3 Financial assets and liabilities

The classification of financial assets and liabilities, into categories, is based on the relevant GRAP standards and the terms of the instruments. Accounting Policy 1.7.2 on Financial Assets Classification and Accounting Policy 1.7.3 on Financial Liabilities Classification describe the factors and criteria considered by the management of the entity in the classification of financial assets and liabilities.

In making the above-mentioned judgement, management considered the definition and recognition criteria for the classification of financial instruments as set out in GRAP.

1.2.4 Impairment of Financial Assets

Accounting Policy 1.7.5 on Impairment of Financial Assets describes the process followed to determine the value by which financial assets should be impaired. In making the estimation for impairment, management of the entity considered the detailed criteria for impairment of financial assets as set out in GRAP, and used its judgement to select a variety of methods and make assumptions that are mainly based on market conditions existing at the end of the reporting period. Management of the entity is satisfied that impairment of financial assets recorded during the year is appropriate.

Calculation in respect of impairment of debtors is based on an assessment of the extent to which debtors have defaulted on payments already due, and an assessment of their ability to make payments based on their creditworthiness.

1.2.5 Useful lives of Property, Plant and Equipment and Intangible Assets

Property, plant and equipment and intangible assets are depreciated over their useful life taking into account residual values, where appropriate. The useful lives of the assets and residual values are assessed annually and may vary depending on a number of factors. In re-assessing useful lives, factors such as technological innovation and maintenance programmes are taken into account. Residual value assessments consider issues such as future market conditions, the remaining life of the asset and projected disposal values.

1.2.6 Impairment: Write down of Property, Plant and Equipment and Intangible Assets

Property, plant and equipment and intangible assets are considered for impairment if there is a reason to believe that impairment may be necessary. The future cash flows expected to be generated by the assets are projected taking into account market conditions and the expected useful lives of the assets. The present value of these cash flows, determined using an appropriate discount rate, is compared to the current carrying value and, if lower, the assets are impaired to the present value taking into account the reasonable cost of replacement.

In making the above-mentioned estimates and judgement, management considered the subsequent measurement criteria and indicators of potential impairment losses as set out in GRAP 17: Property, Plant and Equipment and GRAP 31: Intangible assets. In particular, the calculation of the recoverable service amount for PPE and intangible assets involves significant judgment by management.

1.2.7 Provisions and Contingent Liabilities

Management judgement is required when recognising and measuring provisions and when measuring contingent liabilities. Provisions are discounted where the effect of discounting is material using actuarial valuations. The amount of a provision is the best estimate of the expenditure expected to be required to settle the present obligation at the reporting date. SANSA recognises provision for bonuses based on the expected performance bonuses to be paid out to employees.

1.2.8 Revenue Recognition

Accounting Policy 1.9.2 on Revenue from Exchange Transactions and Accounting Policy 1.9.3 on Revenue from Non-exchange Transactions describe the conditions under which revenue will be recorded by management of the entity.

In making their judgement, management considers the detailed criteria for the recognition of revenue as set out in GRAP 9: Revenue from Exchange Transactions and GRAP 23: Revenue from Non-Exchange transactions, as far as Revenue from Exchange and Non-Exchange Transactions is concerned. In particular, revenue from services rendered is recognised in surplus or deficit in proportion to the stage of completion of the transaction at the reporting date.

The stage of completion is assessed by reference to work performed as at the reporting date. Contract revenue includes the initial amount agreed in the contract plus any variations in contract work, claims and incentive payments to the extent that it is probable that these will result in revenue and can be measured reliably. As soon as the outcome of a contract can be estimated reliably, contract revenue and expenses are recognised in profit or loss in proportion to the stage of completion of the contract.

The stage of completion is assessed by reference to work performed as at reporting date. When the outcome of a contract cannot be estimated reliably, contract revenue is recognised only to the extent of contract costs incurred that are likely to be recoverable. An expected loss on a contract is recognised immediately in surplus or deficit.

Management of the entity is satisfied that recognition of the revenue in the current and prior year is appropriate."

1.3 OFFSETTING

Assets, liabilities, revenues and expenses have not been offset except when offsetting is required or permitted by a standard of GRAP.

1.3.1 Comparative Figures

Prior period comparative information has been presented in the current financial year. Where necessary, comparative figures have been adjusted to conform to changes in presentation in the current year.

1.4 STANDARDS, AMENDMENTS TO STANDARDS AND INTERPRETATIONS ISSUED BUT NOT YET EFFECTIVE

STANDARD NUMBER	STANDARD NAME	EFFECTIVE DATE (IF APPLICABLE)
GRAP 20	Related party disclosures	01 April 2019
GRAP 32	Service Concession Arrangements: Grantor	01 April 2019
GRAP 34	Separate Financial Statements	No effective date
GRAP 35	Consolidated Financial statements	No effective date
GRAP 36	Investment in Associates and Joint Ventures	No effective date
GRAP 37	Joint Arrangement	No effective date
GRAP 38	Disclosure of Interests in Other Entities	No effective date
GRAP 108	Statutory Receivables	01 April 2019
GRAP 109	Accounting by Principals and Agents	01 April 2019
GRAP 110	Living and Non-living Resources	01 April 2020

GRAP 20 – Related parties

This standard provides the requirements for the disclosure of related parties and transactions and balances with related parties. This standard was based on IPSAS 20 as currently applied by the entity for its related party disclosures. Accordingly the adoption of this standard will only affect the disclosures in the Financial Statement.

GRAP 32 – Service Concession Arrangements: Grantor

The objective of this Standard is to prescribe the accounting for service concession arrangements by the grantor, a public sector entity. The implementation of the statement will not be applicable to SANSA currently as SANSA is not an operator providing a mandated function related to the service concession asset.

GRAP 34 – Separate Financial Statements

The objective of this Standard is to prescribe the accounting and disclosure requirements for investments in controlled entities, joint ventures and associates when an entity prepares financial statements. The implementation of the statement will not be applicable to SANSA as SANSA does not have investments in controlled entities, joint ventures and investments in associates.

GRAP 35 – Consolidated Financial Statements

The objective of this Standard is to establish principles for presentation and preparation of consolidated financial statements when an entity controls one or more other entities. The implementation of the statement will not be applicable to SANSA as SANSA does not have controlled entities.

GRAP 36 – Investment in Associates and Joint Ventures

The objective of this Standard is to prescribe the accounting for investments in associates and joint ventures and set out the requirements for the application of the equity method when accounting for investments in associates and joint ventures. The implementation of the statement will not be applicable to SANSA currently as SANSA does not have investments and does not have joint ventures.

GRAP 37 – Joint Arrangements

The objective of this Standard is to establish principles for financial reporting by entities that have an interest in arrangements that are jointly controlled . The standard will not have an impact on SANSA as SANSA has no joint control arrangements.

GRAP 38– Disclosure of interest in Other Entities

The objective of this Standard is to require an entity to disclose information that enables users of its financial statements to evaluate: the nature of, and risks associated with, its interests in controlled entities, unconsolidated controlled entities, joint arrangements interest in associates, and structured entities that are not consolidated; and the effects of those interests on its financial position, financial performance and cash flows. The standard will not have an impact on SANSA as SANSA has no interest in other entities.

GRAP 108 Statutory Receivables

The objective of this Standard is to prescribe accounting for the recognition, measurement, presentation and disclosure of statutory receivables. The standard will not have an impact on SANSA as SANSA is a schedule 3A public entity as listed in the PFMA however if SANSA was to be listed as a schedule 3B National Government Business Enterprise it would have to register for VAT and Income Tax and thus the statement will be applicable.

GRAP 109 Accounting by Principals and Agents

The objective of this Standard is to outline principles to be used by an entity to assess whether it is party to a principal-agent arrangement, and whether it is a principal or an agent in undertaking transactions in terms of such an arrangement. This Standard does not introduce new recognition or measurement requirements for revenue, expenses, assets and/or liabilities that result from principal-agent arrangements. The Standard does however provide guidance on whether revenue, expenses, assets and/or liabilities should be recognised by an agent or a principal, as well as prescribe what information should be disclosed when an entity is a principal or an agent.

GRAP 110 Living and Non-Living Resources

The objective of this Standard is to prescribe accounting for the recognition, measurement, presentation and disclosure of living resources and disclosure requirements for non -living resources. The standard will not have an impact on SANSA as SANSA's operations does not involve dealing with living organisms such as animals and plants.

1.5 PROPERTY, PLANT AND EQUIPMENT

1.5.1 Initial recognition and subsequent measurement

"Property, plant and equipment are measured at cost, net of accumulated depreciation and/ or accumulated impairment losses, if any property, plant and equipment are tangible assets which are held for use in the production or supply of goods and services or for administrative purposes and are expected to be used during more than one financial period.

The cost of an item of property, plant and equipment is recognised as an asset when:

- It is probable that future economic benefits or service potential associated with the item will flow to the entity; and
- The cost of the item can be measured reliably

Costs include costs incurred initially to acquire or construct an item of property, plant and equipment and significant costs incurred subsequently to add to, replace part of, or service it. If a replacement cost is recognised in the carrying amount of an item of property, plant and equipment, the carrying amount of the replaced part is derecognised. All property, plant and equipment are measured at cost, less depreciation, less impairment subsequent to the initial recognition.

Where an asset is acquired at no cost, (i.e. non-exchange transaction), it's cost will be it's fair value as at the date of acquisition.

All repairs and maintenance costs are recognised in surplus or deficit as incurred. The present value of the initial expected estimate cost for the decommissioning of the asset after its use is included in the cost of the respective asset if the recognition criteria for a allowance is met. When parts of an item of property, plant and equipment have different useful lives, they are accounted for as separate items (major components) of property, plant and equipment.

1.5.2 Depreciation

Depreciation is recognised in surplus or deficit on a straight line basis over the estimated useful lives of each part of an item of property, plant and equipment. Depreciation is recognised even if the fair value of the asset exceeds its carrying amount, as long as the asset's residual value does not exceed its carrying amount. Repair and maintenance of an asset do not negate the need to depreciate it.The estimated useful lives are reviewed at the end of each reporting period,with the effect of any changes in estimate accounted for on a prospective basis. SANSA's accounting policy is to depreciate assets as follows:

a. Freehold land

   Land has an unlimited useful life and therefore is not depreciated but stated at cost

b. Freehold buildings

   SANSA identified the following major components of buildings.

   - Buildings
   - Alterations and other fixtures

   The useful lives of the various components of buildings have been assessed to be:

   - Buildings 15-50 years
   - Alterations and other fixtures 14-15 years

c. Equipment and Motor Vehicles

   The useful lives of the various categories of equipment and vehicles have been assessed to be:

   - Office furniture 3-10 years

- Motor vehicles 3-10 years
- Computer equipment 1-10 years
- Research equipment 2-15 years
- Property, Plant & Machinery 2-20 years
- Office Equipment 3-10 years
- Exhibits 10 years
- Laboratory Equipment 5 years

d. Leasehold improvements

These improvements are depreciated over the shorter of the contract period or the useful lives of the assets.

In assessing whether there is any indication that the expected useful life of an asset has changed, management considers the following indications:

(a) The composition of the asset changed during the reporting period, i.e. the significant components of the asset changed.

(b) The use of the asset has changed, because of the following:
- The entity has changed the manner in which the asset is used.
- The entity has changed the utilisation rate of the asset.
- The entity has made a decision to dispose of the asset in a future reporting period(s) such that this decision changes the expected period over which the asset will be used.
- Technological, environmental, commercial or other changes that occurred during the reporting period that have, or will, change the use of the asset.
- Legal or similar limits placed on the use of the asset have changed.
- The asset was idle or retired from use during the reporting period.
- The asset is approaching the end of its previously expected useful life.

(c) Planned repairs and maintenance on, or refurbishments of, the asset and/or its significant components either being undertaken or delayed.

(d) Environmental factors, e.g. increased rainfall or humidity, adverse changes in temperatures or increased exposure to pollution.

(e) There is evidence that the condition of the asset improved or declined based on assessments undertaken during the reporting period.

(f) The asset is assessed as being impaired in accordance with GRAP 21 and GRAP 26.

In assessing whether there is any indication that the expected residual value of an asset has changed, an entity shall consider whether there has been any change in the expected timing of disposal of the asset, as well as any relevant indicators included above.

Disclosure

The financial statements shall also disclose for each class of property, plant and equipment recognised in the financial statements:

(a) the existence and amounts of restrictions on title and property, plant and equipment pledged as securities for liabilities;

(b) the amount of contractual commitments for the acquisition of property, plant and equipment;

(c) if it is not disclosed separately on the face of the statement of financial performance, the amount of compensation from third parties for items of property, plant and equipment that were impaired, lost or given up that is included in surplus or deficit.

An entity shall disclose the following in the notes to the financial statements in relation to property, plant and equipment which is in the process of being constructed or developed:

(a) The cumulative expenditure recognised in the carrying value of property, plant and equipment. These expenditures shall be disclosed in aggregate per class of asset.

(b) The carrying value of property, plant and equipment that is taking a significantly longer period of time to complete than expected, including reasons for any delays.

(c) The carrying value of property, plant and equipment where construction or development has been halted either during the current or previous reporting period(s). The entity shall also disclose reasons for halting the construction or development of the asset and indicate whether any impairment losses have been recognised in relation to these assets.

Derecognition

An item of property, plant and equipment is derecognised upon disposal or when no future economic benefits or service potential is expected from its use or disposal. The gain or loss arising from the derecognition of an item of property, plant and equipment is included in surplus or deficit when the item is derecognised. The gain or loss arising from the derecognition of an item of property, plant and equipment is determined as the difference between the net disposal proceeds, if any, and the carrying amount of the item.

1.5.3 Impairment of non-financial assets

Cash generated units are determined as the smallest identified group of assets which can generate cash flows independently from other assets or groups of assets. Non-cash generating assets are primarily held for service delivery purposes.

1.5.3.1 Cash generating assets

The entity assesses at each reporting date whether there is any indication that an asset may be impaired. If any such indication exists, the entity estimates the recoverable amount of the individual asset

If there is any indication that an asset may be impaired, the recoverable amount is estimated for the individual asset. If it is not possible to estimate the recoverable amount of the individual asset, the recoverable amount of the cash-generating unit to which the asset belongs is determined.

A cash generating unit is the smallest identifiable group of assets that generates cash inflows that are largely independent of the cash inflows from other assets or groups of assets.

The recoverable amount of an asset or a cash-generating unit is the higher of its fair value less costs to sell and its value in use.

If the recoverable amount of an asset is less than its carrying amount, the carrying amount of the asset is reduced to its recoverable amount. That reduction is an impairment loss.

An impairment loss of assets carried at cost less any accumulated depreciation or amortisation is recognised immediately in surplus or deficit.

An impairment loss is recognised for cash-generating units if the recoverable amount of the unit is less than the carrying amount of the unit. The impairment loss is allocated to reduce the carrying amount of the assets of the unit as follows:

- to the assets of the unit, pro rata on the basis of the carrying amount of each asset in the unit.

A entity assesses at each reporting date whether there is any indication that an impairment loss recognised in prior periods for assets may no longer exist or may have decreased. If any such indication exists, the recoverable amounts of those assets are estimated and the carrying amount is increased to the recoverable amount.

The increased carrying amount of an asset attributable to a reversal of an impairment loss should not exceed the carrying amount that would have been determined had no impairment loss been recognised for the asset in prior periods.

A reversal of an impairment loss of assets carried at cost less accumulated depreciation or amortisation is recognised immediately in surplus or deficit.

1.5.3.2 Non-Cash generating assets

The entity assesses at each reporting date whether there is any indication that an asset may be impaired. If any such indication exists, the entity estimates the recoverable service amount of the asset.

The recoverable service amount is the higher of a non-cash generating asset's fair value less costs to sell and its value in use. The value in use for a non-cash generating asset is the present value of the asset's remaining service potential.

If the recoverable service amount of an asset is less than its carrying amount, the carrying amount of the asset is reduced to its recoverable service amount. That reduction is an impairment loss and is recognised in surplus/deficit.

An impairment loss is recognised for non cash-generating units if the recoverable service amount of the unit is less than the carrying amount of the unit. The impairment loss is allocated to reduce the carrying amount of the assets of the unit as follows:

- to the assets of the unit, pro rata on the basis of the carrying amount of each asset in the unit.

An entity assesses at each reporting date whether there is any indication that an impairment loss recognised in prior periods for assets may no longer exist or may have decreased. If any such indication exists, the recoverable service amounts of those assets are estimated and increases the carrying amount to the recoverable service amount.

The increased carrying amount of an asset attributable to a reversal of an impairment loss does not exceed the carrying amount that would have been determined had no impairment loss have been recognised for the asset in prior periods.

A reversal of an impairment loss of assets carried at cost less accumulated depreciation or amortisation is recognised immediately in surplus or deficit.

1.6 INTANGIBLE ASSETS

An intangible asset is recognised when:

- It is probable that the expected future economic benefits or service potential that are attributable to the asset will flow to the entity; and
- The cost of the asset can be measured reliably.

Intangible assets are initially recognised at cost.

Expenditure on research (or on the research phase of an internal project) is recognised in surplus or deficit when it is incurred.

An intangible asset arising from development (or from the development phase of an internal project) is recognised when:

- it is technically feasible to complete the asset so that it will be available for use or sale;
- there is an intention to complete and use or sell it;
- there is an ability to use or sell it
- it will generate probable future economic benefits
- there are available technical, financial and other resources to complete the development and to use or sell the asset; and
- the expenditure attributable to the asset during its development can be used reliably.

Subsequent expenditure is capitalised only when it increases the future economic benefits embodied in the asset to which it relates. The amortisation is calculated at a rate considered appropriate to reduce the cost of the asset less residual value over the shorter of its estimated useful life or contractual period. Residual values and estimated useful lives are reviewed annually. The amortisation method used is the straight line method.

Intangible assets that meet the recognition criteria are stated in the statement of financial position at amortised cost, being the initial cost price less any accumulated amortisation and impairment losses. The assets residual values, useful lives and methods of amortisation are reviewed at each financial year end, and adjusted prospectively if appropriate. Amortisation is charged to surplus or deficit so as to write off the cost of intangible assets over their estimated useful lives, using the straight-line method as follows:

Computer Software: 3- 10 years

An item of intangible assets is derecognised upon disposal or when no future economic benefits or service potential are expected from its use or disposal. The surplus or deficit arising from the derecognition of an item of intangible assets is included in the surplus or deficit when the item is derecognised. The surplus or deficit arising from the derecognition of an item of intangible assets is determined as the difference between the net disposal proceeds, if any, and the carrying amount of the item.

1.7 FINANCIAL INSTRUMENTS

The entity has various types of financial instruments and these can be broadly categorised as either financial assets, financial liabilities or equity instruments in accordance with the substance of the contractual agreement.

1.7.1 Initial recognition

Financial assets and financial liabilities are recognised on the entity's Statement of Financial Position when the entity becomes party to the contractual allowances of the instrument, therefore trade date accounting applies.

The entity does not offset a financial asset and a financial liability unless a legally enforceable right to set off the recognised amounts currently exists, and the entity intends either to settle on a net basis, or to realise the asset and settle the liability simultaneously.

1.7.2 Financial Assets - Classification

A financial asset is any asset that is cash or a contractual right to receive cash or another financial asset.

The financial assets of the entity are classified as financial instruments at amortised cost.

The financial assets are carried at cost are investments in residual interests that do not have a quoted market price in an active market, thus fair value cannot be reliably measured.

The entity has the following types of financial assets as reflected on the face of the Statement of Financial Position or in the notes thereto:

TYPE OF FINANCIAL ASSET	CLASSIFICATION
Cash and cash equivalents	Financial instruments at amortised cost
Receivables from exchange transactions	Financial instruments at amortised cost

Cash includes cash on hand (including petty cash) and cash with banks. Cash equivalents are short-term highly liquid investments, readily convertible into known amounts of cash, that are held with registered banking institutions with maturities of three months or less and are subject to an insignificant risk of change in value. For the purposes of the cash flow statement, cash and cash equivalents comprise cash on hand, deposits held on call with banks, net of bank overdrafts.

Trade receivables and other receivables consist of amounts due by customers, deposits, prepaid expenses and other debtors.

1.7.3 Financial Liabilities - Classification

A financial liability is a contractual obligation to deliver cash or another financial asset to another entity. The entity has the following types of financial liabilities as reflected on the face of the Statement of Financial Position or in the notes thereto:

TYPE OF FINANCIAL LIABILITY	CLASSIFICATION
Trade and other payables	Financial instruments at amortised cost

1.7.4 Initial and Subsequent Measurement

Financial Assets:

Financial Assets (upon initial recognition) are stated at fair value, plus transaction costs that are directly attributable to the acquisition or issue of the financial asset. Subsequent to initial recognition, financial assets are measured at amortised cost.

Financial liabilities:

Financial Liabilities (upon initial recognition) are stated at fair value, plus transaction costs that are directly attributable to the acquisition or issue of the financial liabilities. Subsequent to initial recognition, financial liabilities are measured at amortised cost.

1.7.5 Impairment of Financial Assets

Financial assets, other than those at fair value, are assessed for indicators of impairment at the end of each reporting period. Financial assets are impaired where there is objective evidence of impairment of financial assets (such as the probability of insolvency or significant financial difficulties of the debtor). If there is such evidence the recoverable amount is estimated and an impairment loss is recognised.

Financial assets carried at amortised cost

Financial assets are carried at amortised cost encompass accounts receivables and cash and cash equivalents. An estimate is made for doubtful debt based on past default experience of all outstanding amounts at year-end. Bad debts are written off in the year in which they are identified as irrecoverable.

An allowance for impairment of accounts receivables is established when there is objective evidence that the entity will not be able to collect all amounts due according to the original terms of receivables. The allowance is made whereby the recoverability of accounts receivable is assessed individually and then collectively after grouping the assets in financial assets with similar credit risk characteristics. The amount of the allowance is the difference between the financial asset's carrying amount and the present value of estimated future cash flows, discounted at the original effective interest rate. Future cash flows in a group of financial assets that are collectively evaluated for impairment are estimated on the basis of historical loss experience for assets with credit risk characteristics similar to those in the group.

When a debtor is considered uncollectible, it is written off. Changes in the carrying amount of the allowance account are recognised in the surplus/deficit.

1.7.6 Derecognition of Financial Assets

The entity derecognises financial assets only when the contractual rights to the cash flows from the asset expire or it transfers the financial asset and substantially all the risks and rewards of ownership of the asset to another entity. The entity transfers a financial asset if either it transfers the contractual rights to receive the cash flows of the financial asset or retains the contractual rights to receive the cash flows of the financial asset.

1.7.7 Derecognition of Financial Liabilities

The entity derecognises financial liabilities when, and only when, the entity's obligations are discharged, cancelled or they expire.

The entity recognises the difference between the carrying amount of the financial liability (or part of a financial liability) extinguished or transferred to another party and the consideration paid, including any non-cash assets transferred or liabilities assumed, in surplus or deficit.

1.8 RISK MANAGEMENT OF FINANCIAL ASSETS AND LIABILITIES

It is the policy of the entity to disclose information that enables the user of its financial statements to evaluate the nature and extent of risks arising from financial instruments to which the entity is exposed on the reporting date.

The entity has exposure to the following risks from its use of financial instruments:

- market risk
- credit risk
- liquidity risk

Risks and exposure are disclosed as follows:

Market Risk

Market risk is the risk that changes in market prices, such as foreign exchange rates, interest rates and equity prices will affect the entity's income or the value of its holdings of financial instruments. The objective of market risk management is to manage and control market risk exposures within acceptable parameters, while optimising the return.

Credit Risk

Credit risk is the risk of financial loss to the entity if a customer or counterparty to a financial instrument fails to meet its contractual obligations, and arises principally from the entity's receivables from customers and investment securities.

Each class of financial instrument is disclosed separately. The maximum exposure to credit risk not covered by collateral is specified, and financial instruments covered by collateral are specified.

Liquidity Risk

Liquidity risk is the risk that the entity will encounter difficulty in meeting the obligations associated with its financial liabilities that are settled by delivering cash or another financial asset. The Entity's approach to managing liquidity is to ensure, as far as possible, that it will always have sufficient liquidity to meet its liabilities when due, under both normal and stressed conditions, without incurring unacceptable losses or risking damage to the entity's reputation.

Liquidity risk is managed by ensuring that all assets are reinvested at maturity at competitive interest rates in relation to cash flow requirements. Liabilities are managed by ensuring that all contractual payments are met on a timeous basis and, if required, additional new arrangements are established at competitive rates to ensure that cash flow requirements are met.

1.9 REVENUE RECOGNITION

1.9.1 General

Revenue, is derived from a variety of sources which includes government grants, rendering of services and finance income.

Revenue comprises the fair value of the consideration received or receivable for services rendered in the ordinary course of the entity's activities. Revenue is shown net of rebates and discounts.

The entity recognises revenue when the amount of revenue can be reliably measured, it is probable that future economic benefits will flow to the entity and when specific criteria have been met for each of the entity's activities as described below. The amount of revenue is not considered to be reliably measurable until all contingencies relating to the sale have been resolved. The entity bases its estimates on historical results, taking into consideration the type of customer, the type of transaction and the specifics of each arrangement.

1.9.2 Revenue from Exchange Transactions

Revenue from exchange transactions refers to revenue that accrued to the entity directly in return for services rendered, the value of which approximates the consideration received or receivable.

1.9.2.1 Finance income

Interest earned on investments is recognised in surplus or deficit on a time proportionate basis that takes into account the effective yield on the investment.

1.9.2.2 Rendering of Services

Rendering of Services constitute revenue which arises from service delivery to customers.

The stage of completion is assessed by reference to work performed as at the reporting date. Contract revenue includes the initial amount agreed upon in the contract plus any variations in contract work, claims and incentive payments to the extent that it is probable that these will result in revenue and can be measured reliably. As soon as the outcome of a contract can be estimated reliably, contract revenue and expenses are recognised in surplus or deficit in proportion to the stage of completion of the contract.

The stage of completion is assessed by reference to work performed as at reporting date. When the outcome of a contract cannot be estimated reliably, contract revenue is recognised only to the extent of contract costs incurred that are likely to be recoverable. An expected loss on a contract is recognised immediately in surplus or deficit.

1.9.3 Revenue from Non-exchange Transactions

Revenue from non-exchange transactions refers to transactions where the entity received revenue from another entity without directly giving approximately equal value in exchange. Revenue from non-exchange transactions is generally recognised to the extent that the related receipt or receivable qualifies for recognition as an asset and there is no liability to repay the amount.

1.9.3.1 Government grants/subsidies

Conditional Grants and receipts

"Income received from conditional grants, donations and funding are recognised as revenue to the extent that the entity has complied with any of the criteria, conditions or obligations embodied in the agreement. To the extent that the criteria, conditions or obligations have not been met a liability is recognised.

Unconditional Grants and receipts

Government grants that are receivable as compensation for expenditure or losses already incurred or for the purpose of giving immediate financial support to the entity with no future related costs are recognised in surplus or deficit in the period in which they become receivable

1.9.3.2 Government grants/subsidies

Liability held on behalf of principal

Income received from conditional grants where SANSA is acting as an agent rather than as a principal, SANSA as agent recognises only that portion of the revenue and expenses it receives or incurs in executing the transactions on behalf of the principal

An entity is an agent when, in relation to transactions with third parties, when all three of the following criteria are present,

(a) It does not have the power to determine the significant terms and conditions of the transaction.

(b) It does not have the ability to use all, or substantially all, of the resources that result from the transaction for its own benefit.

(c) It is not exposed to variability in the results of the transaction.

1.10 LEASES

Lease Classification

Leases of property, plant and equipment, in which a significant portion of the risks and rewards of ownership are retained by the lessor are classified as operating leases.

Leases are classified as finance leases where substantially all the risks and rewards associated with ownership of an asset are transferred to the entity.

The Entity as Lessee

Determining whether an arrangement contains a lease

At inception of an arrangement, the entity determines whether such an arrangement is or contains a lease. A specific asset is the subject of a lease if fulfilment of the arrangement is dependent on the use of that specified asset. An arrangement conveys the right to use the asset if the arrangement conveys to the entity the right to control the use of the underlying

asset. At inception or upon reassessment of the arrangement, the entity separates payments and other consideration required by such an arrangement into those for the lease and those for other elements on the basis of their relative fair values. If the entity concludes for a finance lease that it is impracticable to separate the payments reliably, an asset and a liability are recognised at an amount equal to the fair value of the underlying asset. Subsequently the liability is reduced as payments are made and an imputed finance charge on the liability is recognised using the entity's incremental borrowing rate.

Finance leases

Where the entity enters into a finance lease, Property, plant and equipment or Intangible Assets subject to finance lease agreements are capitalised at amounts equal to the fair value of the leased asset or, if lower, the present value of the minimum lease payments, each determined at the inception of the lease. Corresponding liabilities are included in the Statement of Financial Position as Finance Lease Liabilities. The corresponding liabilities are initially recognised at the inception of the lease and are measured as the sum of the minimum lease payments due in terms of the lease agreement, discounted for the effect of interest. In discounting the lease payments, the entity uses the interest rate that exactly discounts the lease payments and unguaranteed residual value to the fair value of the asset plus any direct costs incurred. Lease payments are allocated between the finance cost and capital repayment using the effective interest rate method. Finance costs are expensed when incurred.

Subsequent to initial recognition, the leased assets are accounted for in accordance with the stated accounting policies applicable to property, plant, equipment or intangibles. The lease liability is reduced by the lease payments, which are allocated between finance cost and capital repayment using the effective interest rate method. Lease finance costs are expensed when incurred. The accounting policies relating to derecognition of financial instruments are applied to lease payables. The lease asset is depreciated over the shorter of the asset's useful life or the lease term.

Operating leases

The entity recognises operating lease rentals as an expenditure in surplus or deficit on a straight-line basis over the term of the relevant lease. The difference between the amounts recognised as an expenditure and the contractual payments are recognised as an operating lease asset or liability

1.11 RELATED PARTIES

Individuals as well as their close family members, and/or entities are related parties if one party has the ability, directly or indirectly, to control or jointly control the other party or exercise significant influence over the other party in making financial and/or operating decisions. SANSA is a related entity to all other entities (and their controlled / jointly controlled entities) for which the Minister of Science and Technology is the executive authority and more broadly, to all entities controlled by the national executive.

1.12 EVENTS AFTER THE REPORTING DATE

Events after the reporting date that are classified as adjusting events have been accounted for in the Annual Financial Statements. Events after the reporting date that are classified as non-adjusting events have been disclosed in the notes to the Annual Financial Statements.

1.13 COMPARATIVE INFORMATION

Prior year comparatives

When the presentation or classification of items in the Annual Financial Statements is amended, prior period comparative amounts are reclassified. The nature and reasons for the reclassification is disclosed.

1.14 CAPITAL COMMITMENTS AND EXPENDITURE

Items are classified as commitments where the entity commits itself to future transactions that will normally result in the outflow of resources.

Capital commitments are not recognised in the statement of financial position as a liability but are included in the disclosure notes in the following cases:

- Approved and contracted commitments, where the expenditure has been approved and the contract has been awarded at the reporting date, where disclosure is required by a specific standard of GRAP.

1.15 CONTINGENT LIABILITIES

Contingent liabilities represent a possible obligation that arises from past events and whose existence will be confirmed only by an occurrence or non-occurrence of one or more uncertain future events not wholly within the control of the entity.

A contingent liability can also arise as a result of a present obligation that arises from past events but which is not recognised as a liability either because it is not probable that an outflow of resources embodying economic benefits will be required to settle the obligation or the amount of the obligation cannot be measured with sufficient reliability.

Contingent assets represent possible assets that arise from past events and whose existence will be confirmed only by an occurrence or non-occurrence of one or more uncertain future events not wholly within the control of the entity.

Contingent assets and contingent liabilities are not recognised. Contingencies are disclosed in the notes to the annual financial statements.

1.16 FOREIGN CURRENCIES

Transactions in foreign currencies are initially recorded at the prevailing exchange rate on the dates of the transactions.

Monetary assets and liabilities denominated in such foreign currencies are translated to the functional currencies at the rates prevailing at the reporting date. Exchange differences are included in surplus or deficit.

Foreign currency translation

(a) Functional and presentation currency

Items included in the financial statements are measured using the currency of the primary economic environment in which the entity operates ('the functional currency'). Financial Statements are presented in South African Rands, which is the company's functional and presentation currency.

(b) Transactions and Balances

Foreign currency transactions are translated into the functional currency using the exchange rates prevailing at the date of the transaction. Foreign exchange gains and losses resulting from the settlement of such transactions, and from the translation of monetary assets and liabilities denominated in foreign currencies at year end are recognised in the Statement of Financial Position.

1.17 IRREGULAR EXPENDITURE

Irregular expenditure is expenditure that is contrary to the Public Finance Management Act (Act No 56 of 2003) and is in contravention of any legislation. Irregular expenditure excludes unauthorised expenditure. All expenditure relating to irregular expenditure is recognised as an expense in the Statement of Financial Performance in the year that expenditure was incurred. Expenditure is classified in accordance with the nature of the expense, and where recovered, it is subsequently accounted for as revenue in the Statement of Financial Performance.

1.18 FRUITLESS AND WASTEFUL EXPENDITURE

Fruitless and wasteful expenditure is expenditure that was made in vain and would have been avoided had reasonable care been exercised. Fruitless and wasteful expenditure is accounted for as expenditure in surplus or deficit.

1.19 EMPLOYEE BENEFITS

1.19.1 Short-term Employee Benefits

Remuneration to employees is recognised in the Statement of Financial Performance as the services are rendered, except for non-accumulating benefits, which are only recognised when the specific event occurs.

The entity treats its provision for leave pay as an accrual.

The costs of all short-term employee benefits such as leave pay and bonuses are recognised during the period in which the employee renders the related service. The liability for leave pay is based on the total accrued leave days at year end and is shown as a creditor in the Statement of Financial Position. The entity recognises the expected cost of performance bonuses only when the entity has a present legal or constructive obligation to make such payment and a reliable estimate can be made.

1.20 PROVISIONS

Provisions are recognised when the entity has a present legal or constructive obligation as a result of past events, it is probable that an outflow of resources embodying economic benefits or service potential will be required to settle the obligation and a reliable estimate can be made.

Provisions are reviewed at reporting date and the amount of a provision is the present value of the expenditure expected to be required to settle the obligation. When the effect of discounting is material, provisions are determined by discounting the expected future cash flows that reflect current market assessments of the time value of money at a rate adjusted for the specific risks of a liability. The impact of the periodic unwinding of the discount is recognised in surplus or deficit as a finance cost as it occurs.

1.21 INVENTORY

The entity uses the weighted average costing method to account for inventory. Inventories are valued at the lower of cost price or net realisable value. The net realisable value is the estimated selling price in the ordinary course of business, less the estimated or selling costs.

The cost of inventories comprises all costs of purchase, costs of conversion and other costs incurred in bringing the inventories to their present location and condition.

The amount of any write-down of inventories to net realisable value and all losses of inventories are recognised as an expenditure in the period the write-down or loss occurs.

1.22 TRANSFER OF FUNCTIONS UNDER COMMON CONTROL

If a transfer of functions between entities within the same sphere of government or between entities that are part of the same economic entity the transfer is considered to have occurred between entities under common control. Assets and liabilities transferred between entities under common control are recognised at the carrying values. In instances where the carrying amount is not available or can't be accurately determined, the depreciated replacement cost is used as the deemed carrying amount.

1.23 BUDGET INFORMATION

The Financial Statements and budget are not presented on the same basis, Financial Statements are prepared on accrual basis whilst the budget is prepared on a cash basis of accounting. A reconciliation between the surplus/(deficit) for the period as per the Statement of Financial Performance and budgeted surplus/(deficit) is included in the Statement of Comparison of Budget and Actual Amounts. At the end of September each year the budget may be revised if necessary due to changes in the operations of the entity which require a reallocation of resources. All budget changes are approved by the board of directors prior to the implementation of the revised budget.

2..GENERAL INFORMATION

DOMICILE	South Africa
NATURE OF BUSINESS AND PRINCIPAL ACTIVITIES	The South African National Space Agency (SANSA) is mandated by the SANSA Act, 36 of 2008 and is South Africa's government body for the promotion and use of space. It also fosters cooperation in space-related activities and research in space science, seeks to advance scientific engineering through human capital, and supports the creation of an environment conducive to the industrial development of space technologies within the framework of national government.
LEGAL FORM OF ENTITY	Schedule 3A Public entity, as defined by the Public Finance Management Act (Act No. 1 of 1999 as amended by Act No. 29 of 1999).
EXECUTIVE AUTHORITY	Minister of the Department of Science and Technology
BOARD MEMBERS	**Appointed 1 September 2018** • Ms. X Kakana (Chairman of the Board) • Mr. S Hamilton • Mr. E Jansen • Ms. N. Majaja (Chairman of Human Resources, Social and Ethics Committee) • Adv. I Matlou • Ms. M Matooane • Ms. M Mfeka • Ms. L Msibi • Dr. V Munsami (Chief Executive Officer) • Prof. A Muronga • Mr. A Naidoo • Mr. J Prinsloo (Chairman of Strategy and Investment Committee) • Ms. M Paul • Ms. I Pule (Chairman of Audit and Risk Committee) • Mr. W Van Biljon
BUSINESS ADDRESS	Enterprise Building, Mark Shuttleworth street, Innovation Hub Pretoria Gauteng, South Africa
POSTAL ADDRESS	PO Box 484, Silverton 0127, Gauteng, South Africa
AUDITOR	Nexia SAB&T (012) 682 8800 119 Witch-Hazel Avenue Highveld Technopak, Centurion

3. SEGMENT INFORMATION

3.1 GENERAL INFORMATION ABOUT SEGMENTS

The entity is organised and reports on a basis of four business units comprising five functional areas: the corporate support programme, the earth observation programme, the space science programme, the space operations programme and the space engineering programme. The programmes were organised around the type of services provided and the related space science fields. Management used the same segments for determining and delivering on its strategic objectives. The space engineering programme is aggregated into the corporate programme for reporting purposes. It is not an operation on its own but a business unit within the corporate programme overseeing key projects across the divisions.

The Corporate Support Programme provides management, administrative and technical support across all operating units. This facilitates operational efficiency and cost-effective management, aligned with sound governance principles and the seamless integration and collaboration between SANSA programmes.

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

The Earth Observations Programme is responsible for the collection, processing, archiving and distribution of Earth observation satellite imagery and data products for societal benefit. SANSA maintains an Earth observation portfolio of sensors, provides an R&D platform in Earth observation technologies, conducts satellite image processing, and provides human capital development in Earth Observation and science advancement.

The Space Science Programme leads multidisciplinary space science. Key functions include basic and applied science research, the support of space facilitated science through science data acquisition, the coordination and administration of scientific data ground segments, provision of space weather and other geo-space products and services on a commercial and private basis. The programme also provides leadership in postgraduate science student training, as well as primary science advancement and learner and educator space science support

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 national and international space industry clients and governments. The programme also supplies hosting capabilities.

3. SEGMENT INFORMATION (CONTINUED)

3.2 2019	CORPORATE & SPACE ENGINEERING R	EARTH OBSERVATION R	SPACE OPERATIONS R	SPACE SCIENCE R	ELIMINATIONS R	TOTAL R
REVENUE						
Revenue from Non-Exchange Transactions						
Transfers and Subsidies Received	57 234 328	69 414 254	15 799 573	37 449 185	-	179 897 340
Revenue from Exchange Transactions						
Interest Income	6 329 524	246 155	695 696	537 446	-	7 808 821
Rendering of Services	-	16 696 429	64 461 263	9 258 368	-	90 416 060
Other Income		7 430	566 146	383 920	(285 434)	672 062
Net Gains on Foreign Exchange Transactions	(48)	(72 604)	1 647 279	13 334	-	1 587 960
Total Revenue	**63 563 804**	**86 291 664**	**83 169 957**	**47 642 253**	**(285 434)**	**280 382 243**
EXPENDITURE						
Employee and Employee Related Costs	33 767 595	22 645 100	33 648 936	25 638 717	-	115 700 348
Board Member Remuneration	1 002 124	-	-	-	-	1 002 124
Depreciation and Amortisation	1 465 502	7 381 958	14 133 409	4 630 168	-	27 611 037
Repairs and Maintenance	643 690	2 818 030	5 747 905	1 692 595	-	10 902 220
Data Licence fees	-	28 737 479	-	-	-	28 737 479
Student Bursaries and Research Grants Paid	48 000	32 241		4 556 325	-	4 636 566
Antenna Infrastructure Services		287 971	2 983 292		-	3 271 263
Training Expenses	211 780	524 316	251 001	380 705	-	1 367 802
General Expenses	14 695 010	3 873 307	19 078 907	7 150 480	(285 434)	44 512 270
Net Losses on Foreign Exchange Transactions	-				-	-
Net Losses on Disposal of Property, Plant and Equipment	18 353		670 404	61 762	-	750 519
Irrecoverable Sundry Debtors	47 528	-	-	-	-	47 528
Total Expenditure	**51 899 582**	**66 300 402**	**76 513 854**	**44 110 752**	**(285 434)**	**238 539 156**
Surplus (Deficit) for the year	**11 664 224**	**19 991 261**	**6 656 102**	**3 531 500**	**-**	**41 843 088**
ASSETS						
Non-current - Segment assets	325 174 684	4 750 777	78 693 636	30 082 988	-	438 702 085
Current - Segment assets	93 741 996	12 947 833	11 778 152	39 320 883	-	157 788 864
Total Segment assets	**418 916 680**	**17 698 610**	**90 471 788**	**69 403 871**	**-**	**596 490 949**

3. SEGMENT INFORMATION (CONTINUED)

2019	CORPORATE & SPACE ENGINEERING R	EARTH OBSERVATION R	SPACE OPERATIONS R	SPACE SCIENCE R	ELIMINATIONS R	TOTAL R
LIABILITIES						
Current Segment Liabilities	(45 645 336)	(10 552 382)	(5 215 752)	(8 791 749)		(70 205 219)
Total Segment Liabilities	**(45 645 336)**	**(10 552 382)**	**(5 215 752)**	**(8 791 749)**	**-**	**(70 205 219)**
Capital expenditure	**3 339 725**	**-**	**12 146 542**	**4 718 348**	**-**	**20 204 616**
NON CASH ITEMS EXCLUDING DEPRECIATION						
Accrued expenses	2 540 824	844 060	1 795 619	1 351 661		6 532 164
Deferred revenue		6 745 277		667 557		7 412 834
2018						
REVENUE						
Revenue from Non - Exchange Transactions						
Transfers and Subsidies Received	120 015 192	65 100 991	-	33 835 199		218 951 382
Revenue from Exchange Transactions						
Interest Income	6 739 834	232 253	1 025 646	312 800		8 310 533
Rendering of Services	-	7 528 680	69 971 699	10 309 996		87 810 375
Other Income	3 041 046	4 255 802	14 967 720	373 403	(17 861 960)	4 776 011
Total Revenue	**129 796 072**	**77 117 727**	**85 965 065**	**44 831 398**	**(17 861 960)**	**319 848 300**
EXPENDITURE						
Employee and Employee Related Costs	31 163 626	23 230 175	31 748 543	24 332 468		110 474 811
Board Member Remuneration	1 170 199	-	-	-		1 170 199
Depreciation and Amortisation	983 566	8 402 713	14 644 009	5 609 355		29 639 643
Repairs and Maintenance	572 473	2 319 891	6 145 540	1 495 642		10 533 545
Data Licence fees	-	34 451 213	-	-		34 451 213
Student Bursaries and Research Grants Paid	1 339 805	1 584 360	-	2 696 628		5 620 792
Antenna Infrastructure Services	-	-	3 270 496	-		3 270 496
Training Expenses	387 445	302 009	361 806	175 114		1 226 374
General Expenses	16 785 484	22 991 295	19 050 156	7 631 602	(17 861 960)	48 596 578
Net Losses on Foreign Exchange Transactions	1 297	862 611	1 037 373	(40 236)		1 861 044
Net Losses on Disposal of Property, Plant and Equipment	30 219	1 702	4 540	59 647		96 109
Impairment of Receivables	8 916	-	-	-		8 916
Total Expenditure	**52 349 919**	**94 318 008**	**72 427 827**	**41 466 892**	**(17 861 960)**	**242 709 601**
Surplus (Deficit) for the year	**77 446 152**	**(17 200 280)**	**13 537 238**	**3 364 505**	**-**	**77 138 699**

3. SEGMENT INFORMATION (CONTINUED)

2018	CORPORATE & SPACE ENGINEERING R	EARTH OBSERVATION R	SPACE OPERATIONS R	SPACE SCIENCE R	ELIMINATIONS R	TOTAL R
ASSETS						
Non-current - Segment assets	323 208 886	12 132 735	82 100 173	30 076 915		447 518 708
Current - Segment assets	82 013 639	4 256 519	29 981 849	6 873 419		123 125 426
Total Segment assets	**405 222 523**	**16 389 254**	**112 082 021**	**36 950 333**		**570 644 134**
LIABILITIES						
Non-current Segment Liabilities						
Current Segment Liabilities [1]	260 561 296	(217 603 660)	(7 306 755)	(59 731 259)	(62 121 113)	(86 201 490)
Total Segment Liabilities	**260 561 296**	**(217 603 660)**	**(7 306 755)**	**(59 731 259)**	**(62 121 113)**	**(86 201 490)**
Capital expenditure	**77 516 283**	**1 978 047**	**23 130 248**	**6 489 721**	**-**	**109 114 298**
NON CASH ITEMS EXCLUDING DEPRECIATION						
Accrued expenses	899 962	1 793 358	909 189	1 171 189	-	4 773 698
Deferred revenue		6 269 859	-	732 331	-	7 002 191

[1] Directorate liabilities include intercompany balances which are eliminated on consolidation of the different directorates.

3.3 MEASUREMENT OF SEGMENT SURPLUS OR DEFICIT, ASSETS AND LIABILITIES

The accounting policies of the segments are the same as those described in the summary of the significant accounting policies.

3.4 INFORMATION ABOUT GEOGRAPHICAL AREAS

The majority of the entity's operations are in the Gauteng province, with one facility located in Hermanus in the Western Cape

Revenue from Non-exchange Transactions	2019 R	2018 R
Gauteng Province		
Corporate & Space Engineering	57 234 328	120 015 192
Earth Observation	69 414 254	65 100 991
Space Operations	15 799 573	-
	142 448 156	**185 116 182**
Western Cape Province		
Space Science	37 449 185	33 835 199
Total Revenue from Non-exchange Transactions	**179 897 340**	**218 951 382**

3. SEGMENT INFORMATION (CONTINUED)

	2019 R	2018 R
Revenue from Exchange Transactions		
Gauteng Province		
Corporate	6 113 213	6 866 363
Earth Observation	16 877 411	12 016 737
Space Operations	67 301 212	71 017 622
	90 291 836	**107 762 682**
Western Cape Province		
Space Science	10 193 067	10 996 199
Total Revenue from Exchange Transactions	**100 484 904**	**118 758 880**
SEGMENT EXPENDITURE		
Gauteng Province		
Corporate	51 899 580	52 349 919
Earth Observation	66 300 403	94 318 008
Space Operations	76 513 855	72 427 827
	194 713 837	**219 095 754**
Western Cape Province		
Space Science	44 110 753	41 466 892
Total Segment Expenditure	**238 824 590**	**260 562 646**
NON-CURRENT SEGMENT ASSETS		
Gauteng Province		
Corporate	325 174 684	323 208 886
Earth Observation	4 750 777	12 132 735
Space Operations	78 693 636	82 100 173
	408 619 096	**417 441 794**
Western Cape Province		
Space Science	30 082 988	30 076 915
Total Non - Current Segment Assets	**438 702 084**	**447 518 709**

4. STATEMENT OF COMPARISION OF BUDGET AND ACTUAL AMOUNTS

4.1 The South African National Space Agency presents its approved budget on a cash basis and the financial statements on the accrual basis.

4.2 The budget is approved on a cash basis by functional classification as well as economic classification. The approved budget covers the fiscal period from 1 April 2018 to 31 March 2019. The budget and the accounting bases differ. The Financial Statements for the entity are prepared on the accrual basis using a classification based on the nature of expenses in the Statement of Financial Performance. The Financial Statements differ from the budget, which is approved on the cash basis. The Statement of Comparison of Budget and Actual Amounts is prepared on a comparable basis to the budget. The reconciliation of the actual comparable amounts to the net cash flows per the Cash Flow Statement is presented on the Statement of Comparison of Budget and Actual Amounts. The difference between the approved budget and final budget is to take into account additional revenues and transfers confirmed post budget approval, the carry over of approved cash surpluses as a result of prior year commitments and any reprioritisation of funds between expenditure categories.

4.3 The variance between the actual and budgeted values is explained as follows:

4.3.1 The favourable variance of R15 million on ring fenced transfers is as a result of funds received in the fourth quarter for the African Global Earth Observation System of Systems project. The project will commence in the 2019/20 financial year.

4.3.2 The favourable variance against budget on research grants of R2 million is due to additional research grants awarded which were not included in the original and revised budget estimates.

4.3.3 The R5.3 million unfavourable on revenue from exchange transactions is mainly due to some contracts from public sector clients not materialising as bids applied for were cancelled. In addition to this, SANSA receives payments in advance for the supply of satellite imagery on demand from public sector clients. If requests are not made the funds are not declared in income, but remain in liabilities as income received in advance.

4.3.4 The variance of R2.8 million is mainly due to additional interest income earned on bank account balances.

4.3.5 The underspend variance on compensation of employees is mainly due to vacancies that had materialised during the year due to resignations within the professionally qualified and skilled employees in the space engineering, earth observation and administration positions due to the satellite build programme being on hold as well as employees being poached by industry, universities and other public institutions. The filling of these vacancies is also affected by the scarcity of these skills which take longer to replace.

4.3.6 The underspend variance on repairs and maintenance consists of items on order but not yet delivered, which normally have long delivery lead times. These are disclosed as commitments in note 33.

4.3.7 The underspend on data licence fees is due to lengthy contract negotiations with international suppliers to access satellites for the acquisition of satellite imagery. The SPOT data multi user licence agreement ended in March 2018, which meant that SANSA needed to secure access for the continued provision of data to various state institutions. SANSA negotiated access to a suite of satellites with three major international suppliers. These funds are now ring fenced through commitments as disclosed in note 33.

4.3.8 Antenna infrastructure services relate to the facilitation of civil works and the antenna base for client hosted infrastructure. The build project had not yet commenced as contract negotiations were still underway with the customer. The build costs are recovered from contract revenue.

4.3.9 The underspend on general expenses is due to the budget provision for ICASA Licence fees, fibre and internet services costs as they relate to the new dark fibre maintenance and service contracts. The costs were anticipated to commence on completion of the second pair dark fibre and the income contracts relating to these expenditures were signed in last quarter of the year, so expenditure relating to these contracts will commence in the 2019/20 financial year. Another major cost budgeted for under general expenses is the hosting of the Space Ops 2020 conference by SANSA, which is an international event. The amounts paid are classified as prepaid expenses, which are mainly to secure the venue and some conference preparation fees.

4.3.10 The variance on machinery and equipment spend is due to the second pair dark fibre installation project only awarded in the last quarter of the year. The funds are included in commitments.

4.3.11 The computer equipment budget is allocated for the earth observation data cube which is a cloud based storage and processing platform for archived satellite imagery. The implementation is envisaged through collaboration with SARAO, CSIR, HPC centre and SANSA. Delays were experienced in the procurement stage as SANSA needed to clarify the procurement method when collaborating with state institutions on a project. The project is funded from ring fenced funds.

4.3.12 The satellite development project was placed on hold during the year, due to funding constraints on seeing the build to completion. There were no funds transferred for the project during the financial year. The variance on spend against the remaining funds is due to the stoppage on invoicing by Denel for the optical test bench project.

5. CASH AND CASH EQUIVALENTS

	2019 R	2018 R
Cash and Cash Equivalents	121 113 842	97 223 484
Total Cash and Cash Equivalents	**121 113 842**	**97 223 484**

Cash and cash equivalents are measured at amortised cost. Cash includes cash on hand and cash with banks.

5.1 ANALYSIS OF CASH AND CASH EQUIVALENTS BALANCE

Cash in Bank for operational requirements[1]	76 822 629	39 131 505
Cash in Bank held for Committed Conditional Grants[2]	44 285 178	58 087 680
Total Cash in Bank Accounts	**121 107 807**	**97 219 185**

5.2 CASH ON HAND

Cash on hand	6 035	4 299
Total Cash on Hand	**6 035**	**4 299**
Total Cash and Cash equivalents	**121 113 842**	**97 223 485**

[1] Cash held for operational requirements represents cash to be utilised to settle trade and other payables, provisions and commitments when the obligations are due. Refer to Statement of Financial Position and Note 33.

[2]Cash in the bank held for committed conditional grants detailed in Note 14.

6. RECEIVABLES FROM EXCHANGE TRANSACTIONS

Trade receivables	27 874 430	21 673 774
Other receivables	8 510 956	3 720 050
	36 385 386	**25 393 824**

6.1 TRADE RECEIVABLES

As at 31 March 2019	GROSS R	ALLOWANCE FOR IMPAIRMENT R	NET R
Trade debtors	27 874 430	-	27 874 430
Total	**27 874 430**	**-**	**27 874 430**
As at 31 March 2018			
Trade debtors	21 673 774	-	21 673 774
Total	**21 673 774**	**-**	**21 673 774**

6.1.1 Ageing of Trade receivables	2019 R	2018 R
Current:		
0 - 30 days	10 467 963	20 833 770
Past Due:		
31 - 60 Days	7 376 212	750 531
61 - 90 Days	21 660	12 200
91 - 120 Days	10 008 595	77 272
Total	**27 874 430**	**21 673 774**

6. RECEIVABLES FROM EXCHANGE TRANSACTIONS (CONTINUED)

6.2 OTHER RECEIVABLES

As at 31 March 2019	GROSS R	ALLOWANCE FOR IMPAIRMENT R	NET R
Prepaid expenses[1]	6 246 279	-	6 246 279
Deposits [2]	2 198 593	-	2 198 593
Other Debtors	66 084	-	66 084
Total	**8 510 956**	**-**	**8 510 956**
As at 31 March 2018			
Prepaid expenses	1 484 490	-	1 484 490
Deposits	2 123 281	-	2 123 281
Other Debtors	112 279	-	112 279
Total	**3 720 050**	**-**	**3 720 050**

[1] Prepaid expenses consist of advance payments on projects with such contractual arrangements. The major prepayments for (2019) are for securing the Cape Town International Convention Centre for the SPACE OPS 2020 conference to be hosted by SANSA and for (2018) the major prepayments were for annual licences for ICASA and for online journal subscriptions.

[2] Deposits consist of electricity consumption and office space lease deposits as per the contractual requirements and are recoverable at the end of the contract term.

6.3 CREDIT QUALITY OF TRADE AND OTHER RECEIVABLES

Trade receivables consist of local customers mainly in government and international customers mainly from the US and Europe that are in the space industry. Trade receivables are non-interest bearing and are generally on 30 - 60 day collection terms. The maximum exposure to credit risk at the reporting date is the carrying amount of trade receivables.

Other receivables consist of prepayments and deposits paid to suppliers. Other receivables are non-interest bearing and their recovery is based on contractual arrangements with specific suppliers, such as delivery of services or the end of a contractual arrangement where an upfront deposit is required. The maximum exposure to credit risk at the reporting date is the carrying amount of other receivables.

Any allowance for impairment on trade and other receivables exists predominantly due to the possibility that these debts will not be recovered. Management assesses these debtors individually for impairment and where impairment is identified, these are disclosed as an allowance for impairment under trade customers.

The credit quality of trade receivables that are neither past due nor impaired are considered as such by the entity taking into account the contract arrangements with these customers and their payment history.

6.4 FAIR VALUE OF TRADE AND OTHER RECEIVABLES

Trade and other receivables from exchange transactions (upon initial recognition) are stated at fair value, plus transaction costs that are directly attributable to the acquisition or issue of the financial asset. Subsequent to initial recognition, financial assets are measured at amortised cost.

Management considers the carrying amounts of financial assets recorded at amortised cost in the financial statements to approximate their fair values on 31 March 2019, as a result of the short-term maturity of these assets and liabilities.

6. RECEIVABLES FROM EXCHANGE TRANSACTIONS (CONTINUED)

6.5 CLASSIFICATION OF FINANCIAL ASSETS

The Financial Assets of the entity are classified as follows:

FINANCIAL ASSETS	CLASSIFICATION	CARRYING AMOUNT 2019 R	CARRYING AMOUNT 2018 R
Cash and Cash Equivalents			
Cash and cash equivalents	At amortised cost	121 113 842	97 223 484
Trade receivables			
Trade receivables	At amortised cost	27 874 430	21 673 773
Other receivables			
Deposits	At amortised cost	2 198 593	2 123 281
Other Debtors	At amortised cost	66 084	112 279

7. INVENTORY

	2019 R	2018 R
Fuel	289 636	508 117
Total Inventory	**289 636**	**508 117**

8. PROPERTY, PLANT AND EQUIPMENT

31 March 2019	LAND R	LEASEHOLD IMPROVEMENTS R	LEASED ASSETS R	BUILDINGS R	PLANT AND MACHINERY R	RESEARCH EQUIPMENT R	VEHICLES R	OFFICE EQUIPMENT R	FURNITURE AND FITTINGS R	COMPUTER EQUIPMENT R	EXHIBITS R	WORK IN PROGRESS R	LABORATORY EQUIPMENT R	TOTAL R
Carrying values at 1 April 2018	**4 307 700**	**23 290**	**219**	**11 174 534**	**71 376 762**	**7 626 722**	**4 291 203**	**1 782 246**	**3 407 502**	**12 774 789**	**191 872**	**312 526 967**	**1 939 866**	**431 423 674**
Cost	4 307 700	1 700 946	328 387	13 876 324	119 000 650	20 736 760	7 164 838	8 102 083	6 381 654	40 606 637	388 800	312 526 967	3 303 478	538 425 226
Completed Assets	4 307 700	1 700 946	328 387	13 876 324	119 000 650	20 736 760	7 164 838	8 102 083	6 381 654	40 606 637	388 800	-	3 303 478	225 898 259
Under construction	-	-	-	-	-	-	-	-	-	-	-	312 526 967	-	312 526 967
Accumulated Depreciation	-	(1 677 655)	(328 169)	(2 701 790)	(47 623 888)	(13 110 038)	(2 873 635)	(6 319 837)	(2 974 152)	(27 831 848)	(196 928)	-	(1 363 612)	(107 001 551)
Acquisitions	**-**	**206 910**	**-**	**-**	**5 417 223**	**1 538 485**	**524 996**	**165 095**	**27 058**	**5 524 958**	**1 002 079**	**4 739 018**	**21 744**	**19 167 566**
Acquisitions at cost	-	206 910	-	-	5 417 223	1 538 485	524 996	165 095	27 058	5 524 958	1 002 079		21 744	14 428 548
Under construction	-	-	-	-	-	-	-	-	-	-	-	4 739 018	-	4 739 018
Depreciation	**-**	**(34 904)**	**-**	**(420 488)**	**(12 141 812)**	**(1 900 757)**	**(566 893)**	**(253 663)**	**(626 178)**	**(4 386 781)**	**(164 389)**	**-**	**(562 763)**	**(21 058 628)**
Transfers between asset classes	**-**	**-**	**-**	**-**	**663 273**	**-**	**-**	**-**	**1 598**	**109 158**	**-**	**(774 029)**	**-**	**-**
Disposals	**-**	**-**	**(216)**	**-**	**(487 898)**	**(28 620)**	**(245 197)**	**(4 290)**	**(17 510)**	**(22 105)**	**-**	**-**	**-**	**(805 836)**
Disposals at cost	-	-	(328 386)	-	(6 678 933)	(168 103)	(267 487)	(2 904 853)	(101 466)	(6 231 596)	-	-	-	(16 680 824)
Accumulated Depreciation	-	-	328 170	-	6 191 035	139 483	22 290	2 900 563	83 956	6 209 491	-	-	-	15 874 988
Carrying values at 31 March 2019	**4 307 700**	**195 296**	**0**	**10 754 046**	**64 827 549**	**7 235 829**	**4 004 108**	**1 689 388**	**2 792 471**	**14 000 019**	**1 029 562**	**316 491 955**	**1 398 848**	**428 726 776**
Cost	4 307 700	1 907 856	0	13 876 324	118 402 213	22 107 142	7 422 346	5 362 325	6 308 845	40 009 157	1 390 879	316 491 956	3 325 223	540 911 967
Completed Assets	4 307 700	1 907 856	0	13 876 324	118 402 213	22 107 142	7 422 346	5 362 325	6 308 845	40 009 157	1 390 879		3 325 223	224 420 010
Under construction	-	-	-	-	-	-	-	-	-	-	-	316 491 957	-	316 491 957
Accumulated Depreciation	-	(1 712 560)	0	(3 122 278)	(53 574 664)	(14 871 312)	(3 418 238)	(3 672 937)	(3 516 373)	(26 009 138)	(361 316)	-	(1 926 375)	(112 185 191)

8. PROPERTY, PLANT AND EQUIPMENT (CONTINUED)

31 March 2018	LAND R	LEASEHOLD IMPROVEMENTS R	LEASED ASSETS R	BUILDINGS R	PLANT AND MACHINERY R	RESEARCH EQUIPMENT R	VEHICLES R	OFFICE EQUIPMENT R	FURNITURE AND FITTINGS R	COMPUTER EQUIPMENT R	EXHIBITS R	WORK IN PROGRESS R	LABORATORY EQUIPMENT R	TOTAL R
Carrying values at 1 April 2017	**4 307 700**	**39 960**	**218**	**11 595 329**	**59 263 996**	**7 518 572**	**4 410 559**	**2 161 501**	**3 648 683**	**12 335 490**	**233 152**	**237 717 183**	**1 482 370**	**344 714 713**
Cost	4 307 700	1 700 946	328 387	13 876 324	98 407 045	18 035 835	6 964 535	8 078 896	6 040 492	36 250 015	388 800	237 717 183	2 315 076	434 411 235
Completed assets	4 307 700	1 700 946	328 387	13 876 324	98 407 045	18 035 835	6 964 535	8 078 896	6 040 492	36 250 015	388 800	-	2 315 076	196 694 053
Under construction	-	-	-	-	-		-	-	-	-	-	237 717 183	-	237 717 183
Accumulated Depreciation:	-	(1 660 986)	(328 169)	(2 280 995)	(39 143 049)	(10 517 263)	(2 553 975)	(5 917 395)	(2 391 809)	(23 914 526)	(155 648)	-	(832 706)	(89 696 521)
Acquisitions	**-**	**-**	**-**	**-**	**20 637 303**	**2 714 230**	**874 999**	**33 645**	**365 455**	**6 038 471**	**-**	**74 809 784**	**988 402**	**106 462 290**
Acquisitions at cost	-	-	-	-	20 637 303	2 714 230	874 999	33 645	365 455	6 038 471	-		988 402	31 652 506
Capital under Construction - Additions	-	-	-	-	-	-	-	-	-	-	-	74 809 784	-	74 809 784
Depreciation	**-**	**(16 670)**	**0**	**(420 795)**	**(8 480 839)**	**(2 601 883)**	**(461 020)**	**(409 357)**	**(600 942)**	**(5 179 328)**	**(41 280)**	**-**	**(530 906)**	**(18 743 020)**
Carrying value of Disposals:	**-**	**-**	**-**	**-**	**(43 698)**	**(4 148)**	**(533 335)**	**(3 529)**	**(5 671)**	**(419 748)**	**-**	**-**	**-**	**(1 010 130)**
Cost of disposed asset	-	-	-	-	(43 698)	(13 306)	(674 695)	(10 458)	(24 293)	(1 681 849)	-		-	(2 448 300)
Accumulated depreciation	-	-	-	-	-	9 158	141 360	6 929	18 623	1 262 101	-	-	-	1 438 170
Carrying values at 31 March 2018	**4 307 700**	**23 290**	**219**	**11 174 534**	**71 376 762**	**7 626 722**	**4 291 203**	**1 782 246**	**3 407 502**	**12 774 789**	**191 872**	**312 526 967**	**1 939 866**	**431 423 674**
Cost	4 307 700	1 700 946	328 387	13 876 324	119 000 650	20 736 760	7 164 838	8 102 083	6 381 654	40 606 637	388 800	312 526 967	3 303 478	538 425 225
Completed Assets	4 307 700	1 700 946	328 387	13 876 324	119 000 650	20 736 760	7 164 838	8 102 083	6 381 654	40 606 637	388 800		3 303 478	225 898 257
Under construction	-	-	-	-	-	-	-	-	-	-	-	312 526 967		312 526 967
Accumulated Depreciation	-	(1 677 655)	(328 169)	(2 701 790)	(47 623 888)	(13 110 038)	(2 873 635)	(6 319 837)	(2 974 152)	(27 831 848)	(196 928)		(1 363 612)	(107 001 551)

8. PROPERTY, PLANT AND EQUIPMENT (CONTINUED)

	2019 R	2018 R
8.1 WORK IN PROGRESS		
Work in progress consists of:		
Satellite Development	316 491 957	312 526 967

Work in progress is mainly made up of R314 million relating to the satellite development programme commenced in 2015. During the year under review, the project was put on hold due to insufficient funds for completion and commissioning.

The project is funded by the Department of Science and Technology, through annual ring fenced transfers. This is the first flagship project for SANSA and prior to its commencement, it required a consolidation of the space engineering industry through a programme to retain satellite build capabilities in South Africa. Development test equipment and the upgrade of assembly integration and test facilities needed an upgrade in order to perform quality tests on the instrument prior to its commissioning.

8.2 ASSETS GIVEN AS SECURITY

No assets were given as security.

8.3 INSURANCE PAY-OUTS RECEIVED	319 800	68 252

During the year a total amount of R 0.319 m (2018:R 0.068m) was received as insurance pay out for assets that were either damaged or stolen as follows: Motor Vehicle R0.319m (2018:R Nil), Computer Equipment R Nil (2018: R0.068).

8.4 CHANGE IN ESTIMATE

Property Plant and Equipment

In terms of the requirements of GRAP 17 the useful lives of all asset items were reviewed by management at year end. The remaining useful live expectations of some asset items differed from previous estimates. This resulted in a revision of some of the previous estimates which was accounted for as a change in accounting estimate. The effect of this revision is an increase in the depreciation charges for the current period of R1,7 million and an increase in the amortisation charges of R239 893.

9. INTANGIBLE ASSETS

At cost less accumulated amortisation and accumulated impairment losses	9 975 309	16 095 034

The entity does not have internally generated intangible assets

9.1 RECONCILIATION OF CARRYING VALUE OF INTANGIBLE ASSETS

31 MARCH 2019	WORK IN PROGRESS R	INTELLECTUAL PROPERTY R	COMPUTER SOFTWARE R	TOTAL R
Carrying value at 01 April 2018	**8 112 416**	**22 660**	**7 959 958**	**16 095 034**
Cost	8 112 416	2 822 660	36 886 398	47 821 474
Accumulated impairment	-	(1 440 000)	-	(1 440 000)
Accumulated amortisation	-	(1 360 000)	(28 926 439)	(30 286 439)
Acquisitions	**(8 112 416)**	**-**	**8 545 099**	**432 683**
Cost			432 683	432 683
Capitalised	(8 112 416)	-	8 112 416	-

9. INTANGIBLE ASSETS (CONTINUED)

31 MARCH 2019	WORK IN PROGRESS R	INTELLECTUAL PROPERTY R	COMPUTER SOFTWARE R	TOTAL R
Disposals	-	-	-	-
Cost of disposed asset	-	-	(796 330)	(796 330)
Accumulated amortisation of disposed asset	-	-	796 330	796 330
Amortisation				
Amortisation during the year	-	144 000	(6 696 409)	(6 552 409)
Carrying value at 31 March 2019	**-**	**166 660**	**9 808 648**	**9 975 309**
Cost	-	2 822 660	44 635 167	47 457 827
Accumulated impairment	-	(1 440 000)	-	(1 440 000)
Accumulated amortisation	-	(1 216 000)	(34 826 518)	(36 042 518)

9.2 RECONCILIATION OF CARRYING VALUE OF INTANGIBLE ASSETS

31 MARCH 2018	WORK IN PROGRESS R	INTELLECTUAL PROPERTY R	COMPUTER SOFTWARE R	TOTAL R
Carrying values at 01 April 2017	**5 606 381**	**22 660**	**14 470 491**	**20 099 532**
Cost	5 606 381	2 822 660	36 740 425	45 169 466
Accumulated impairment	-	(1 440 000)	-	(1 440 000)
Accumulated amortisation	-	(1 360 000)	(22 269 934)	(23 629 934)
Acquisitions	**2 506 035**	**-**	**145 973**	**2 652 008**
Cost	2 506 035	-	145 973	2 652 008
Capitalised	-	-		-
Disposals				
Cost of disposed asset	-	-	-	-
Accumulated amortisation of disposed asset	-	-	-	-
Amortisation				
Amortisation during the year	-	-	(6 656 505)	(6 656 505)
Carrying values at 31 March 2018	**8 112 416**	**22 660**	**7 959 958**	**16 095 034**
Cost	8 112 416	2 822 660	36 886 398	47 821 474
Accumulated impairment	-	(1 440 000)	-	(1 440 000)
Accumulated amortisation	-	(1 360 000)	(28 926 439)	(30 286 439)

9.3 WORK IN PROGRESS - INTANGIBLE ASSETS

	2019 R	2018 R
Work in progress on intangible assets consists of the following asset classes:		
Computer Software - ERP system	-	8 112 416

10. TRADE AND OTHER PAYABLES FROM EXCHANGE TRANSACTIONS

	2019 R	2018 R
Trade creditors	2 165 214	1 632 380
Other creditors	1 421 636	731 307
Income received in advance[1]	7 412 834	7 002 191
Accrued expenses	1 855 115	5 013 098
Accrued leave[2]	4 252 419	7 036 776
Accrued Board Fees	46 145	34 620
Accrual for 13th cheque	378 486	658 293
Total Creditors	**17 531 849**	**22 108 665**

[1] Income received in advance consists of prepayments from customers of R7.4m (2018:R7m).

[2] Leave accrues to employees on an monthly basis, subject to certain conditions. The accrual is an estimate of the amount due at the reporting date. Employees may not accumulated more than 25 leave days.

10.1 CREDIT TERMS OF TRADE AND OTHER PAYABLES

The average credit period on trade creditors is 30 days from the receipt of the invoice. No interest is charged for the first 30 days from the date of receipt of the invoice. Thereafter interest is charged in accordance with the credit policies of the various individual creditors that the entity deals with. The entity has financial risk policies in place to ensure that all payables are paid within the credit timeframe.

10.2 CLASSIFICATION OF FINANCIAL LIABILITIES

The Financial Liabilities of the entity is classified as follows:

		CARRYING AMOUNT	
FINANCIAL ASSETS	CLASSIFICATION	2019 R	2018 R
Trade and other payables			
Trade creditors	At amortised cost	2 165 214	1 632 380
Other creditors	At amortised cost	1 421 636	731 307
Accrued expenses	At amortised cost	6 532 165	12 742 787

11. PROVISIONS

	2019 R	2018 R
Performance bonus provision	8 242 115	6 005 146
Total Provisions	**8 242 115**	**6 005 146**

The bonus provision represents the estimated liability in respect of performance bonuses payable to employees. Performance bonuses are not guaranteed and are based on the assessed performance of the entity as well as employees for the financial year ending 31 March 2019.

RECONCILIATION OF MOVEMENT IN PROVISIONS

Balance at beginning of year	6 005 146	7 645 025
Reversal of prior year (unutilised)/under estimated provision	-	(1 626 793)
Contributions to provision	8 242 115	6 005 146
Amount utilised during the year	(6 005 146)	(6 018 232)
Balance at end of year	**8 242 115**	**6 005 146**

12. COMMITTED CONDITIONAL GRANT LIABILITY

	2019 R	2018 R
Transfer payment from executive authority	42 285 388	57 404 622
Transfer payment from other departments/entities	1 999 790	683 057
Total Committed conditional grant liability	**44 285 178**	**58 087 679**

Committed conditional grant liability is made up of amounts not yet spent on ring fenced transfers for projects as follows:

Satellite development programme (Note 14.1.1)	1 469 404	4 027 386
Operation Phakisa - Earth observation SAR data acquisition (Note 14.1.2)	3 367 105	26 592 000
Assembly, integration and test facilities upgrade (Note 14.1.4)	4 704 676	4 704 676
Earth Observation Data Center (Note 14.1.5)	15 467 416	20 980 000
Post graduate student bursary support programme (Note 14.2)	2 067 772	1 100 559
Research and human capital development grants (Note 14.3)	1 999 789	683 058
Science Awareness Outreach (Note 14.4)	709 016	-
South African Earth Observation Strategy Implementation (Note 14.5)	14 500 000	-
	44 285 178	**58 087 679**

Refer to Note 14 for a full reconciliation of movement in ring fenced grants.

13. OPERATING LEASE LIABILITY

The following liabilities have been recognised in respect of non-cancellable operating leases:

Balance at beginning of year	-	76 721
Operating lease liability movement	146 077	(76 721)
Total Operating lease liability	**146 077**	**-**

13.1 AMOUNTS PAYABLE UNDER OPERATING LEASES

At the reporting date the entity had outstanding commitments under non-cancellable operating leases, which fall due as follows:

Up to 1 year	**4 154 100**	**3 829 719**
Buildings	3 944 085	3 651 930
Office equipment	210 015	177 789
2 to 5 years	**355 578**	**4 477 452**
Buildings	-	3 944 085
Office equipment	355 578	533 367
More than 5 years	**-**	**-**
Buildings	-	-
Office equipment	-	-
Total Operating Lease Arrangements	**4 509 678**	**8 307 172**

The entity has operating lease agreements for the following classes of assets, which are only significant collectively:

- Buildings - for the rental of office space .
- Office Equipment - for the rental of copier machines

No restrictions have been imposed on the entity in terms of the operating lease agreements.

14. TRANSFERS AND SUBSIDIES RECEIVED

	2019 R	2018 R
Operational Transfers	**138 036 000**	**131 226 000**
Baseline allocation	138 036 000	131 226 000
Ring fenced transfers	**41 861 340**	**87 725 382**
Conditions met - transferred to revenue (Notes 14.1; 14.2; 14.3; 14.4 and 14.5)	41 861 340	87 725 382
Total Transfers and subsidies received	**179 897 340**	**218 951 382**

14.1 RECONCILIATION OF MOVEMENT IN RING FENCED GRANTS- SATELLITE PROGRAMME

Balance unspent at beginning of year	56 304 062	81 987 427
Current year receipts	-	49 840 000
Reallocation of administration fee allocation from the CubeSat project	-	1 009 766
Conditions met - transferred to revenue	(31 295 463)	(76 533 131)
Conditions still to be met - remain in liabilities	**25 008 599**	**56 304 062**

The satellite programme funding agreement includes five projects funded by the Department of Science and Technology (DST). The various funds received over the years were consolidated onto the satellite funding agreement in 2016/17 which contains the specific deliverable for projects outlined below:

14.1.1 Satellite development programme - EOSAT 1

Balance unspent at beginning of year	4 027 386	48 869 897
Current year receipts	-	28 860 000
Reallocation of administration fee allocation from the CubeSat project	-	1 009 766
Conditions met - transferred to revenue	(2 557 982)	(74 712 278)
Conditions still to be met - remain in liabilities	**1 469 404**	**4 027 386**

14.1.2 Operation Phakisa - Earth Observation SAR data acquisition

Balance unspent at beginning of year	26 592 000	4 548 000
Current year receipts	-	-
Reallocation from ocean and coast information management system	-	22 044 000
Conditions met - transferred to Revenue	(23 224 895)	-
Conditions still to be met - remain in liabilities	**3 367 105**	**26 592 000**

14.1.3 Operation Phakisa - Ocean and coast information management system

Balance unspent at beginning of year	-	22 044 000
Current year receipts	-	-
Reallocation to Ocean and Coast satellite data acquisition	-	(22 044 000)
Conditions met - transferred to revenue	-	-
Conditions still to be met - remain in liabilities	**-**	**-**

The funding contract conditions for the two Operation Phakisa projects were consolidated into the acquisition of Synthetic Aperture Radar (SAR) satellite data as the initial funds allocated were not sufficient to cover the licence fee to access a radar satellite for imagery to be ingested in the oceans and coast information management system.

14. TRANSFERS AND SUBSIDIES RECEIVED (CONTINUED)	2019 R	2018 R
14.1.4 Assembly, integration and test facilities		
Balance unspent at beginning of year	4 704 676	6 525 530
Current year receipts	-	-
Conditions met - transferred to revenue	-	(1 820 854)
Conditions still to be met - remain in liabilities	**4 704 676**	**4 704 676**
14.1.5 Earth Observation Data Center		
Balance unspent at beginning of year	20 980 000	-
Current year receipts	-	20 980 000
Conditions met - transferred to revenue	(5 512 584)	-
Conditions still to be met - remain in liabilities	**15 467 416**	**20 980 000**

This grant is for the purpose of the upgrade of the Earth Observation Data Center (EODC) to support the Earth Observation sensors and to acquire high resolution satellite imagery aimed at meeting current user requirements to complement the EOSAT-1 satellite development programme for the data infrastructure system.

14.2 POST GRADUATE STUDENT BURSARY SUPPORT PROGRAMME		
Balance unspent at beginning of year	1 100 559	2 257 696
Current year receipts	4 042 226	3 714 000
Conditions met - transferred to revenue	(3 075 013)	(4 871 137)
Conditions still to be met - remain in liabilities	**2 067 772**	**1 100 559**

14.3 RESEARCH AND HUMAN CAPITAL DEVELOPMENT GRANTS		
Balance unspent at beginning of year	683 058	2 570 822
Current year receipts	7 916 610	4 433 350
Current year refunds	-	-
Conditions met - transferred to revenue	(6 599 879)	(6 321 113)
Conditions still to be met - remain in liabilities	**1 999 789**	**683 058**

These grants are for multiple purposes which include research infrastructure grants as well as student bursaries linked to research projects. The research project grants include running expenses and travel funds as well. The grants were received from the National Research Fund (NRF) by particular researchers after successful application to a competitive programme. Some of the grants were purely mobility grants. All of the grants are multiple year awards and are on-going until the project is completed.

14.4 SCIENCE AWARENESS OUTREACH		
Balance unspent at beginning of year	-	-
Current year receipts	1 600 000	-
Current year refunds		-
Conditions met - transferred to revenue	(890 984)	-
Conditions still to be met - remain in liabilities	**709 016**	**-**

14.5 SOUTH AFRICAN EARTH OBSERVATION STRATEGY IMPLEMENTATION		
Balance unspent at beginning of year	-	-
Current year receipts	14 500 000	-
Conditions met - transferred to revenue		-
Conditions still to be met - remain in liabilities	**14 500 000**	**-**

15. ACCUMULATED SURPLUS

	2019 R	2018 R
Accumulated Surplus	526 285 730	484 442 643
Total Accumulated Surplus	**526 285 730**	**484 442 643**

The accumulated surplus represents the residual interest in the assets of the entity after deducting all its liabilities. Refer to the Statement of Financial Position.

16. INTEREST INCOME

Interest earned on bank accounts	7 808 821	8 310 533
	7 808 821	**8 310 533**

17. RENDERING OF SERVICES

Services to local public entities	27 992 476	21 582 437
Services to local private entities	10 238 068	4 148 748
Services to foreign clients	52 185 516	62 079 191
	90 416 060	**87 810 375**

18. OTHER INCOME

Sundry Income	12 175	178 729
Conference hosting fees	-	4 132 871
Project Revenue	-	6 770
Rent Received	273 502	315 020
Discount Received	1 270	1 257
Donations	65 315	-
Insurance pay-out	319 800	68 525
Expense Recovery	-	72 840
Entrance Fees	-	
Total Other Income	**672 062**	**4 776 010**

19. EMPLOYEE AND EMPLOYEE RELATED COSTS

Employee related costs - salaries	104 634 593	102 480 125
Remote location allowance	3 297 000	3 071 615
Performance bonuses current year adjustment	7 768 755	4 923 071
Total Employee related costs	**115 700 348**	**110 474 811**

REMUNERATION OF KEY MANAGEMENT PERSONNEL OF SANSA DURING THE YEAR:

Remuneration of the Chief Executive Officer: Dr. V Munsami

Annual Remuneration	2 273 211	2 167 171
Performance Bonus	133 832	-
Cellphones Allowance	14 760	-
Total	**2 421 803**	**2 167 171**

19. EMPLOYEE AND EMPLOYEE RELATED COSTS (CONTINUED)	2019 R	2018 R
Remuneration of the Chief Financial Officer: Ms. B Pono		
Annual Remuneration	1 757 436	1 672 730
Performance Bonus	100 593	96 847
Cellphones Allowance	8 280	-
Total	**1 866 309**	**1 769 576**
Remuneration of the Executive Director Space Programme: Mr. A. Khatri		
Annual Remuneration	1 607 957	1 531 311
Performance Bonus	88 224	88 609
Cellphones Allowance	8 280	-
Total	**1 704 461**	**1 619 920**
Remuneration of the Acting Executive Director Corporate Services: Dr. L McKinnell		
Acting Allowance	-	145 398
Total	**-**	**145 389**
Remuneration of the Managing Director Space Operations: Mr. R Hodges		
Annual Remuneration	1 476 949	1 412 773
Performance Bonus	83 058	81 502
Car and Travel Allowance	63 000	60 000
Cellphones Allowance	11 760	
Total	**1 634 767**	**1 554 276**
Remuneration of the Managing Director Earth Observation: Ms. A Mlisa		
Annual Remuneration (Appointed October 2017)	1 415 066	669 378
Performance Bonus	37 761	-
Cellphones Allowance	8 280	-
Total	**1 461 107**	**669 378**
Remuneration of the Acting Managing Director Earth Observation: Dr. P Mangara		
Acting Allowance (February 2017 to September 2017)	-	63 826
Total	**-**	**63 826**
Remuneration of the Managing Director Space Science: Dr. L McKinnell		
Annual Remuneration	1 409 957	1 343 989
Performance Bonus	93 093	103 598
Cellphones Allowance	8 280	
Total	**1 511 330**	**1 447 586**

19. EMPLOYEE AND EMPLOYEE RELATED COSTS (CONTINUED)

	2019 R	2018 R
Remuneration of the Acting Managing Director Space Science: Dr. G. Lamprecht		
Acting Allowance (April 2017 to March 2018)	-	74 003
Total	**-**	**74 003**
Remuneration of the Executive Director Corporate Services: Ms Ann Slavin		
Annual Remuneration	1 629 068	-
Cellphones Allowance	8 099	-
	1 637 167	**-**

20. BOARD MEMBER REMUNERATION

	2019		
	MEETING FEES R	REIMBURSIVE CLAIMS R	TOTAL R
INDEPENDENT NON-EXECUTIVE CHAIRMAN OF THE BOARD			
Ms. X Kakana [3]	40 364	2 820	43 184
Ms. J Lawrence [2]	51 700	6 150	57 850
INDEPENDENT NON-EXECUTIVE MEMBERS			
Mr. V Gore [2]	27 832	3 450	31 282
Mr. L S Hamilton [1]	70 895	5 544	76 439
Mr. E Jansen [1]	86 610	6 172	92 782
Ms. G Khambule [2]	36 532	4 391	40 923
Mr. P Maine [2]	39 637	6 265	45 902
Ms. M I Matooane [1]	62 618	3 450	66 068
Ms. M Mfeka [1]	48 273	4 056	52 329
Dr. N P Mjoli [2]	36 532	3 912	40 444
Mr. J Prinsloo [1]	94 653	16 157	110 810
Prof. R Bharuthram [2]	21 742	4 368	26 110
Mr. M Rezelman [2]	51 318	6 316	57 634
Mr. W J van Biljon [1]	73 672	7 240	80 912
Mr M Riba [2&4]	-	-	-
Mr A Naidoo [1&4]	-		-
Ms. I M Pule [1]	68 343	3 193	71 536
Ms. N. Majaja [3&4]	-	2 176	2 176
Adv. I Matlou [3]	27 522	1 798	29 320
Ms. L Msibi [3]	37 614	-	37 614
Prof. A Muronga [3]	37 614	-	37 614
Ms. M Paul [3&4]	-	1 195	1 195
Total Board members Remuneration	**913 471**	**88 653**	**1 002 124**

[1] Reappointed on 1 September 2018

[2] Term ended on 31 August 2018

[3] Appointed on 1 September 2018

[4] Appointed as representative of the state

20. BOARD MEMBER REMUNERATION (CONTINUED)

	2018		
	MEETING FEES R	REIMBURSIVE CLAIMS R	TOTAL R
INDEPENDENT NON-EXECUTIVE CHAIRMAN OF THE BOARD			
Ms J Lawrence	69 575	14 760	84 335
INDEPENDENT NON-EXECUTIVE MEMBERS			
Mr. V Gore	63 945	8 460	72 405
Mr. L S Hamilton	36 540	8 972	45 512
Mr. E Jansen	79 605	11 110	90 715
Ms. G Khambule	87 000	11 172	98 172
Mr. P Maine	84 298	13 014	97 312
Ms. M I Matooane	84 825	8 280	93 105
Ms. M Mfeka	70 035	8 839	78 874
Dr. N P Mjoli	71 775	9 677	81 452
Mr A Naidoo [2]	-	-	-
Mr. J Prinsloo	90 869	14 278	105 147
Ms. I M Pule	74 131	3 543	77 674
Prof. R Bharuthram	52 418	9 162	61 580
Mr. M Rezelman	79 619	14 154	93 773
Mr. W J van Biljon	80 258	9 887	90 144
Mr M Riba [1]	-	-	-
Total Board members Remuneration	**1 024 892**	**145 307**	**1 170 199**

[1] Mr M Riba is a senior manager at the Department of Rural Development and Land Reform and appointed to the SANSA Board as a representative of DRDLR

[2] Mr A Naidoo is a senior manager at the Department of Environmental Affairs and is appointed to the SANSA Board as a representative of DEA

21. DEPRECIATION AND AMORTISATION

Depreciation: Property, Plant and Equipment	21 058 628	18 743 020
Amortisation: Intangible Assets	6 552 409	6 656 506
Total Depreciation and Amortisation	**27 611 037**	**25 399 526**

22. REPAIRS AND MAINTENANCE

Plant & Machinery	3 103 365	4 160 979
General Repairs	1 513 276	2 885 149
Land & Buildings	1 837 106	1 698 835
Computer Equipment	683 070	786 813
Vehicles	138 960	458 470
Computer Software	3 269 592	341 977
Research Equipment	89 492	127 109
Laboratory Equipment	164 222	53 475
Furniture & Fittings	103 137	20 737
Total Repairs and Maintenance	**10 902 220**	**10 533 545**

23. DATA LICENCE FEES

	2019 R	2018 R
Data licence fees	28 737 479	34 451 213
Total Data Licence Fees	**28 737 479**	**34 451 213**

Data licence fees are paid for access to various satellites for downloading earth observation satellite imagery.

24. STUDENT BURSARIES AND RESEARCH GRANTS PAID

Bursaries to students	3 569 255	5 326 392
Research and development	530 291	294 400
Bursaries Student Other	537 020	-
Total Grants and subsidies paid	**4 636 566**	**5 620 792**

25. ANTENNA INFRASTRUCTURE SERVICES

Antenna Infrastructure Services	3 271 263	3 270 496
Total Antenna Infrastructure Services	**3 271 263**	**3 270 496**

26. TRAINING EXPENSES

Staff Training	1 109 260	566 548
Staff Bursaries	155 042	659 826
Board Member Training	103 500	
Total Training Expenses	**1 367 802**	**1 226 374**

27. GENERAL EXPENSES

Electricity	7 905 062	7 561 078
Travel and accommodation	6 712 074	8 391 431
Other General Expenses	5 239 564	5 479 559
Rent and lease charges	4 614 545	3 935 460
License fees	4 802 921	4 247 540
Data and internet services	4 151 102	4 035 359
Insurance	1 636 631	1 573 048
Advertising & Marketing	1 524 609	1 096 419
External Audit fees	1 077 753	2 255 004
Internal Audit Fees	424 527	-
Security	1 348 930	1 192 132
Consulting fees	977 263	580 980
Telephone Cost	973 072	942 988
Fuel and Oil	847 231	889 506
Conferences and Seminars	829 705	830 204
Printing and Stationery	496 154	666 924
Transport Costs	356 124	306 017
Consumables	223 806	57 166
Bank Charges	183 355	173 288
Entertainment	104 640	317 815
Legal Costs	83 202	125 063
Conference hosting fees	-	3 938 270
Discount Granted	-	1 327
	44 512 270	**48 596 577**

28. NET GAINS AND LOSSES ON FOREIGN EXCHANGE TRANSACTIONS

	2019 R	2018 R
Gains in foreign exchange transactions	**2 143 577**	**1 582 169**
Gains in net Foreign Exchange - realised	2 113 665	-
Gains in net Foreign Exchange - unrealised	29 912	1 582 169
Losses in foreign exchange transactions	**(555 617)**	**(3 443 213)**
(Losses) in net Foreign Exchange - realised	(555 617)	(3 426 690)
(Losses) in net Foreign Exchange -unrealised	-	(16 523)
Net Gains/(Losses) on foreign exchange transactions	**1 587 960**	**(1 861 044)**

29. NET GAINS/LOSSES ON DISPOSAL OF PROPERTY, PLANT & EQUIPMENT

Net (Losses) on Disposal of Property, Plant and Equipment	(750 519)	(96 109)
	(750 519)	(96 109)

30. NET CASH FLOWS FROM OPERATING ACTIVITIES

Surplus for the Year	**41 843 087**	**77 138 699**
Adjustment for:		
Depreciation and Amortisation	27 611 037	25 399 526
Net Losses on Disposal of Property, Plant and Equipment	750 519	96 109
Net (Gains)/Losses on foreign exchange transactions	(1 587 960)	1 861 044
Irrecoverable of sundry debtors	47 528	8 916
Donations	(65 315)	-
Other non cash items	(604 364)	-
Sundry income	-	(407 455)
Discount Received	(1 270)	(1 257)
Operating surplus before working capital changes	**67 993 262**	**104 095 583**
Decrease/(Increase) in Inventory	(218 481)	(44 842)
Increase In Receivables from exchange transactions	(10 991 562)	(4 593 185)
Decrease in Trade and other payables	(13 292 613)	(38 454 905)
Cash flow from operating activities	**43 490 606**	**61 002 652**

31. SUNDRY DEBTORS WRITTEN OFF

Irrecoverable Sundry Debtors	47 528	8 916
	47 528	**8 916**

32. IRREGULAR EXPENDITURE

	2019 R	2018 R
Reconciliation of Irregular Expenditure:		
Opening balance	-	-
Irregular Expenditure relating to the prior year	120 538	-
Irregular Expenditure relating to the current year	132 858	-
Less: Condoned or written off by relevant authority	(253 396)	
Total	**-**	**-**

DETAILS OF IRREGULAR EXPENDITURE

Preferential procurement policy	Outcome of investigation		
The lowest quote bidder was awarded instead of the highest scoring bidder after evaluating price and preference points. The reason for not selecting the highest scoring bidder was not documented.	SANSA did not suffer any loss as the services were appropriately rendered. The outcome of the investigation was that the PPPF Act was not complied with as there was an error in awarding the bid to the lowest quotation and reasons were not documented. In 2017/18, the expenditure was under an internal investigation to confirm if it was irregular to the value of R120 537. Subsequent to the investigation, during the 2018/19 financial year it was confirmed that it was irregular expenditure. The total contract value of R331 324 was reported to National Treasury and condoned subsequent to the 2018/2019 financial year end, on the 31 May 2019.		
		-	-

33. COMMITMENTS FOR EXPENDITURE

CAPITAL AND EXPENDITURE COMMITMENTS		
Approved and Contracted for	**112 897 731**	**144 085 771**
Property, Plant and Equipment	7 879 965	100 879 699
Intangible assets	1 312 745	185 592
Expenditure	103 705 021	43 020 480
Approved but Not Yet Contracted for	**17 389 641**	**-**
Property, Plant and Equipment	17 389 641	-
Expenditure	-	-
Total Capital and Expenditure Commitments	**130 287 372**	**144 085 771**
This expenditure will be financed from:		
Transfers and subsidies	130 287 372	144 085 771
	130 287 372	**144 085 771**

34. EMPLOYER RETIREMENT BENEFIT INFORMATION

The only obligation of the entity with respect to the retirement benefit plans is to pay over the specified contributions to the pension fund.

The total expense recognised in the Statement of Financial Performance represents contributions payable to the plan by the entity at rates specified in the rules of the plan. These contributions have been expensed under employee related costs. Refer to Note 20.

35. RELATED PARTY TRANSACTIONS

35.1 RELATED PARTY RELATIONSHIPS: REVENUE AND RECEIVABLES

South African National Space Agency (SANSA) is a Public Entity under the control of the Department of Science and Technology South Africa. The Agency is a schedule 3A Public entity in terms of the Public Finance Management Act, Act 1 of 1999 as amended by Act 29 of 1999, and therefore falls within the national sphere of government. SANSA has a significant number of related parties, being those that fall within the national sphere of government. Amounts due from / (to) these entities are subject to the same terms and conditions as normal trade receivables and trade payables and transactions with these entities are concluded at arm's length. Related party transactions have been disclosed in accordance to the applicable standard.

A detailed list of transactions with related parties and amounts due to / from related parties are as follows:

	2019		2018	
Entity Name	REVENUE R	RECEIVABLES R	REVENUE R	RECEIVABLES R
Department of Science and Technology	173 297 461	-	218 951 382	-
National Research Foundation (NRF)	6 599 879	-	4 433 350	-
National Research Foundation (NRF - HartRAO)	-	4 484 490	3 767 680	-
South African Agency for Science and Technology (SAASTA)	-	-	-	-
Statistics SA	-	-	-	-
	179 897 340	**4 484 490**	**227 152 412**	**-**

35.2 RELATED PARTY RELATIONSHIPS: PURCHASES AND PAYABLES

	2019		2018	
Entity Name	PURCHASES R	RECEIVABLES R	PURCHASES R	RECEIVABLES R
Council for Scientific and Industrial Research (CSIR)	348 750	-	-	-
Denel Soc Ltd t/a Denel Dynamics	-	-	63 141 087	-
National Research Foundation (NRF)	30 000	-	-	-
	378 750	**-**	**63 141 087**	**-**

With the exception of transactions disclosed below, all other transactions with related parties were normal supplier and/ or client/recipient relationships on terms and conditions no more or less favourable than those which it is reasonable to expect the entity to have adopted if dealing with that individual entity or person in the same circumstances; and terms and conditions within the normal operating parameters established by that reporting entity's legal mandate.

35. RELATED PARTY TRANSACTIONS (CONTINUED)

During the year under review SANSA received grants from the National Research Fund (NRF) to fund different research projects, the details of the grants, the liabilities and revenues relating to the grant are disclosed in note 14.3

SANSA has a current contractual commitment with Denel for the development of the satellite. This is a multi year project funded through a grant from DST. Refer to Note 14.1.1 for detailed disclosure of revenues and liabilities relating to this project.

35.3 RELATED PARTY RELATIONSHIPS: KEY MANAGEMENT

The members of key management personnel of SANSA during the year were:

Chief Executive Officer - Dr. V Munsami (Ex-officio member of the Board)

Chief Financial Officer - Ms. B Pono

Executive Director Space Programme - Mr. A Khatri

Managing Director Space Science - Dr. L McKinnell

Managing Director Space Operations - Mr. R Hodges

Managing Director Earth Observations - Ms. A. Mlisa

36. PENDING LAND CLAIM

The land claim remains pending since approximately 2008 in respect of the property upon which SANSA Space Operations is located. South African National Space Agency (SANSA) is not the owner of the land, however the Department of Science and Technology has supported the application made by SANSA to the Department of Public Works to formalise the land use rights toward the property. In respect of the land claim proceedings, SANSA has also facilitated the filing of the notice to intervene as an interested party in November 2014 with the Randburg Land Claims Court. A scientific expert report is also being finalised and will be submitted in support of the notice to intervene and also used in support of the submission to Department of Public Works as part of the application for formalised land use rights.

37. IN-KIND DONATIONS AND ASSISTANCE

Space Science received research equipment in Sutherland from a German counterpart GFZ.

38. EVENTS AFTER THE REPORTING DATE

No events having financial implications requiring disclosure occurred subsequent to 31 March 2019.

39. GOING CONCERN

The annual financial statements have been prepared on the basis of accounting policies applicable to a going concern. This basis presumes that funds will be available to finance future operations and that the realisation of assets and settlement of liabilities, contingent obligations and commitments will occur in the ordinary course of business.

40. FINANCIAL RISK MANAGEMENT OBJECTIVES AND POLICIES

All financial instruments arise directly from operations.

The entity does not enter into any derivative transactions. The main risk arising from the entity's financial instruments are cash flow interest rate risk, liquidity risk and credit risk.

The entity reviews and implements policies managing each of these risks. There are no significant concentrations of risk. Compliance with policies and procedures is reviewed by internal and external auditors on a continuous basis.

The carrying amounts of financial liabilities at reporting date was:	2019 R	2018 R
Trade and other payables	10 119 015	15 106 475
	10 119 015	**15 106 475**

40.1 INTEREST RATE RISK

No material risk exists due to there being no material finance costs in the current finance year. The only real risk that exists is the risk of variations in cash flow due to changes in the interest rate, which will affect interest income.

The entity's income and operating cash flows are substantially independent of changes in the market interest rates.

31 March 2019	FLOATING INTEREST RATE R	NON-INTEREST BEARING R	TOTAL R
Assets			
Receivables from Exchange Transactions	-	36 385 386	**36 385 386**
Cash and cash equivalents	121 107 807	6 035	**121 113 842**
Liabilities			
Trade and other payables	-	(17 531 849)	**(17 531 849)**
Net Financial assets/(Liabilities)	**121 107 807**	**18 859 572**	**139 967 379**
31 March 2018			
Assets			
Receivables from Exchange Transactions	-	25 393 824	**25 393 824**
Cash and cash equivalents	97 219 187	4 299	**97 223 486**
Liabilities			
Trade and other payables	-	(22 108 665)	**(22 108 665)**
Net Financial assets/(Liabilities)	**97 219 187**	**3 289 457**	**100 508 644**

40.1 INTEREST RATE RISK(CONTINUED)

Interest Rate Sensitivity Analysis

The sensitivity analysis below was determined based on the exposure to interest rates at the reporting date. For variable rate long-term instruments, the analysis is prepared assuming the amount of the instrument outstanding at the reporting date was outstanding for the whole year. A 100 basis point increase or decrease was used, which represents management's assessment of the reasonably possible change in interest rates.

40. FINANCIAL RISK MANAGEMENT OBJECTIVES AND POLICIES (CONTINUED)

Effect of a change in interest rate on interest bearing financial assets and liabilities

Financial Assets	Classification	2019 R	2018 R
External investments:			
Bank balances	Financial assets at amortised cost	121 107 807	97 219 185
Cash Floats	Financial assets at amortised cost	6 035	4 299
		121 113 842	**97 223 486**
Interest received		**7 808 821**	**8 310 533**
Interest rate		**6,4%**	**8,5%**
Effect of a change in interest rate on interest earned from external investments:			
Effect of change in interest rate		1%	1%
Effect of change in interest rate		1 211 138	972 235
Effect of change in interest rate		-1%	-1%
Effect of change in interest rate		(1 211 138)	(972 235)

40.2 LIQUIDITY RISK

The entity prevents liquidity risk by maintaining adequate banking facilities and by receiving contributions annually in the form of transfers and subsidies.

The following are the contractual maturities of financial liabilities, including interest payments and excluding the impact of netting agreements for the entity:

	2019				
Non-derivative financial liabilities	CARRYING AMOUNT R	CONTRACTUAL CASH FLOWS: 1 MONTH OR LESS R	CONTRACTUAL CASH FLOWS: 1 -3 MONTHS R	CONTRACTUAL CASH FLOWS: 3 - 12 MONTHS R	CONTRACTUAL CASH FLOWS: 12 - 60 MONTHS R
Trade and other payables	10 119 015	10 119 015	-	-	-
	10 119 015	**10 119 015**	**-**	**-**	**-**

	2018				
Non-derivative financial liabilities	CARRYING AMOUNT R	CONTRACTUAL CASH FLOWS: 1 MONTH OR LESS R	CONTRACTUAL CASH FLOWS: 1 -3 MONTHS R	CONTRACTUAL CASH FLOWS: 3 - 12 MONTHS R	CONTRACTUAL CASH FLOWS: 12 - 60 MONTHS R
Trade and other payables	15 106 475	15 106 475	-	-	-
	15 106 475	**15 106 475**	**-**	**-**	**-**

40. FINANCIAL RISK MANAGEMENT OBJECTIVES AND POLICIES (CONTINUED)

40.3 MARKET AND CREDIT RISK

Financial assets which potentially subject the entity to the risk of non-performance by counter parties consist of Receivables from exchange and non-exchange.

An allowance for impairment is established based on management's estimate of any identified potential losses in respect of Receivables from exchange and non-exchange. Bad debts identified are written off as they occur. The entity does not have any significant credit risk exposure to any single counterparty. There is a foreign exchange risk due to the existence of international debtors. These debtors however have strict 30 day payment terms which ensures that the movement in exchange rates is limited to a shorter time period.

The entity's exposure to foreign currency risk was as follows:	**2019**			
	ZAR	EURO	USD	GBP
Receivables from Exchange Transactions	9 084 187	206 355	396 441	-
Trade payables	(638 076)	(39 339)		-
Gross exposure	**8 446 111**	**167 016**	**396 441**	**-**

	2018			
	ZAR	EURO	USD	GBP
Receivables from Exchange Transactions	8 348 672	190 121	1 192 345	13 740
Trade payables	(14 970 334)	-	(11 547)	-
Gross exposure	**(6 621 662)**	**190 121**	**1 180 798**	**13 740**

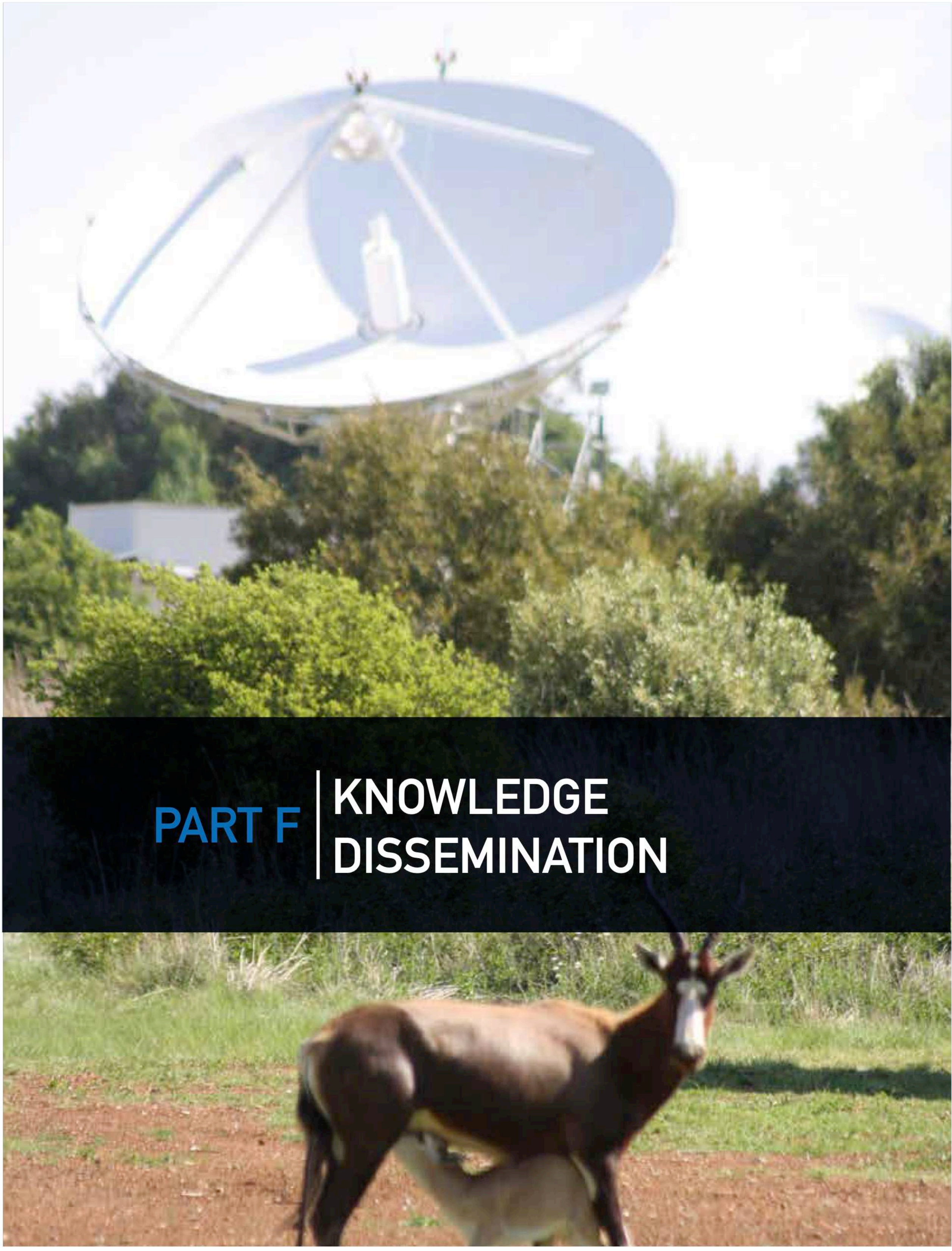
The following significant exchange rates applied during the year:	**2019 R**	**2018 R**
Year-end spot rate		
Euro	16,23	14,52
GBP	18,84	16,51
USD	14,47	11,79

Sensitivity analysis

A 10% weakening of the rand against the above currencies at 31 March would have had the equal but opposite effect on the above currencies to the amounts shown above, on the basis that all other variables remain constant.

Euro	271 017	276 056
GBP	-	22 685
USD	573 567	1 392 161
Total	**844 583**	**1 690 900**

A 10% strengthening of the rand against the following currencies at 31 March 2019 would have decreased profit or loss by the amounts shown below. This analysis assumes that all other variables remain constant. The analysis is performed on the same basis as was performed at 31 March 2019.



PART F | KNOWLEDGE DISSEMINATION

14. RESEARCH PUBLICATIONS

SANSA has progressed well on its scientific outputs in 2018/19. SANSA researchers have produced a total of 39 peer reviewed publications in high impact journals covering the broad fields of space science and earth observation. The top 10, ranked by journal impact factor, are given in table 26. Key highlights from the publications are also provided. Researchers also presented numerous conference papers, and published 3 book chapters during the 2018/19 year. Details of the book chapters are given in table 25. SANSA is proud of the international recognition that its researchers are receiving. During December 2018 a SANSA researcher received the American Geophysical Union (AGU) 2018 Sunanda and Satimay Basu International Early Career Award in Sun-Earth Systems Science. This is the second time that a SANSA researcher has received this specific award and the third time that a SANSA researcher received an AGU award.

SANSA exceeded its target in 2018/19 for research productivity.

	TITLE	JOURNAL	IMPACT FACTOR	SANSA AUTHORS	HIGHLIGHTS
1	Past, Present and Future of Active Radio Frequency Experiments in Space	Space Science Reviews	9.327	Kosch, M.J	This review paper, supported by the International Space Science Institute in Switzerland, presented the state of the art for active radio wave experiments in the ionospheric plasma. The SANSA author produced the entire section on optical "artificial auroras", which result from electron acceleration due to wave-plasma resonances.
2	Evaluating the capability of Landsat 8 OLI and SPOT 6 for discriminating invasive alien species in the African Savanna landscape	International Journal of Applied Earth Observation and Geoinformation	4.003	Kganyago, M; Adjorlolo, C; Mangara, P	The study demonstrates the use of Landsat 8 and SPOT 6 data for mapping the distributions and patch sizes of problematic exotic plant: Famine weed, for supporting eradication efforts and prevent further spread.
3	Simulation study for ground-based Ku-band microwave observations of ozone and hydroxyl in the polar middle atmosphere	Atmospheric Measuring Techniques	3.248	Kosch, M.J.	The paper models the expected performance of a radiometer to detect high-altitude atmospheric O3 and OH molecules. This is important because these trace gasses respond directly to incoming proton precipitation from solar storms.
4	A Hybrid Regression-Neural Network (HR-NN) Method for Forecasting the Solar Activity, Space Weather	Journal of Space Weather	2.89	Habarulema, J.B.	Most applications requiring modelling/forecasting of space weather phenomena depend largely on solar activity. A combination of regression and neural networks was used to forecast the solar activity using the current and past solar parameters. The upcoming solar cycle 25 was forecasted to have a maximum in January 2025 plus/minus 6 months and minimum in April 2031 plus/minus 5 months.
5	SuperDARN radar-derived HF radio attentuation during the September 2017 solar proton events.	Journal of Space Weather	2.89	Kosch, M.J.	This paper presents the first attempt to use SuperDARN radars as riometers, i.e. detect high-energy particle precipitation into the atmosphere from space. This is important because the SuperDARN radars cover a much greater part of the polar regions whereas traditional riometers do not.

	TITLE	JOURNAL	IMPACT FACTOR	SANSA AUTHORS	HIGHLIGHTS
6	An empirical model of vertical plasma drift over the African sector. Space Weather	Journal of Space Weather	2.89	Dubazane, M. B.; Habarulema, J. B.	This is the first work that developed a quantitative relationship between equatorial electrojet (inferred from magnetometer observations) and space-based vertical ExB drift data from the Communication and Navigation Outage Forecasting System satellite over the African sector. Lorentz force governs the variability of the equatorial ionisation anomaly and increase in eastward electric field during local day time leads to EIA expansion to midlatitudes which could later influence some applications such as HF planning. The developed ExB drift model was found to be accurate up to 85% and 56 % during quiet and disturbed conditions respectively.
7	First conjugate observations of medium-scale traveling ionospheric disturbances (MSTIDs) in the Europe⊠Africa longitude sector	Journal of Geophysical Research: Space Physics	2.75	Kosch, M.J.	This paper presents the first observation of conjugate medium-scale atmospheric gravity waves using the airglow imager located at Sutherland. This is important because it demonstrates for the first time that such waves may occur simultaneously in both hemispheres.
8	Storm-time TEC modelling over African low and mid latitude regions	Journal Geophysical Research: Space Physics	2.75	Uwamahoro, J. C.; Habarulema, J.B.	The occurrence of geomagnetic storms is the biggest challenge towards accurately nowcasting/ forecasting ionospheric variability. This later leads to significant errors for communications, navigation and positioning. For the first time, this paper developed storm-time models of total electron content over different latitude regions within the African continent. This work established that the inclusion of the meridional wind velocity in TEC modelling leads to a quantitative improvement of 5%, 10% and 5% for the low latitude, northern and southern hemisphere mid-latitude regions respectively.
9	Long-term estimation of diurnal vertical E × B drift velocities using C/NOFS and ground-based magnetometer observations.	Journal Geophysical Research: Space Physics	2.75	Habarulema, J. B.; Dubazane, M. B.; Katamzi-Joseph, Z. T.; Uwamahoro, J. C.	This paper provides results from the first attempt to combine sparse satellite data and ground-based magnetometer data to develop a mathematical expression for deriving vertical ExB drift data on a long-term basis. One of the implications of this is that it is now possible to utilise relatively cheap magnetometer data to develop reliable, realistic and all space weather conditions low latitude vertical drift models for accurate space weather modelling; which was previously limited by sparse radar instrumentation. It also forms a basis for developing a global model that will allow accurate analyses and interpretation of space weather events especially if different latitude regions are influenced by low latitude electrodynamics. The study therefore improvised methods of filling in the much needed data for continuous coverage of most longitude sectors.

	TITLE	JOURNAL	IMPACT FACTOR	SANSA AUTHORS	HIGHLIGHTS
10	Mapping The Spatial Distribution of LippiaJavanica (Burm. F.) Spreng Using Sentinel-2 and Srtm-derived Topographic Data in MalariaEndemic Environment	Ecological Modelling	2.507	Malahlela, O. E.; Adjorlolo, C.	In this paper, the new method of mapping the distribution of Lippia javanica (lemon bush) was demonstrated. The article has also shown that the distribution of lemon bush was high in areas where malaria occurrence was low to moderate. The combination of two satellite datasets yielded higher accuracies for species prediction.

Table 24: Top 10 journal publications ranked by impact factor.

	BOOK TITLE	CHAPTER TITLE	SANSA AUTHORS	HIGHLIGHTS
1	Classical and Recent Aspects of Power System Optimization, Eds. Ahmed F. Zobaa, Shady H.E. Abdel Aleem, Almoataz Youssef Abdelaziz	Geomagnetically Induced Currents: A Threat to Modern Power Systems.	Cilliers, P.J.	This chapter provides an overview of the origin and nature of Space Weather effects which can cause disruptive geomagnetically induced currents (GICs) on Power Systems. It outlines the methodology to estimate GICs in a power network and provides possible technological mitigation measures for the optimisation of power systems to minimise the impacts of Space Weather.
2	Smart Economy in Smart African Cities. Advances in 21st Century Human Settlements, Eds. Mboup G., Oyelaran-Oyeyinka B.	Smart Energy for Smart Infrastructure Development	Mudau N.; Mangara P.	The chapter reviews the status of smart energy development and appraises the status of ICT in Africa. The chapter also demonstrates case studies on smart energy systems in Africa aimed towards energy efficiency and smart grid development.
3	Smart Metropolitan Regional Development. Advances in 21st Century Human Settlements, Eds. Vinod Kumar T.	Towards a Smart Metropolitan Regional Development—Spatial and Economic Design Strategies: Johannesburg.	Mudau N.; Mangara P.	This chapter assesses progress made towards making Johannesburg a smart city according Smart City Foundation Framework. This study presented Gauteng City region and Johannesburg in Time and Space, Urban Accessibility; Smart Energy for Economic Development, Spatial and Economic Design Strategies for a Smart Johannesburg Metropolitan Regional Development.

Table 25: SANSA authored book chapters for 2018/19

JOURNAL ARTICLES (ALPHABETICAL)

1. Ahoua, S.M., Habarulema, J.B., Obrou, O.K., Cilliers, P.J. and Zaka, Z.K., Evaluation of the NeQuick model performance under different geomagnetic conditions over South Africa during the ascending phase of the solar cycle (2009–2012). *Annales Geophysicae*, Vol. 36, No. 5, pp. 1161-1170, https://doi.org/10.5194/angeo-36-1161-2018, 2018.

2. Bland, E.C., Heino, E.P., Kosch, M.J., Partamies, N. SuperDARN radar-derived HF radio attentuation during the September 2017 solar proton events. *Space Weather*, doi: 10.1029/2018SW001916, 2018.

3. Dubazane, M. B., Habarulema, J. B. An empirical model of vertical plasma drift over the African sector. *Space Weather*, 16. https://doi.org/10.1029/2018SW001820, 2018.

4. Dugassa T., Habarulema, J.B., Nigussie, M. Longitudinal variability of occurrence of ionospheric irregularities over the American, African and Indian regions during geomagnetic storms, *Advances in Space Research*, https://doi.org/10.1016/j.asr.2019.01.001, 2019.

5. Habarulema, J. B., Dubazane, M. B., Katamzi-Joseph, Z. T., Yizengaw, E., Moldwin, M. B., Uwamahoro, J. C. Long-term estimation of diurnal vertical E × B drift velocities using C/NOFS and ground-based magnetometer observations. *Journal of Geophysical Research: Space Physics*, 123. https://doi.org/10.1029/2018JA025685, 2018.

6. Katamzi-Joseph, Z.T., Aruliah, A.L., Oksavik, A., Habarulema, J.B., Kauristie, K., Kosch, M.J., Multi-instrument observations of large-scale atmospheric gravity waves/traveling ionospheric disturbances associated with enhanced auroral activity over Svalbard. *Advances in Space Research*, S0273-1177(18)30670-7 JASR 139072018.

7. Kganyago, M., Odindi, J., Adjorlolo, C., Mhangara, P. Evaluating the capability of Landsat 8 OLI and SPOT 6 for discriminating invasive alien species in the African Savanna landscape, *International Journal of Applied Earth Observation and Geoinformation*, Volume 67, 2018, Pages 10-19, 2018.

8. Kherani, E. A., Bharuthram, R., Maharaj, S.K. Growth of plasma waves of scales longer than 10 km by gradient-drift instability in the E-region of equatorial ionosphere. *Physics of Plasmas* 25, 072902, doi: 10.1063/1.5034018, 2018.

9. Kotzé, P. B., Hermanus Magnetic Observatory: a historical perspective of geomagnetism in southern Africa, *History of Geo- and Space Sciences*, 9, 125-131, https://doi.org/10.5194/hgss-9-125-2018, 2018.

10. Lotz, S. I., Clilverd, M. A. Demonstrating the use of a class of min-max smoothers for D region event detection in narrow band VLF phase. *Radio Science*, 54. https://doi.org/10.1029/2018RS006701, 2019.

11. Malahlela, O. E., Adjorlolo, C., Olwoch., J.M. Mapping The Spatial Distribution Of LippiaJavanica (Burm. F.) Spreng Using Sentinel-2 and Srtm-derived Topographic Data in MalariaEndemic Environment. *Ecological Modelling*, 392:147–158. 2019.

12. Malahlela O.E., Adjorlolo C., Olwoch J.M., Kganyago M.L., Mashalane M.J. Integrating geostatistics and remote sensing for mapping the spatial distribution of cattle hoofprints in relation to malaria vector control. *International Journal of Remote Sensing*, 2019.

13. Malahlela, O.E., Oliphant, T., Tsoeleng, L.T., Mhangara, P. Mapping chlorophyll-a concentrations in a cyanobacteria- and algae-impacted Vaal Dam using Landsat 8 OLI data. *South African Journal of Science*, 114(9-10), 1-9. 2019.

14. Mahmoudian, A., Senior, A., Scales, W. A., Kosch, M. J., Rietveld, M. T. Dusty space plasma diagnosis using the behavior of polar mesospheric summer echoes during electron precipitation events. *Journal of Geophysical Research: Space Physics*, 123. https://doi.org/10.1029/2018JA025395, 2018.

15. Martinis, C., Baumgardner, J., Mendillo, M., Wroten, J., MacDonald, T., Kosch, M., Lazzarin, M., Umbriaco, G., First conjugate observations of medium-scale traveling ionospheric disturbances (MSTIDs) in the Europe-Africa longitude sector. *Journal of Geophysical Research: Space Physics*, 124. https://doi.org/10.1029/2018JA026018, 2019.

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18. Mungufeni, P., Habarulema J.B., Migoya-Orué, Y., Jurua, E., Statistical analysis of the correlation between the equatorial electrojet and the occurrence of the equatorial ionisation anomaly over the East African sector, *Annales Geophysicae*, 36, 841-853, 2018.

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