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Contribution by South Africa

to the CSTD 2019-2020 priority theme on “Exploring space technologies for sustainable development and the benefits of international research collaboration in this context

## INTRODUCTION

Since 1994 South Africa has had to face many challenges due to legacy of apartheid. The Government, through its National Development Plan has identified the need to increase economic growth. The current overarching priorities of Government for strong, sustainable and inclusive growth are:

- Poverty alleviation;
- Address inequality and
- Job creation.

The government has identified areas that satellites can play a significant role to enhance their contribution to the GDP. They include, (i) agriculture and agro-processing; (ii) private sector investment; (iii) stimulating small, township and rural enterprises; (iv) Operation Phakisa (ocean's economy); and (v) energy security. Therefore, Space Science and Technology will make an immense contribution to the National Development Plan particularly in addressing the geospatial legacies of apartheid and alleviating the triple challenges of inequality, poverty and unemployment.

In 2008 the Department of Trade and Industry developed the National Space Policy followed by the Department of Science and Innovation (DSI)-led development of the National Space Strategy (NSS), which aims to promote the development and application of space science and technology for the socio-economic benefit of the country. The NSS stems from the DSI's Ten Year Innovation Plan (TYIP) which identifies space science and technology as one of the five grand challenges. The space grand challenge set out to achieve the following outcomes:

- Establish a National Space agency
- Ensure independent Earth observation high-resolution data from a constellation of satellites designed and manufactured in Africa;
- Have in place a 20-year launch capability plan;
- Specify and co-built a domestic/ regional communications satellite and secure a launch slot and ITU slot for its operations;

- Become the preferred destination for major astronomy projects; and
- Construct a powerful radio-astronomy telescope

## NATIONAL SPACE PROGRAMME

The South African Government recognises the potential role of space science and technology to deliver on a wide spectrum of our national priorities, including job creation, poverty reduction, resource management and rural development.

In 2008 the Department of Trade, Industry and Competition (DTIC) developed the National Space Policy followed by the Department of Science and Innovation (DSI)-led development of the National Space Strategy, which aims to promote the development and application of space science and technology for the socio-economic benefit of the country.

The primary rationale for the national space programme is to leverage the benefits that space science and technology can deliver to a host of socio-economic applications. This rationale remains central to the National Space Strategy, for which the strategic context is highlighted below.

### Goals

The space programme will be aligned with three primary goals, namely –

1. to capture a global market share for small to medium-sized space systems in support of the establishment of a knowledge economy through fostering and promoting innovation and industrial competitiveness;
2. to empower better decision making through the integration of space-based systems with ground-based systems for proving the correct information products at the right time; and
3. to use space science and technology to develop applications for the provision of geospatial, telecommunication, timing and positioning products and services.

**Objectives**

*The objectives to be realised through implementation of the Strategy are –*

- *developing the local private space science and technology industry sector;*
- *developing services and products that can respond to user needs;*
- *developing an export market for specific equipment for satellites or services offered from existing facilities;*
- *organising some of the current space science and technology activities into strategic programmes;*
- *optimising the organisation of future space activities to respond to opportunities with international industrial partners or international space agencies;*
- *creating partnerships with established and developing space-faring countries for industrial and capacity development purposes;*
- *strengthening training and technology transfer programmes, including the sharing of experience and expertise;*
- *promoting space science and technology in academic institutions and science centres and the providing opportunities for both short-term and long-term training and education;*
- *responding to challenges and opportunities in Africa;*
- *advocating the importance of space science and technology as a priority measure for meeting national developmental needs; and*
- *building local awareness of space science and technology and its benefits.*

For the goals and objectives to be realised, there is a need to develop the main components of the space value chain and these include the satellite segment and the assembly, integration and testing facility, ground infrastructure and launching or rocket engines.

**SATELLITE DEVELOPMENT PROGRAMME**

South Africa, much like other countries around the globe, relies incalculably on space- and ground-based data for information relating to the various interconnected thematic areas that have been mentioned in this document. This information is used to provide direction for maintenance, development and security measures to be taken by Government with regards to the nation's resources. Much of this space-based data is obtained from affiliating countries that are technologically more independent in terms of space-based applications and hence, can distribute their information to other countries. By investing in and managing our own satellite programme, we can ensure that the information we receive is more reliable and locally-specific to whichever area that requires attention.

The opportunity cost of not investing in the satellite programme will result in (i) South Africa lagging behind in its global space capability and its leading position on the African continent; (ii) the erosion of a solid skills and technology base; (iii) the degradation of high-tech infrastructure and facilities; (v) over-reliance on foreign parties for space applications including our national security; (vi) and an inability to seize opportunities offered by a rapidly growing space market.

A solid base has now been established to initiate a vibrant satellite build programme called African Resource and Environmental Management Constellation (ARMC) with the Nano-satellite programme being used as a technology platform to respond to immediate challenges such as Operation Phakisa. These new initiatives will require an investment of R1.5 billion to ensure that South Africa's leadership position in space science and technology is maintained in the African continent, as we continue to develop critical skills and modernise our existing facilities and build the requisite space infrastructure. The EOSAT1 programme is receiving R335 million but R1.5 billion required.

**HOUWTEQ AIT FACILITY UPGRADE**

One of the phases envisaged during the establishment of the South African National Space Agency (SANSA) entailed the acquisition and migration of the Assembly, Integration and Testing (AIT) facility at Houwteq as one of the key infrastructures available for the space programme. The Department of Science and Innovation (DSI) had therefore communicated to the Department of Public Enterprise, Denel (Pty) Ltd, and the Department of Public Works (DPW) the intention to acquire the facility.

South Africa had built some infrastructure that is mission critical for satellite build programme. A key facility in the realisation of the EOSat-1 is the Assembly Integration and Testing (AIT) facility at Houwteq, Grabouw in the Western Cape. The facility was established in the mid 1980's to support the South African Air Force space programme. It was equipped with all the instruments for satellite integration relevant at the time: a clean room, the biggest anechoic chamber in the southern hemisphere to date for electromagnetic interference (EMI), electromagnetic compatibility (EMC) and a vacuum and thermal stress test chamber. The facility furthermore has a vibration table that can test satellites up to one ton and gantry crane that has the capacity to handle up to a 23-tonne satellite, space station component, or spacecraft.

The space industry audit of 2007 revealed that the Houwteq facility still retains the capability to become an efficient centre for the integration and testing of space applications provided that adequate funding is made available for upgrade, appointing and training of staff and for the development of appropriate processes.

## LAUNCHING CAPABILITY

In 2009, after the launch of SumbandaSat in Kazakhstan, Minister proposed that the DSI investigate and develop a 20-year launching technology capability plan for South Africa.

The plan would advise the DSI with regard to the launching capability, and the opportunity cost if South Africa is not involved in launching satellites services and continual dependence on International partners to launch her satellites.

The space program lost most of its momentum in the last years before the transition to the new democracy and was cancelled in 1993. At about this time South Africa joined the MTCR and as part of this process had to destroy the capability to develop, test, and manufacture launch vehicles. It also resulted in restrictions on the sale and application of technologies developed under the space program. Most facilities were closed and personnel laid off, being scattered to other and mostly unrelated industries. The Overberg Test Range, which has a launch platform, is one of the legacy facility remaining and is currently used to test sounding rockets.

The recognition of the strategic importance of access to space and the potential of Space Science and Technology (SST) as a contributor in addressing our economic and social priorities has been identified as an imperative component in the space value chain to enhance South Africa's capability in the space arena. SST is regarded as one of the drivers for job creation, poverty reduction, and sustainable resource management.

## EXPLORING SPACE TECHNOLOGIES FOR SUSTAINABLE DEVELOPMENT AND THE BENEFITS OF INTERNATIONAL RESEARCH COLLABORATION IN THIS CONTEXT

The United Nations Office for Outer Space Affairs works to promote international cooperation in the peaceful use and exploration of space, and in the utilisation of space science and technology for sustainable economic and social development. Space technologies have an impact on almost all aspects of development.

Economic development, social development and environmental protection form the three pillars of sustainable development. Politicians, academics and leaders in business and science are challenged, to use this framework to create lasting, economically effective and healthy societies in a world with finite resources.

The role of industry in the access to space is increasing and strengthening the co-operation with the space industry is a way to increase the opportunities for developing countries to access space technologies and services. The UNCSTD session shall provide inputs on potential areas for partnerships considering the needs of developing countries, in particular Africa;

- Propose actions to progress in the definition of pilot projects that could foster collaboration;
- Promote collaboration in capacity-building at regional and international levels;
- Exploring the role of space industry in cooperation on the use of space for global health; and
- Exploring the role of space industry towards building resilient space technologies and applications.

**Earth observation**

Space imagery is a cost-effective way of obtaining unbiased and essential data on the physical world. Decision makers use this information to understand trends, evaluate needs, and create sustainable development policies and programmes in the best interest of all populations.

All States, particularly those with relevant space capabilities and with programmes for the exploration and use of outer space, should contribute to promoting and fostering international cooperation on an equitable and mutually acceptable basis. In this context, particular attention should be given to the benefit for and the interests of developing countries and countries with emerging space programmes stemming from such international cooperation conducted with countries with more advanced space capabilities.

**In Agriculture:**

Agriculture forms the basis of the world's food supply. Soil conditions, water availability, weather extremes and climate change can represent costly challenges both to farmers and to the overall food security of populations. Space-based technology is of value to farmers, agronomists, food manufacturers and agricultural policymakers who wish to simultaneously enhance production and profitability. Remote sensing satellites provide key data for monitoring soil, snow cover, and drought and crop development. Rainfall assessments from satellites, for example, help farmers plan the timing and amount of irrigation they will need for their crops. Accurate information and analysis can also help predict a region's agricultural output well in advance and can be critical in anticipating and mitigating the effects of food shortages and famines.

**In Health:**

In the 21st century, health challenges can transcend both national borders and traditional approaches to medical science. Medical professionals, public health and policy authorities, human rights advocates, environmental scientists and technological experts are increasingly collaborating to work towards the common aim of improving health for people worldwide. In recent years, space-based technologies have played a growing role in furthering global health objectives. Information from remote sensing technologies is, for instance, applied to study the epidemiology of infectious diseases. Data is used to monitor disease patterns, understand environmental triggers for the spread of diseases, predict risk areas and define regions that require disease-control planning.

**In Disaster management:**

A disaster is a serious disruption to the functioning of a community or society. Disasters cause human, material, economic and environmental losses that exceed a community's ability to cope using its own resources. In the past years, there has been an increase in the frequency, intensity and unpredictability of disasters, such as earthquakes, hurricanes, floods, landslides and wildfires. Disaster management aims to lessen the impacts of disasters, minimising losses of life and property.

**In Education:**

Access to education increases economic prospects, broadens opportunities for social mobility, and contributes to the empowerment of women and young girls. While remote and rural communities have traditionally struggled with access to education, space-based technologies, such as satellite communications technologies (e.g. VSAT), are helping to bridge this access gap.

**In Communication:**

Daily life for a large portion of the world's population now involves sharing information via mobile phones, personal computers and other electronic communication devices. Space-based technologies, namely communications satellites, enable global telecommunications systems by relaying signals with voice, video and data to and from one or many locations. While Earth-based alternatives to space technologies are sometimes possible, space-based technology can often reduce infrastructure requirements and offer more cost effective service delivery options. For instance, instead of constructing a series of transmission and relay towers to broadcast television programmes to far-to-reach places, one satellite dish could be provided to a remote community to pick up broadcast signals sent from a satellite.