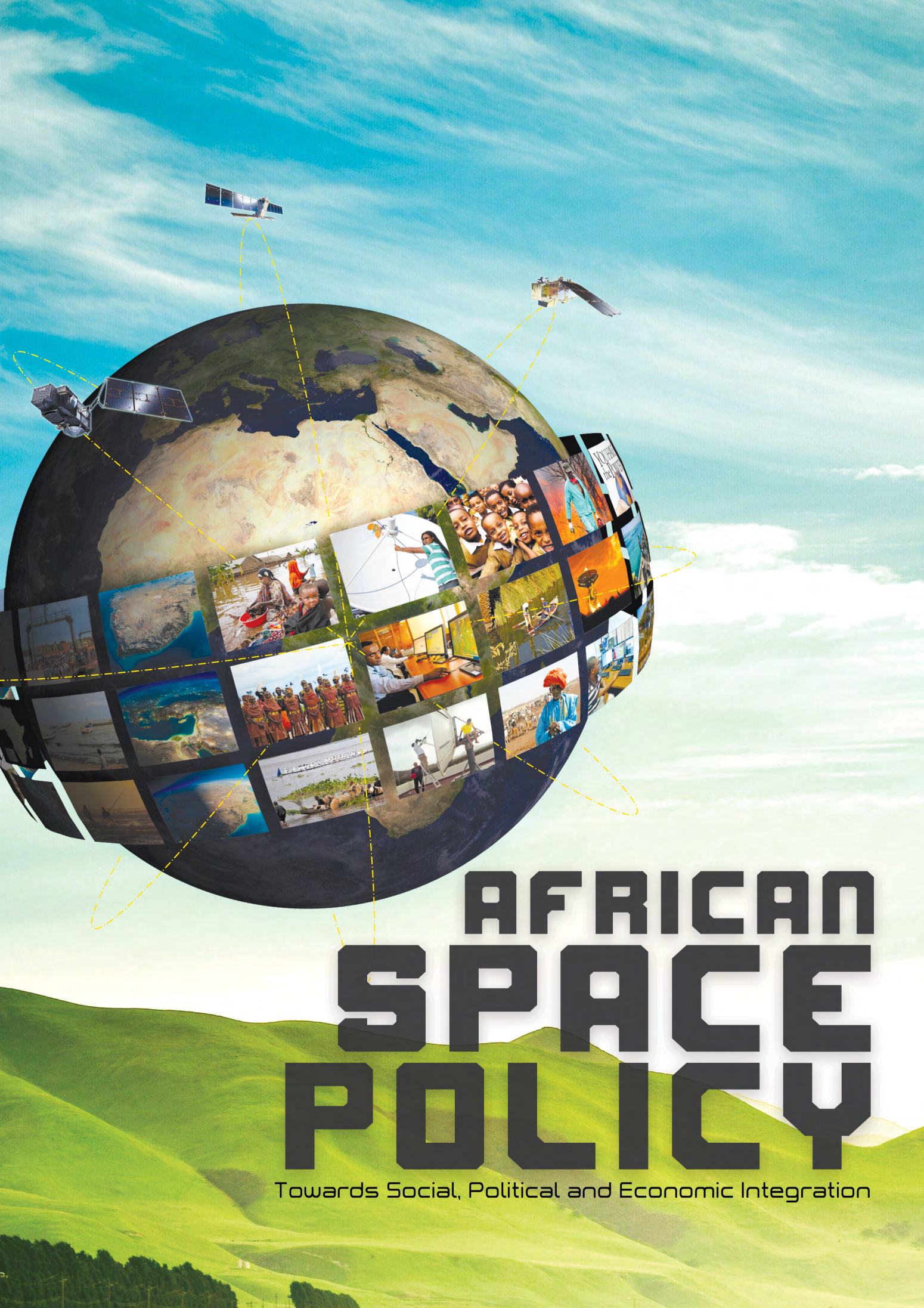


# AFRICAN SPACE POLICY

Towards Social, Political and Economic Integration

This document is prepared by the African Union Commission (AUC) Department of Human Resources, Science and Technology (HRST).

# CONTENTS

# FOREWARD

Africa's Aspirations for the upcoming 50 years and as stated in the Agenda 2063 reflect Africans' desire for shared prosperity and well-being, for unity and integration, and for a continent of free citizens and expanded horizons, where the full potential of women and youth, boys and girls are realized, and with freedom from fear, disease and want. Realizing the seven aspirations of the Agenda 2063 requires focus on addressing Africa's current development issues and challenges specifically with respect to its economic pillars that are agriculture, natural and water resources, energy, blue economy and digital infrastructure. Moreover in Africa, we continue to be confronted with challenges of climate change and variability, natural and anthropogenic disasters and environmental degradation, which have negatively impacted agricultural production, economic productivity and socio-economic infrastructures.

These and other pressing realities facing the continent prompted the African Union to formulate the Science, Technology and Innovation Strategy (STISA 2024), which is an important intervention for using science, technology and innovation to respond to the key priorities of the continent and realize Africa's aspirations. On January 31, 2016, the African Union Heads of State and Government adopted the first African Space Policy and Strategy as one of the key mechanisms for implementing STISA 2024.

It is clear that space science and technology is an important tool for ensuring the sustainable use of natural resources and the creation of high-technology industrial sectors. Furthermore, it makes a considerable contribution to the creation of enabling environments for addressing a wide range of pressing challenges, including the need to create jobs, reduce poverty, manage resources sustainably, and develop rural areas. A formal space sector will assist Africa to realise the vision of a peaceful, integrated, and prosperous continent.

It therefore gives me great pleasure to introduce the African Space Policy, which is the first in a set of instruments that will help us to formalise Africa's space programme. This policy provides the guiding principles for a sustainable and fully effective space programme that will serve the needs of the African continent.

**H.E. Prof. Sarah Anyang Agbor**
Commissioner for Human Resources,
Science and Technology

# GLOSSARY

## Data democracy

Provision of wider and easier access to geospatial data, software tools for manipulating data and capacity building, education and training

## Data integrity

Maintaining and assuring the accuracy and consistency of data over its entire life cycle

## Earth observations

Gathering of data and information about Earth's physical, chemical, meteorological and biological systems using in situ, aerial and space-borne platforms to monitor and assess the status of, and changes in, the natural and built environment

## Global navigation satellite system

Constellations of Earth-orbiting satellites that broadcast their locations in space and time, of networks of ground control stations, and of receivers that calculate ground positions by triangulation

## Navigation and positioning

The determination of position and direction

## Remote sensing

Acquisition of information about an object or phenomenon without making physical contact with the object

## Satellite communications

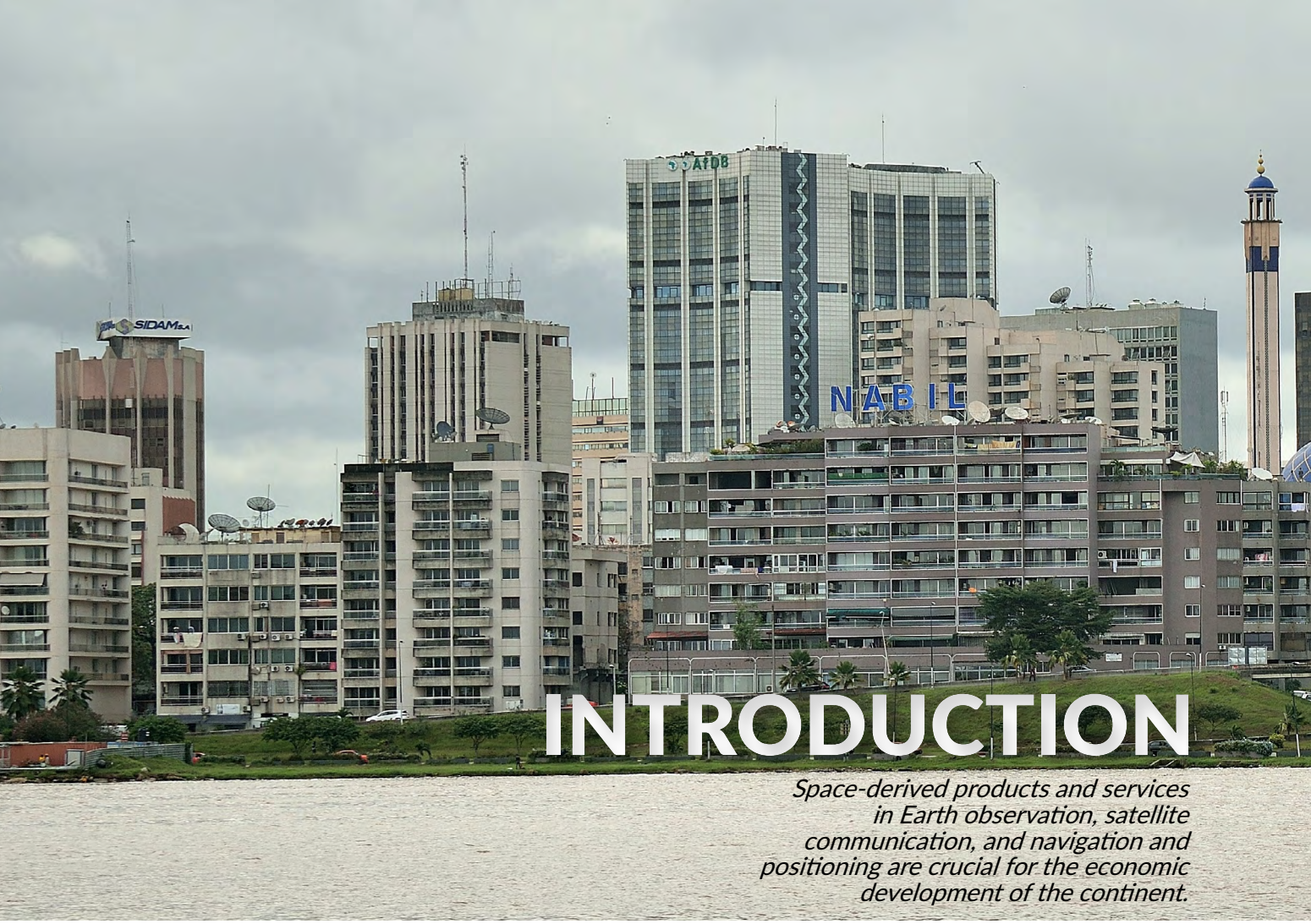
Artificial satellites placed in space for the purpose of telecommunications

## Satellite systems

Artificial objects comprising computer-controlled systems that attend to many tasks, such as power generation, telemetry, altitude control and orbit control

## Space exploration

Exploration and discovery of outer space using a variety of technologies




# INTRODUCTION

*Space-derived products and services in Earth observation, satellite communication, and navigation and positioning are crucial for the economic development of the continent.*

As a developing continent, Africa has a significant socio-economic growth potential compared to developed regions of the world. However, this growth potential needs to be realised in a sustainable manner when drawing on the people and the abundant resources of the continent. The prime intention of realising this potential on the African continent should always be directed toward the improvement of the quality of life and the creation of wealth for all its citizens through knowledge generation and exploitation, and the development of congruent economic activities. Experiences in other parts of the world show that space science and technology provide an ideal platform to support the development of a knowledge-based economy. For example, in the United Kingdom, space services contribute to a number of societal benefits, and currently generate £7 billion annually, supporting over 70 000 jobs[1].

Space science and technology, and the many practical benefits that can be derived from their application, have played a significant role in international, regional and national economic and social development efforts. Space presents a unique opportunity for cooperation in using and sharing enabling infrastructure and data towards the proactive management of disease outbreaks, natural resources and the environment, responses to natural hazards and disasters, weather forecasting, climate-change mitigation and adaptation, agriculture and food security, peacekeeping missions and conflict resolution.

Used as tools for peace, satellites have been instrumental in resolving major differences among nations in the last century, and continue to contribute to the reduction of tensions that might lead to wars. Satellite-derived information also forms the backbone of the United Nations Security Council decisions on several conflicts around the world.

Space-derived products and services in Earth observation, satellite communication, and navigation and positioning are crucial for the economic development of the continent. While some of these products and services have helped to meet the social and economic needs of the continent, Africa does not have the full technical know-how to participate independently in these space-related activities. If Africa is to leapfrog into the technological advancements of the 21st century, the continent needs to develop an adequate number of indigenous space scientists, engineers and related professionals who will actively contribute to finding solutions to continental problems.

New applications for space science and technology are constantly being discovered, and spin-offs from space technologies have led to advancements in such diverse fields as medicine, materials science and computers. Exploiting these applications and technological advancements for Africa's social and economic development would bring many benefits. However, the high cost of participating in space activities has hindered many countries, particularly those on the African continent, from taking full advantage of the practical benefits that space science and technology offer.

[1] *Extracted from Satellite and Space Services – Intellect Technology Association, UK, Intellect Publication, 2013*


*Space is benefiting Africa and its people in a number of ways. Access to transportation allows mobility, promotes commerce, and fosters education and health.*

Space is benefiting Africa and its people in a number of ways. Space applications are effective tools for monitoring and conducting assessments of the environment, managing the use of natural resources, providing early warnings of and managing natural disasters, providing education and health services in rural and remote areas, and connecting Africa with people around the world and is also heavily employed in transportation services, which is another essential component of sustainable development in Africa. Access to transportation allows mobility, promotes commerce, and fosters education and health. In many African countries, transport access routes and network quality are low . Space-related applications are widely used in agriculture, which remains an important economic sector in much of Africa. Space-based information systems play a significant role in risk reduction and disaster management on the African continent, which is heavily affected by natural and man-made disasters.

It is imperative that the benefits accruing from Africa's participation in continental-level space activities should promote the empowerment of women and the youth. If these two groups are healthy, educated and confident, they will contribute to the health and well-being of whole families, communities and nations. The promotion of the political, economic and social status of women and youth is a critical precursor for advancing the development of the African continent. Accordingly, priority attention will be given to ensuring gender equity and the involvement of young people in space-related activities. This imperative cuts across all policy principles and objectives advocated in this policy.

Africa has to build its capabilities in the following constellation programmes: Earth observation systems, navigation and positioning applications, and communications systems. In developing a continental space programme, Africa will not reinvent the wheel. There are some African countries that are in the process of developing their own space-related capabilities and programmes, and are building institutions to manage these programmes. These national efforts could be nurtured to contribute towards a continental programme, without diluting the focus of the national space programmes.

Currently, there are a number of fragmented initiatives that have a regional dimension. The pragmatic challenge is to bring all of these pockets of excellence together to create synergised, complementary programmes to foster collective actions towards Africa's development, and eventually enable the continent to be a global space player. There are only a few countries on the African continent that have established national space programmes. In many other African countries there is limited appreciation of the potential role and benefits of space in socio-economic development. There is thus a clear and urgent need to build awareness among the political, scientific and industrial leadership of African countries on the importance of introducing space education, which, in turn, will assist in the development of space programmes and related industries.

The use of space for development presents many opportunities that Africa cannot afford to ignore. The benefits of space science and technology need to be made available to all African countries, and there is a growing need for Africa to adopt a policy framework that guides the implementation of a continental space programme to enable the continent to develop and exploit its space resources in a more coordinated and systematic manner, with the overarching objective of contributing to Africa's socio-economic development.

# *Benefits of* SPACE SCIENCE *and* TECHNOLOGY

Humanity is facing major challenges in ensuring the adequate provision of basic necessities, such as food, shelter, a clean and healthy environment and proper education for the growing population. Africa can only hope to address these challenges through sustainable development – or yet further challenges will arise. Political, social and economic commitments will be effective only if there is a regional partnership for sustainable development and if the available resources are equitably allocated.
Earth observation/remote-sensing satellites use state-of-the-art instruments to gather information about the natural resources and the condition of Earth's interrelated land, sea, and atmospheric systems.
Located in various orbits, these satellites use sensors that can «see» a broad area and report very fine details about these systems and their interactions to provide information on, among other things, weather, the terrain and the environment. Satellite sensors receive signals in various spectral bands to provide vital information that is invisible to the naked eye. For example, these instruments can detect an object's temperature and composition, the wind direction and speed, and environmental conditions, such as erosion, fires and pollution.
Satellite navigation uses satellites as reference points to calculate positions that are accurate to within a metre. With advanced techniques and augmentations, satellite navigation can provide measurements that are accurate to a centimetre. Navigation and positioning receivers have been miniaturised and are becoming economical, making the technology accessible to everyone. For example, Global Navigation Satellite System (GNSS) receivers are currently built into cars, boats, planes, construction equipment and even laptops. Navigation and positioning, such as provided by the COSPAS-SARSAT System [3], is the main element for search and rescue. With appropriate augmentation systems, navigation and positioning satellites will enable gate-to-gate navigation and all weather capabilities for suitably equipped aircraft. GNSS is also being used, together with Earth observation applications, for the surveillance and monitoring of illegal shipping activities, such as unlawful fishing, oil spills and the ensuing environmental damage.
Satellite communication is a key technology that could enable developing countries to participate in the build-up of global information infrastructure. Research indicates that satellite-based wireless systems are the most cost-effective way to develop or upgrade telecommunications networks in areas where user density is lower than 200 subscribers per square kilometre. Such wireless systems can be installed five to 10 times faster and at a 50% lower cost than landline networks.
Technologies for education and training, in particular distance learning and multimedia technologies, may be instrumental in meeting the needs of African countries that have to train and integrate a large number of workers in widely dispersed and underserviced areas. Many African countries have to cope with large-scale disease outbreaks, and telemedicine may help to meet these challenges by improving the organisation and management of remote health care delivery. Satellite television broadcasting is another important application of space technology, and will help in improving access to information and to make the African voice heard worldwide. The Regional African Satellite Communications Organization (RASCOM) and other satellite systems with global or sub-regional coverage are currently providing a small proportion of these data services.

*[3]COSPAS-SARSAT is an international satellite-based search-and-rescue, distress-alert-detection, and information-distribution system, established by Canada, France, the United States, and the former Soviet Union in 1979. Five African Member States (Algeria, Madagascar, Nigeria, South Africa and Tunisia) currently provide location-related space-based search-and-rescue services, particularly for people and transportation systems in danger, e.g. air crashes, shipwrecks and automobile accidents.*

# POLICY GOALS

*The policy drivers for an African space programme are expressed through high-level policy goals, which are as follows:*

1. To create a well-coordinated and integrated African space programme that is responsive to the social, economic, political and environmental needs of the continent, as well as being globally competitive.

2. To develop a regulatory framework that supports an African space programme and ensures that Africa is a responsible and peaceful user of outer space.

# POLICY OBJECTIVES & PRINCIPLES

*During the implementation of the African space programme, the objectives below will need to be adhered to and achieved.*

## Objective 1:

### *Addressing user needs*

*To harness the potential benefits of space science and technology in addressing Africa's socio-economic opportunities and challenges. This will include the following:*

(a) To improve Africa's economy and the quality of life of its people. Although Africa is one of the wealthiest continents in terms of natural resources and has a relatively high economic growth, it is, however, one of the poorest in terms of per capita income, with a relatively low level of gross domestic product. Space applications will be used to address the socio-economic developmental needs of Africa by providing critical information for evidence-based management of human habitats, ecosystems and natural resources.

(b) To address the essential needs of the African market. Space-derived services and products will be applied to address the essential information needs of the African market. The space resources of the few African nations with space programmes should be used to provide technological know-how, data access and information dissemination, as well as operational services and products to nations in Africa that do not have space science activities to address the essential needs.

(c) To develop the requisite human resources for addressing user needs. Africa has the challenge of sustaining its space efforts and promoting the use of space technology services among all African nations. Meeting these challenges requires significant human capital development. Accordingly, Africa should develop and adopt essential space education programmes and tools needed to build its capacity and thus maintain the widespread use of space technologies for its development.

d) To develop products and services using African capacities. Space-derived services and products have to be developed primarily through African capacity and managed by Africans, so as to ensure sustained ownership of the space resources. This will ensure timely responses to our essential needs to improve sustainable development in Africa and thereby promote its economy, alleviate poverty and reduce risk hazards.

(e) To establish communities of practice. For each of the space application areas, it will be necessary to establish communities of practice for the sharing of experiences and best practices. These communities of practice will also assist in articulating the user needs and technical requirements for each of these areas. Such communities of practice will ensure the facilitation of space applications at grass-roots level, where it is most needed.

(f) To develop and enhance early warning systems on the continent. Africa is subjected to various extreme weather, climate, ecosystem and geological events such as tropical cyclones, heavy or lack of precipitation, heat waves, dust storms, red tides and tsunamis, which can lead to loss of life and property and hamper essential services. A combination of space applications will be used to improve, among other things, weather forecasts to develop a range of early warning systems (such as for monitoring flood, drought and health risks).

# Objective 2:

## *Accessing Space Services*

*To strengthen space mission technology on the continent in order to ensure optimal access to space-derived data, information services and products. This will include the following:*

(a) To use existing space infrastructure. Existing infrastructure will be used as a foundation for the development of new capabilities to support the delivery of products and services, research and development (R&D) and human capacity building. Such capabilities will be established in a complementary manner to reduce unnecessary duplication, provide a full range of space-related services, and, at the same time, ensure equitable access to services across the continent. This will enhance Africa's technical development, technology transfer, management of intellectual property rights, and international and intra-continental cooperation.

(b) To coherently develop, upgrade and operate cutting-edge African space infrastructure. As Africa develops its indigenous space industrial capability, it needs to ensure the coherent development, upgrade and operation of cutting-edge African space infrastructure that ensures optimal coordination, utilisation and cost-effectiveness. A technology roadmap therefore needs to be produced for the development and strengthening of Africa's industrial capability, underpinned by an appropriate governance structure that draws on both national and regional capabilities in a seamless manner.

(c) To promote capacity-building for the development of space services. The development of capabilities and capacities in space science and technology through existing related institutions should be supported to create an enabling environment for knowledge generation and exploitation, which will ensure optimal access to space services on the continent. The Pan African University Space Science Institute should be strengthened to cater for the space-related human resource requirements on the continent.

(d) To develop and increase our space asset base. The current space asset base on the continent is limited and it is therefore necessary to develop and increase this asset base to ensure optimal accessibility and interoperability. Any extension of the current space asset base should be premised on ensuring complementarities and minimising duplication. This core capability can only be optimally achieved if a culture of collaboration rather than competition is nurtured, and, where possible, Africa needs to draw on the competencies of existing national space programmes on the continent.

(e) To establish regional and sub-regional centres of space competencies. In order to ensure that the continent is appropriately capacitated and serviced in space science and technology, it is important that the varied interests and challenges of all regions of the continent are catered for. This will be accomplished through the establishment of regional and sub-regional centres of space competencies that have a localised span of control and links up with the continental space agenda. Priority should be given to the revitalisation and rationalisation of existing institutions and the optimal shared use of these assets should be promoted.

(f) To adopt data-sharing protocols. In line with spatial data infrastructure frameworks, data-sharing protocols need to be developed, adopted and implemented to ensure equitable access and data democracy that is cost-effective and acceptable to all Member States. The protocols will encourage Member States that have space assets to share data services and products with Member States that do not presently have such capacity, and ensure that data services and products are interoperable. This will encourage the commitment of all Member States to data gathering and sharing that facilitates the reuse of data in multiple applications.

# Objective 3:

## *Developing the regional market*

*To develop a sustainable and vibrant indigenous space industry that responds to the needs of the African continent. This will include the following:*

(a) To develop a globally competitive African space programme. Appropriate interventions should be put in place to ensure the global competitiveness of African space technologies, products and services. In order to achieve this, a continental space programme that meets globally accepted space industry standards will be established. The African space industry should demonstrate its ability and successes by ensuring a space heritage that will serve to attract a share of the global space market.

(b) To create an industrial capability. As African countries embark on the development of an indigenous space capability, supported by robust R&D initiatives, it is imperative that the core focus remains a people-centred, market-based industrial capability. Rightsizing the market-based industrial capability with the relevant human expertise and skills will ensure a cost-effective continental space programme. Free-market transactions should be encouraged on the African continent to effectively use the core industrial and human capability that is developed.

(c) To promote public-private partnerships. Public-private partnerships should be pursued in developing an innovative indigenous and sustainable space industry. These partnerships should draw on complementary capabilities and expertise through effective technology transfer and intellectual property management arrangements, at an intra-continental level. These partnerships should also be bolstered in collaborative R&D efforts that focus on the development of space services and products in response to market needs. In this regard, appropriate commercialisation frameworks and agreements should be put in place to service the regional and foreign export markets.

(d) To promote R&D-led industrial development. The technical capability and infrastructure should be used to support R&D and, in so doing, promote an innovative indigenous space industry. The space asset base is a precondition for a fully sustainable, efficient and effective industry, which also forms the basis for cutting-edge R&D that further promotes industrial development. Knowledge generated through R&D should also be translated, through support of an innovation value chain, into services and products for either commercial use or the public good.

(e) To use indigenous space technologies, products and services. Development of an African space market will take place both through the development of products and services for the public good and through the commercialisation of indigenous space technologies, products and services. In order to achieve this, it is imperative that we become intelligent users of space-acquired data, where such a use reflects and responds to the user needs of the continent. Hence, the development of technologies, products and services should respond to the African space market and be largely market-driven.

## Objective 4:

### *Adopting good governance &management*

*To adopt good corporate governance and best practices for the coordinated management of continental space activities. This will include the following:*

((a) To establish an organisational framework. African Member States will have to establish an organisational framework that will coordinate all African space activities and assets to serve the goals of this policy in an efficient and cost-effective manner. African countries with space science and technology experience will help less experienced African countries to access space services and applications, develop their space capabilities and promote human resources in space science, space engineering and space applications. The organisational framework should follow a bottom-up approach when working and providing appropriate levels of transparency and accountability that allow for equal opportunities among African Member States in accessing space products and services.

(b) To support the African space programme financially. Funding schemes for space activities should preserve the independence of the African space programme and thus guarantee the alignment of space activities with user needs. In order to develop and enhance its space capabilities, Africa should welcome collaboration and cooperation at an international level according to established rules and procedures. However, Africa should not rely on external donor funding to subsidise its space ambitions, since, the continent will be able to compete internationally (including in the African space market) only through its own committed space efforts. Financial support from African governments should therefore be the main funding source for space activities.

(c) To maintain an efficient and sustainable African space programme. Efficient monitoring and evaluation will be needed when the African space programme is implemented. Africa should therefore adopt key performance indicators for regular reviews to ensure best-fit capability-building initiatives, as well as up-to-date services and products to address user needs.

(d) To promote knowledge sharing. Knowledge sharing is one of the main strategic tools that will ensure the sustainability of an indigenous space sector. Knowledge should be disseminated over the African continent under a framework that promotes the development of an African space market. The same framework will have to control space-based intellectual property exchanges to ensure proper usage and avoid improper dissemination.

(e) To conduct and maintain an awareness campaign. Space science and technology and the associated applications that provide socio-economic benefits are not generally appreciated by all African Member States. Hence, there is a need for a significant awareness campaign that will educate and inform African decision makers, politicians and the public of the benefits of space science and technology. It is vitally important that the awareness campaign promotes collective buy-in and ownership of an African space programme.

(f) To monitor and evaluate space activities. The organisational framework adopted should clearly state the monitoring and evaluation procedures that will ensure compliance and achievement of the broad objectives set for an African space agenda. The procedures should set and monitor proper return on investment, significant investment in people, best resource utilisation, proper funding approaches, and an efficient risk management and mitigation strategy.

## Objective 5:

### *Coordinating the African space arena*

*To maximise the benefit of, current and planned, space activities, and avoid or minimise the du-plication of resources and efforts. This will include the following:*

(a) To commit funds to optimise and improve effectiveness. Space technology has many benefits, but the high capital cost is a significant barrier to entry. Therefore, Africa's developed space nations should make their assets and space resources available and African Member States should commit funds to optimise and improve the required space operations and associated services and products.

(b) To harmonise and standardise all infrastructure. African Member States will need to harmonise and standardise all infrastructure to ensure the interoperability and seamless integration of space-based and ground-based segments. It is only through such harmonisation and standardisation that all African Member States will benefit optimally from space applications, as it provides a platform for the sharing of experiences, knowledge, and technology transfer.

(c) To regulate space activities. The African space programme will need to be regulated in order to guarantee that strategic objectives are attained. Conflicts of interest will need to be managed to best serve African interests. A regulatory environment will have to be established to allow industrial entities to access space technologies and to promote African commercial private sector participation in the space arena. This regulatory framework will need to be developed and implemented to ensure effective compliance with international treaties and conventions, with the necessary levels of transparency. The African space programme should be compliant with national, continental and broader international laws and regulations.

(d) To secure the space environment for Africa's use. A prime responsibility in relation to continental space activities is to ensure that wavelength spectrums, orbital locations, quiet areas for radio astronomy and other assets and rights, are secured for current and future continental and national space activities in Africa. Representation on international bodies such as the International Telecommunication Union will be important.

(e) To preserve and maintain the long-term sustainability of outer space. During the implementation phase of the continental-level space programme, it is prudent that we exercise commitment and act responsibly in preserving and maintaining the long-term sustainability of outer space. Transparency and confidence-building measures should be enforced to minimise the effects of space debris, thus preserving the space environment for future generations.

## Objective 6:

### *Promoting intra-Africa & other international cooperation*

*To promote the African-led space agenda through mutually beneficial partnerships. This will include the following:*

(a) To promote intra-continental partnerships. Intra-continental partnerships should be promoted to leverage national strengths, activities and programmes. Such partnerships remain central to endeavours relating to human capital development, infrastructure development and the development of an indigenous space industry sector. These partnerships would also need to foster African regional collaboration, where the regional needs are primarily addressed.

(b) To forge international partnerships. Space science and technology is a global endeavour and therefore Africa should strive to be involved in international projects from which new knowledge can be acquired and exploited. In addition, where capability gaps exist, these should be accessed through international partnerships, either through technology know-how and transfer or the use of international facilities. Joint research, development and innovation initiatives should be a core focus of international partnerships.

(c) To foster partnerships across all sectors. Joint collaboration and synergy among academia, industry and government in all fields of space science and technology in Africa should be fostered in order to ensure comprehensive involvement by all sectors. All sectors will need to work in concert to deliver an efficient and effective African space programme. An enabling environment should be created to ensure a transfer of scarce skills and knowledge between different economic sectors.

(d) To facilitate equitable partnerships. A key driver to ensuring the development of an indigenous space capability and capacity will be the level of equity maintained by the African space programme. The principle of equal partnerships should be pursued in developing the African market, and also taken into account when leveraging strategic international partnerships to address technological gaps.

(e) To ensure a reasonable and significant financial and/or social return. All international partnerships should be based on mutually beneficial outcomes and should also ensure acceptable socio-economic returns for the African continent. Such strategic partnerships should also be premised on the notion of technical excellence that will help to further strengthen Africa's space asset base and capabilities.

(f) To influence international agreements. In our pursuit of an indigenous space capability, it is important that we observe all appropriate international treaties, conventions and agreements. Where such international agreements are considered for implementation, it is crucial that a consolidated African position be heard that best serves an indigenous African space programme.

# CONCLUSION

This policy identifies the key policy goals that will drive the agenda for any formal space initiatives on the continent. The policy goals are supported by a set of objectives and principles that articulate important aspects that need to be addressed in developing and maintaining a viable and sustainable space programme. These policy objectives and principles form the core building blocks and the basis for all decisions and action of the African space programme.

This Policy is a guiding framework for the formalisation of an African space programme, and is complemented by the African Space Strategy and associated implementation plans, and governance structure.

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