Innovate UK | Global Alliance Africa

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THE VALUE OF SPACE TECHNOLOGY IN AFRICA

Driving international partnerships and delivering for communities

Released in November 2024

CONTENTS

LIST OF ACRONYMS

ACRONYM	FULL SPELLING
AFC	Africa Finance Corporation
AfDB	African Development Bank
AFIS	Advanced Fire Information Service
CEO	Chief Executive Officer
CSIR	Council for Scientific and Industrial Research
EO	Earth Observation
ESA	European Space Agency
EMDEs	Emerging Markets and Developing Economies
FAO	Food and Agriculture Organisation
FCDO	Foreign Commonwealth and Development Office
FCT	Federal Capital Territory
FDI	Foreign Direct Investment
FDPs	Farm Development Plans
GAA	Global Alliance Africa
GCRF	Global Challenges Research Fund
GDP	Gross Domestic Product
GIN	Global Innovation Network
GIS	Geographic Information Systems
GPEI	Global Polio Eradication Initiative
ICAO	International Civil Aviation Authority
JAXA	Japan Aerospace Exploration Academy
KSA	Kenya Space Agency
LEO	Lower Earth Orbit

ACRONYM	FULL SPELLING
NDC	Nationally Determined Contributions
NDP	National Development Plan
NST1	National Transformation Strategy (Rwanda)
PPPs	Public Private Partnerships
PRISE	Pest Risk Information Service
RSA	Rwanda Space Agency
SALT	Southern African Large Telescope
SANSA	South Africa National Space Agency
SatDRR	Satellite Enablement for Disaster Risk Reduction in Kenya
SDGS	Sustainable Development Goals
SKA	Square Kilometer Array
SPIN	Space Placements in Industry
STEM	Science, Technology, Engineering, Mathematics
UKRI	United Kingdom Research and Innovation
UKSA	UK Space Agency
UNDP	United Nations Development Programme
UNOOSA	United Nations Office for Outer Space Affairs

EXECUTIVE SUMMARY

Innovate UK Global Alliance Africa (GAA) is a six-year project funded by UK International Development through the Foreign, Commonwealth and Development Office (FCDO) and the Global Challenges Research Fund (GCRF). The project aims to build new and stronger UK-African partnerships to maximise the creation of inclusive market access, funding and investment opportunities through innovation, technology and knowledge transfer between the UK, Kenya, Nigeria and South Africa.

In 2024, GAA launched a flagship **UK-Africa Space Technology for Sustainability Global Innovation Network** (Space GIN) across the United Kingdom, South Africa, Kenya, and Rwanda. The initiative aims to foster innovation and international collaboration within the sector, leveraging the potential of space technology to drive sustainable development.

Space technology holds immense socio-economic potential for Africa, with its market valued at £16.16 billion in 2021 and projected to grow to £18.77 billion by 2026[1]. This growth, alongside the continent's population expected to surge to 830 million by 2050[2], presents a significant opportunity to leverage innovation for socio-economic advancement on the continent. The UK is a global leader in space technology, contributing significantly to the global space industry. In 2023, the UK space sector generated £18.2 billion in revenue, making it the largest space economy in Europe and the sixth largest globally[3].

Space technology is increasingly crucial in addressing societal and climate challenges, with applications that enhance agricultural productivity such as in boosting crop yields by up to 20% in Kenya[4]; and enabling connectivity for rural healthcare workers in Nigeria[5]. By further utilising space-based technologies, Africa can gain valuable insights, refine decision-making processes, and implement transformative solutions to pressing issues.

This study outlines the value of space technology sector in Africa. It details the current landscape, key strategies and impactful projects that enforce and inform GAA's commitment to advancing the continent's space capabilities through its Space GIN. It highlights the 'why' behind our work, improving access to advanced technologies, building local expertise and unlocking international collaboration within the space sector. By showcasing successful partnerships in and innovative applications of space technology, we aim to demonstrate its catalytic effect on future economic growth, social development, and climate change mitigation and adaptation in Africa.

Our strategic focus is on fostering collaboration between the United Kingdom, Kenya, Rwanda, and South Africa. Strong international partnerships between these geographies will support project development, enabling environments and commercial viability of doing business in the space sector in Africa. This document serves as a comprehensive guide to understanding the transformative impact of space technology across three strategic geographies in Africa and the potential for international business partnerships in the sector to support the sustainable development agenda.

1 Space in Africa, 2024
2 UN Economic Commission for Africa, 2022. Africa's Demographic Trends
3 UK Space Agency. 2023 UK Space Sector Report 2023
4 World bank, 2019. Earth observation for sustainable development.
5 UK government. 2023 www.devtracker.fcdo.gov.uk/programme/GB-GOV-13-GCRF-UKSA_NG_UKSA-039/summary

PART 1
OVERVIEW OF THE SPACE SECTOR IN AFRICA

Innovate UK Global Alliance Africa

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1.1 A valuation of the African space industry

The space industry has grown from its roots in government-led missions to a dynamic sector brimming with private enterprises, ambitious ventures, and cutting-edge technology[6]. While the US and other advanced economies have traditionally led the space race, Africa is also leveraging the power of space technology for innovation development and societal benefits.

In 2021, the valuation of the African space industry was £16.16 billion and is set to grow to £18.77 billion by 2026. Figure 1[7] below shows the largest market segments of the sector.

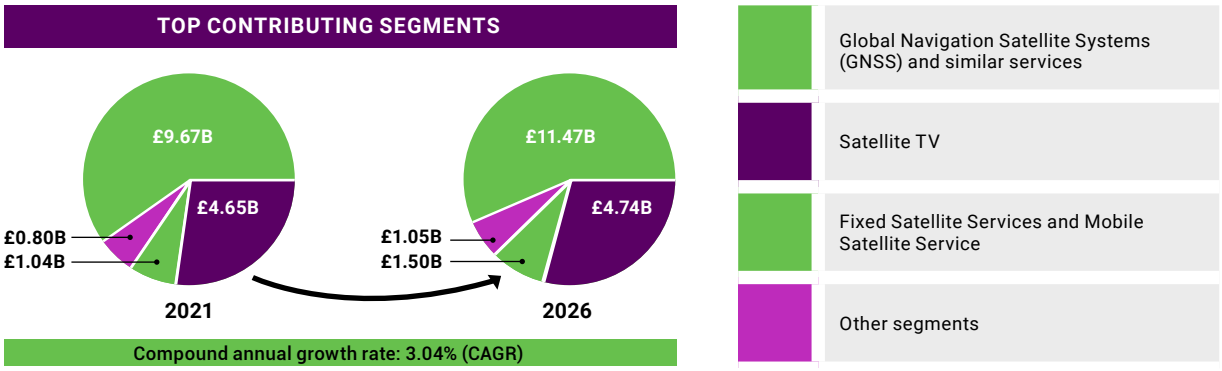

Figure 1: Market segments in the space industry in Africa[7]

In 2022, the Space industry provided over 19,000 jobs on the African continent[8]

To date, African governments have invested over £2.3 billion in the space industry over the last seven years, this figure does not include private sector investment or grant activities[9]. Figure 2 shows the year-on-year (government) budget from 2018-2024.

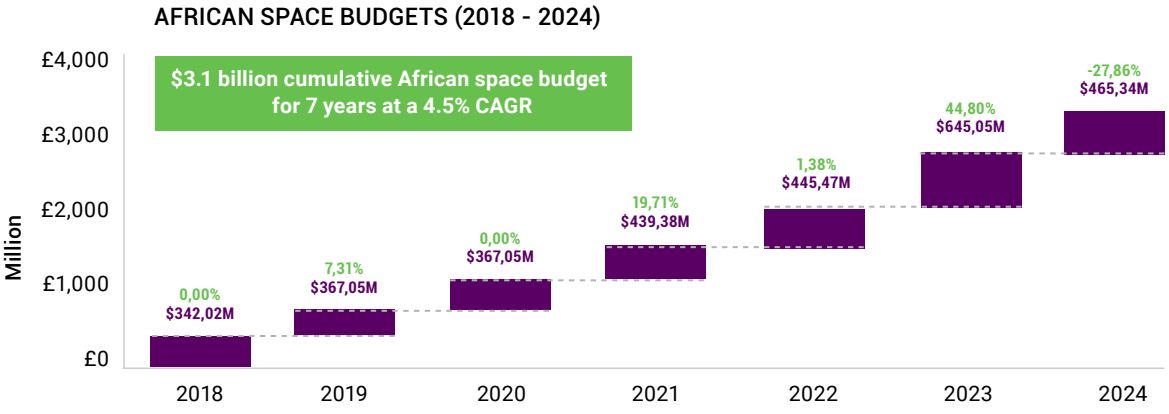

Figure 2: Space Industry Budgets - African governments[9]

6 Brukardt, R. How will the Space economy change the world? McKinsey & Co. 2024
7 Space in Africa, 2024
8 Space in Africa, 2024
9 Space in Africa, 2024

The decline in funding allocations for the space economy from 2023 to 2024 has been largely due to steep local currency devaluations in countries like Kenya, Zimbabwe and Nigeria[10]. In real terms, space sector budgets have increased year on year in local currencies. This trend shows the commitment of governments to continue investing in the development of the space sector, even in the face of other financial and economic challenges.

Collaboration has been beneficial in unlocking the value of Africa's space industry. With over 400 space institutions across the continent and more than 25 national space programmes, Africa is actively working to harness the industry's social and economic benefits. From 2000 to 2023, African nations entered into over 166 bilateral space agreements, involving more than 100 institutions from 32 countries globally. Notably, 90% of these agreements are with international, non-African stakeholders, reflecting the continent's strong focus on global partnerships. In the past three years alone, 89 new agreements have been signed, signalling a rapid increase in collaborative efforts[11].

1.2 Africa's space technology infrastructure

Space technology is a relatively nascent industry across most countries on the African continent, however, there remains a wide array of technologies developed and already in use in various applications. Figure 3 outlines the distribution of satellite ground infrastructure available on the continent. Figures 4 and 5 display the number of satellites launched across Africa by either African companies or governments and shows the proportion of large and small satellites being used for earth observation and communication services, respectfully.

WHY ARE THERE LARGE AND SMALL SATELLITES?

Large satellites, typically geostationary, are vital for broad applications like global telecommunications, weather monitoring, and broadcasting. Their size allows them to carry heavier payloads and more advanced instruments, enabling them to cover wide geographic areas from high orbits. For example, they support high-capacity, long-distance data transmission, making them essential for internet services, GPS, and large-scale environmental monitoring.[12]

Small satellites (or smallsats), on the other hand, are more agile, cost-effective, and suitable for targeted missions. Due to their smaller size, they can be produced and launched in clusters, often deployed in Low Earth Orbit (LEO). These satellites are invaluable for Earth observation, scientific research, and specialised communication needs. Smallsats offer flexibility, enabling frequent launches and quicker adaptation to emerging technologies. This makes them ideal for both commercial and academic use, allowing more players to participate in space-related activities at a lower cost.[13]

Together, large and small satellites are shaping the future of space exploration and commercial applications by balancing cost, capacity, and accessibility. Large satellites handle heavy, critical tasks, while small satellites excel in rapid, affordable innovation and targeted missions.

10 Adetola, A. 2023. African Space Industry Annual Report, 2023 Edition
11 Adetola, A. 2023. African Space Industry Annual Report, 2023 Edition
12 Amphenol aerospace. 2022. How small satellites are leading to big leaps in space
13 Newspace economy. 2024. Small satellites, Big Impact: Sustainability in the Space economy

Figure 3: Distribution of Ground Stations in Africa[14]

Over 353 satellite ground stations are in operation in Africa[15]. The stations are used for receiving and processing data from satellites, supporting communication networks, providing internet connectivity, facilitating remote sensing applications, and enabling satellite-based navigation and tracking.

[14] Space in Africa, 2024
[15] Space in Africa, 2024

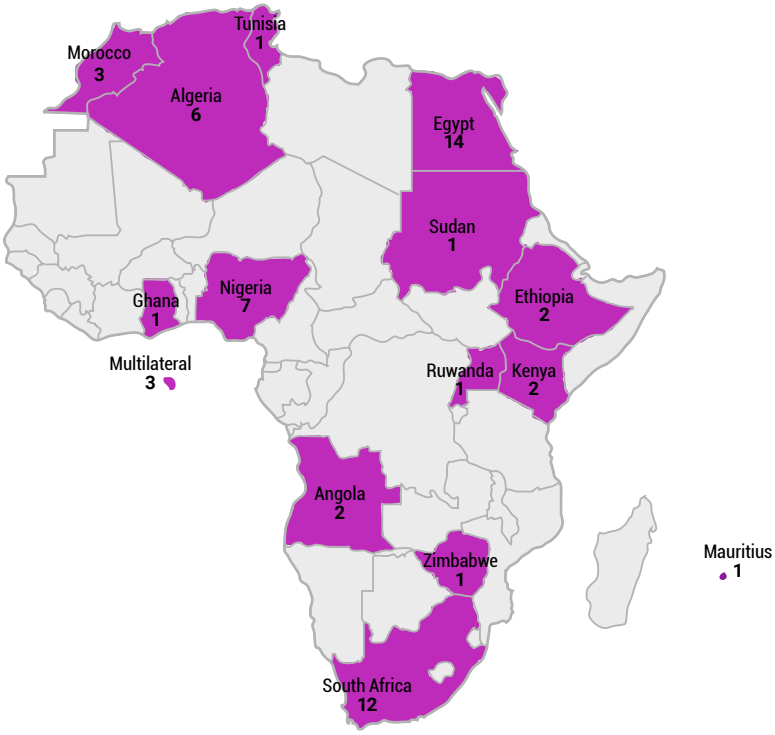

Figure 4: African countries that have launched a satellite[16]

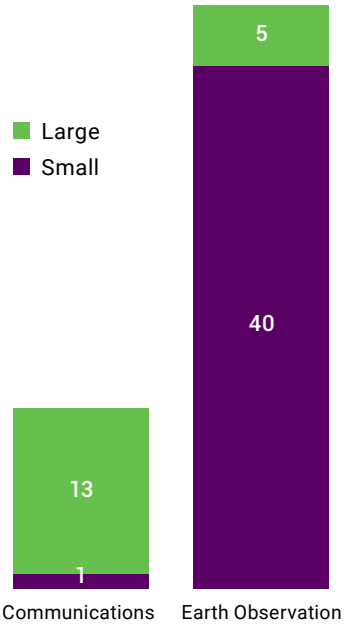

Figure 5: Mission and size of Africa owned satellites[16]

A total of 59 satellites have been launched by African nations, with an estimate of 110 African satellites launched by 2030[17]. South Africa and Egypt are the leading African countries with satellites in space (see Figure 4), driven by to their historic satellite capabilities and strategic applications in the telecommunications industry.[18] South Africa is the largest player in Sub-Saharan Africa, having launched 12 satellites, displaying its capacity for satellite deployment and signifying its leadership in African space technology. According to current plans, 24 countries in Africa will have launched a satellite by the end of the decade[19].

Rwanda and Kenya, although only displaying one to two satellites respectfully, show the emergence of their space programmes due to the youth of their industry. Both regions aim to leverage space technology for societal benefit, address developmental challenges while becoming a regional hub for space capabilities and activities[20].

Earth Observation relies heavily on the use of small satellites as demonstrated in Figure 5, with 40 missions dedicated to earth observation compared to just five large satellite missions. This trend reflects a broader global move toward cost-effective satellite solutions, particularly for environmental monitoring and resource management, areas where many African countries are focusing their efforts. South Africa's involvement in both communications and earth observation suggests its broad capacity, while Kenya and Rwanda are taking incremental steps, focusing more on specific needs like earth observation for national development[21].

16 Space in Africa, 2024
17 Space in Africa, 2024
18 Varada, P. 2022. Harvard International Review. The Space Race Expands: Why African Nations Are Looking Beyond Earth
19 Space in Africa, 2024
20 Rwanda Space Agency, 2023
21 Gopaldas, R. 2023. The State of the African Space Industry. Nanyang technological University.

1.3 Africa's budding NewSpace industry

"We're entering a new world in which data may be more important than software." Tim O'Reilly, Author

Data collected by satellites can provide significant value to the general population of Africa – the daily applications of and interactions with space data supports social, economic and commercial development[22]. For example, communication satellites are used for TV and radio broadcasting services; they provide internet and navigation services and can enable delivery of education and medical help in remote areas. Earth Observation satellites are used for agricultural monitoring, environmental and climate change tracking, disaster management, urban planning, and infrastructure development.

The variety of uses of data from space technology has birthed a new type of space industry, **NewSpace**, which refers to a community of new aerospace companies working to develop low-cost access to space or spaceflight technologies and advocates of low-cost spaceflight technology and policy[23].

The NewSpace industry emerged due to a combination of advancements in technology, declining costs of space access, and the rise of private investment in space activities. Governments, particularly NASA, played a pivotal role by fostering private-sector partnerships through initiatives like the Commercial Orbital Transportation Services (COTS) program, which encouraged companies to develop commercial capabilities for transporting cargo and crew to the International Space Station (ISS). Leading companies in this sector include SpaceX, Blue Origin, Rocket Lab and Planet Lab.[24]

22 Space in Africa, 2024
23 Martin, G. 2015. NASA. "NewSpace: The emerging Commercial Space industry https://www.earthdata.nasa.gov/s3fs-public/2023-11/newspace_nasa.pdf
24 Jones, A. 2024. Space.com. Looking ahead to the next 25 years of private space stations

Over 50% of all NewSpace companies in Africa are based in South Africa, Nigeria and Kenya. Figure 6 outlines some 494 NewSpace companies are at the forefront of leveraging space technology and its valuable data in Africa according to Space in Africa[25]. Of these, 462 are downstream focused, with only 32 working on upstream capabilities (these are shown in Figure 7 below), indicating the business viability potential of downstream capabilities.

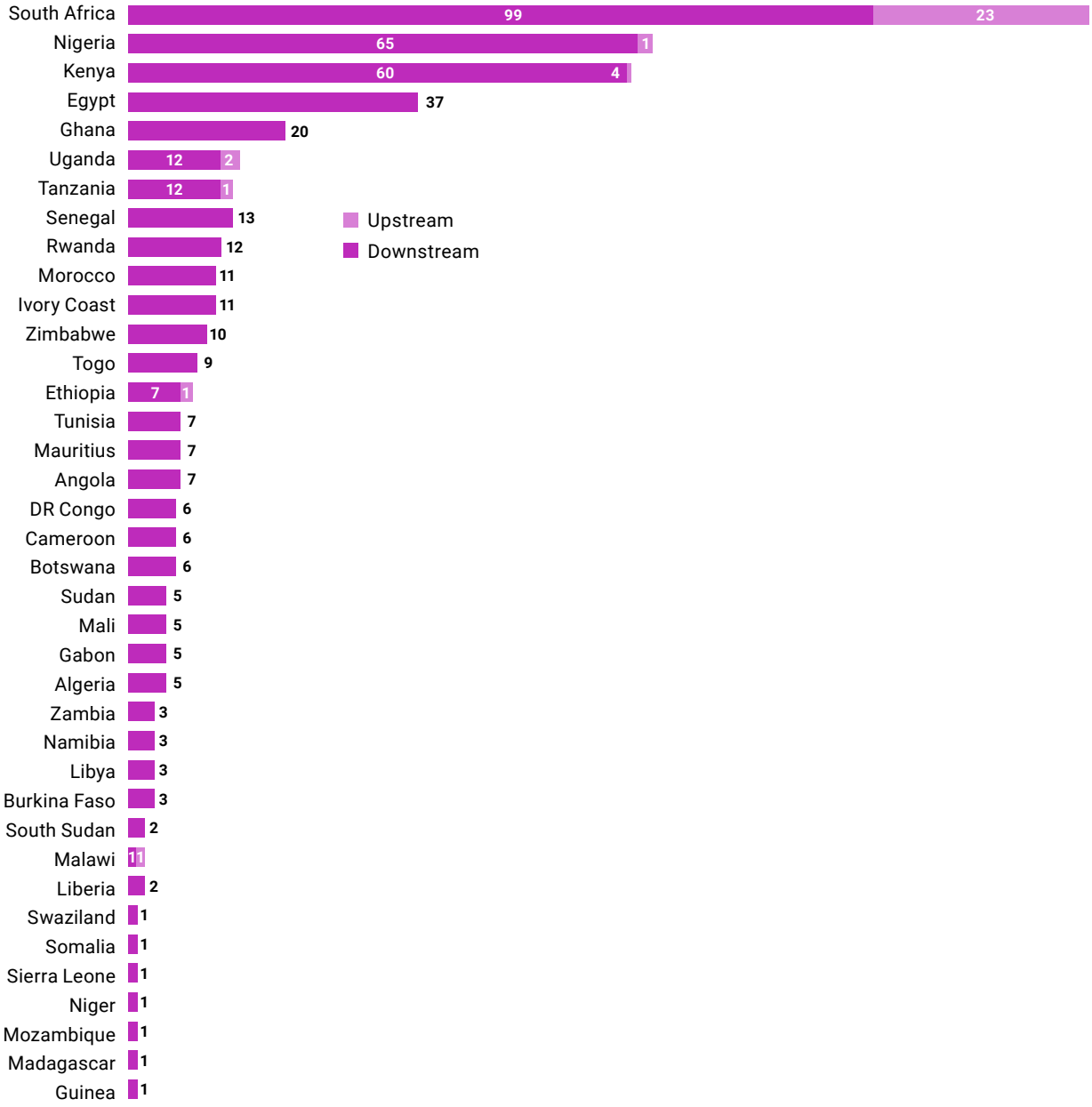

Figure 6: Geographical distribution of NewSpace companies in Africa[26]

[25] Space in Africa, 2024
[26] Space Republic, 2023

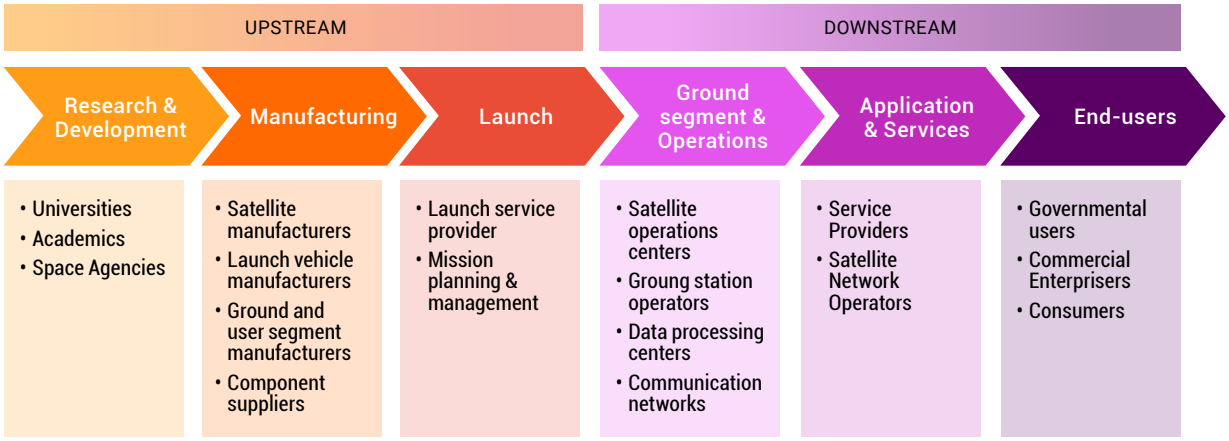

Figure 7: Diagram depicting the value chain of the Space economy[26]

With Africa's strong willingness in collaborations to address the continent's ongoing socio-economic challenges, there has been over 250 space technology application projects run across Africa, mostly funded by international, African, or intergovernmental organisations[27]. Figure 8 below provides a breakdown of the different space segments used in these application projects. The implementation of such programmes has supported NewSpace companies to adopt and commercialise space applications in Africa, as outlined in Figure 9.

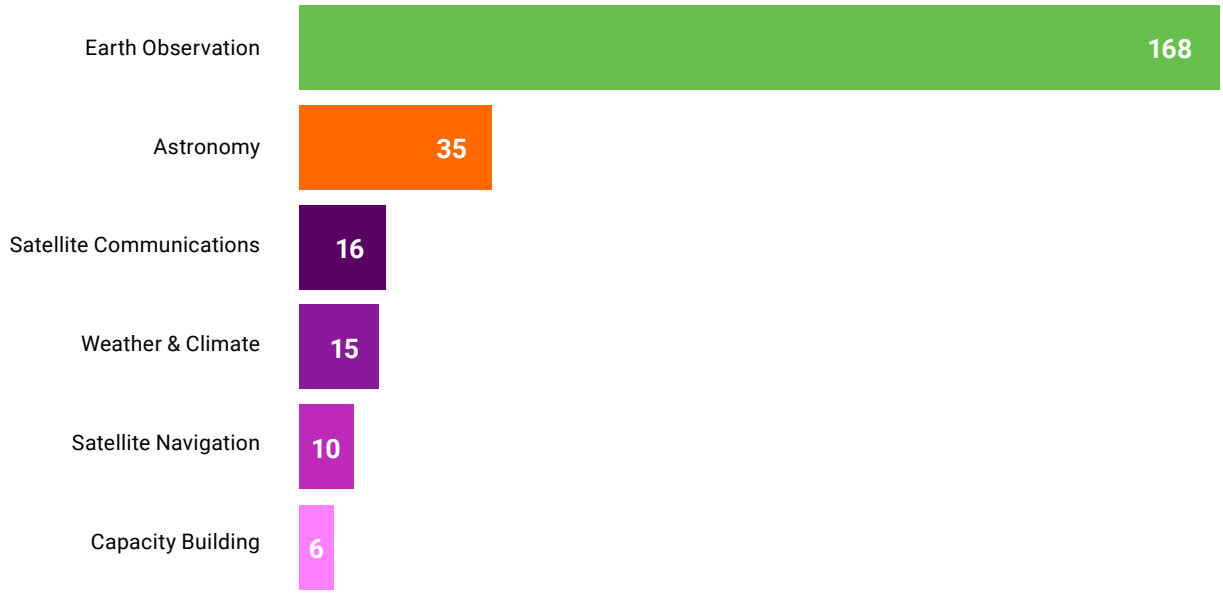

Figure 8: Bar graph to show the different uses of space technology in Africa for international space projects[27]

[26] Space Republic, 2023
[27] Space in Africa, 2024

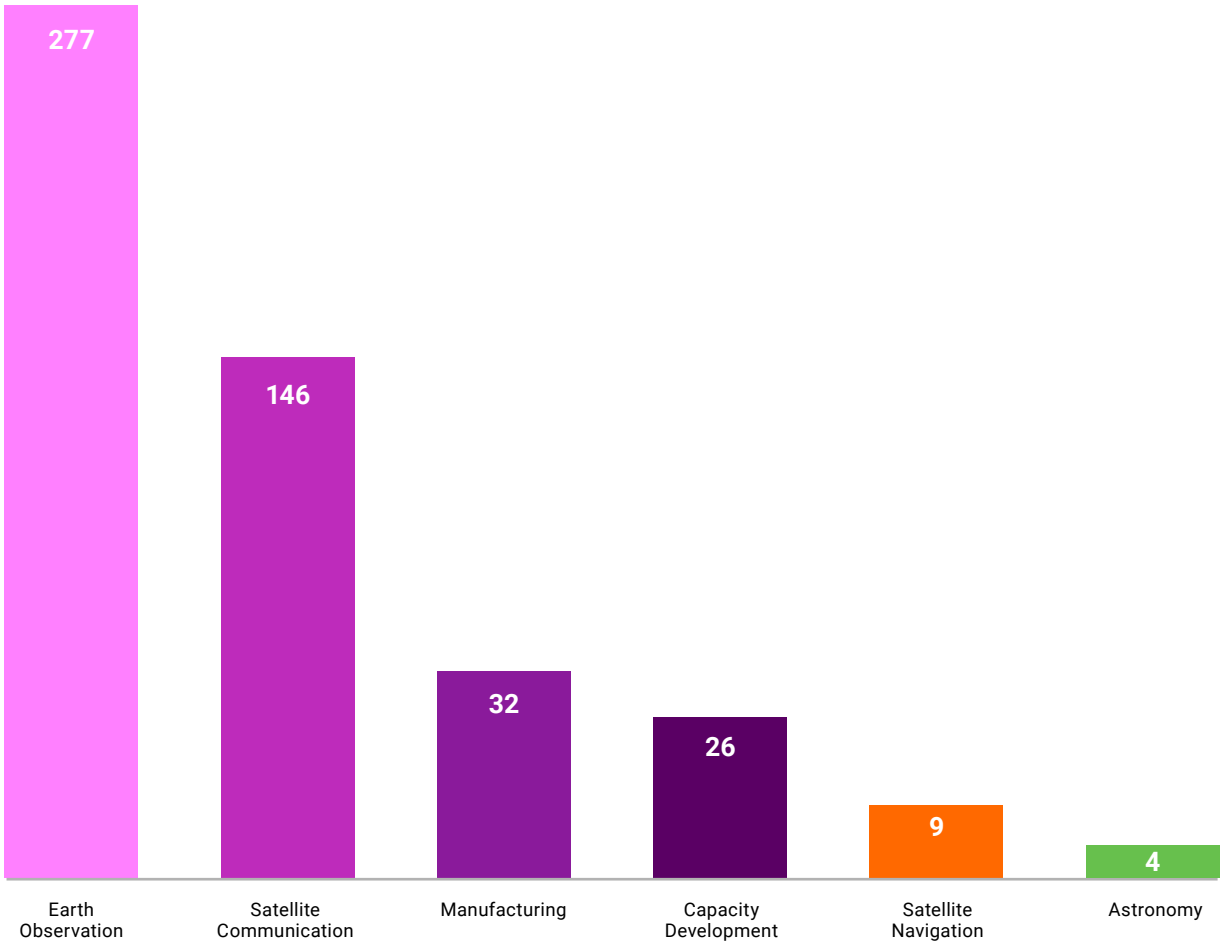

Figure 9: Segments that African NewSpace companies operate in[27]

Earth observation is the most common space segment being applied commercially by NewSpace companies. This is due to the cost-effective opportunities the data from small satellites provide in industries such as agriculture, disaster management, and urban development[28]. In contrast, astronomy remains a relatively nascent field in Africa, indicating that space exploration is not yet a viable venture for NewSpace companies entering the market. However, the growing emphasis on manufacturing capabilities within the NewSpace industry highlights the expanding industrial applications of space technology and displays the appetite for NewSpace companies to engage in the sector's global value chain.

27 Space in Africa, 2024
28 World Economic Forum. 2024. How AI and earth observation can help life on our planet

PART 2
SPACE STRATEGIES – A COMPARATIVE ANALYSIS OF GLOBAL ALLIANCE AFRICA PARTNER COUNTRIES

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2.1 Summary comparison of GAA partner countries

This section provides a comparative analysis of space sector strategies across the UK, Kenya, Rwanda and South Africa. Table 1 provides a summary of priorities in different aspects ranging from strategic focus and commercial opportunities to regulation. More details of each strategy are provided in the following sub-section to evidence the areas and primary opportunities for multilateral collaboration in the sector.

Table 1: Comparison of key aspects of space technologies

Aspect	Kenya	Rwanda	South Africa	UK
Space Agency	Kenya Space Agency (KSA)	Rwanda Space Agency (RSA)	South African National Space Agency (SANSA)	UK Space Agency (UKSA)
Key Documents	Kenya Space Policy 2020, KSA Strategic Plan	Rwanda Vision 2050, National Transformation Strategy 1	National Space Policy 2008, SANSA Strategic Plan	National Space Strategy 2021, Space Industry Act 2018
Strategic Focus[29]	Socio-economic development, agriculture, disaster management, resource management	Innovation-driven development, healthcare, urban planning, climate adaptation	Earth observation, communications, national security	Commercial growth, global leadership, space domain awareness, environmental monitoring
Commercial Opportunities[30]	Agriculture, disaster management, telecommunications	Agriculture, smart cities, communications	Space weather, communications, satellite manufacturing	Spaceports for small satellite launches, satellite growth
Key Initiatives	KSA Strategy Nanosatellite development	RSA Strategy EO satellite Smart city development	SANSA Programme SANSA CubeSat SARAO	UKSA Programme Artemis Accords Spaceport development
Education & Talent Development	STEM education, scholarships, entrepreneurship	Space-related research, local capacity building	Satellite production skills, STEM outreach	University programs, space apprenticeships, STEM engagement
Satellite Programs	Taifa-1 for local data, reducing reliance on foreign tech	RwaSat-1 for data sovereignty (deorbited)	ZACube satellites for disaster management	Support for small satellite launches, LEO growth
Space Policy	**Kenya Space Policy 2020:** Focuses on leveraging space for socio-economic growth, disaster management, and environmental sustainability	**Rwanda Space Policy 2020:** Aims for innovation-driven development, satellite independence, and data sovereignty	**National Space Policy 2008:** Aims to strengthen local satellite production, drive economic transformation, and ensure national security. It mandates capacity-building in local industries	**National Space Strategy 2021:** Aims to make the UK a global leader, emphasising commercial growth, sustainability, and national security. Strong focus on space debris reduction and sustainability
Regulation	**Kenya Space Act 2017:** KSA regulates satellite launches, space tech applications, and international collaborations	**Rwanda Space Law 2021:** RSA oversees satellite development, ensuring alignment with national development and the transformation agenda	**South African National Space Agency Act 2008:** SANSA regulates space operations, ensuring compliance with international and national standards	**Space Industry Act 2018:** Governs spaceports, satellite launches, space sustainability, and responsible use

29 Varada, P. 2022. Harvard International Review. The Space Race Expands: Why African Nations Are Looking Beyond Earth
30 ibid

2.2 KENYA

Emerging key player in the African space industry with innovative satellite technology and strategic initiatives

As outlined in the Kenya Space Agency's (KSA) Strategic Plan and Kenya's Space Policy[31], this strategy emphasises the application of satellite technology for critical sectors such as agriculture, disaster management, environmental monitoring, and national security. Through enhanced satellite data collection and analysis, Kenya aims to improve decision-making in areas like food security, climate resilience, and resource management to address national challenges and promote socioeconomic development.

A key component of this strategy is the development and launch of national satellites, exemplified by the launch of the Taifa-1 satellite in April 2023. This marked a major milestone in Kenya's space ambitions, as the initiative seeks to reduce reliance on international satellite data and support local content in satellite design, manufacturing, and operation. Kenya's long-term vision is to develop a local satellite and launch industry to gradually dependency on external providers and expand the domestic economic contribution of its space industry.

International collaboration is critical to the implementation of Kenya's space strategy – KSA is actively seeking partnerships with space-faring nations and organisations. Some of KSA's international partners include the African Union (AU), United Nations Office for Outer Space Affairs (UNOOSA), and regional space agencies such as Japan Aerospace Exploration Agency (JAXA), ESA and NASA. These collaborations provide access to advanced technologies, expertise and

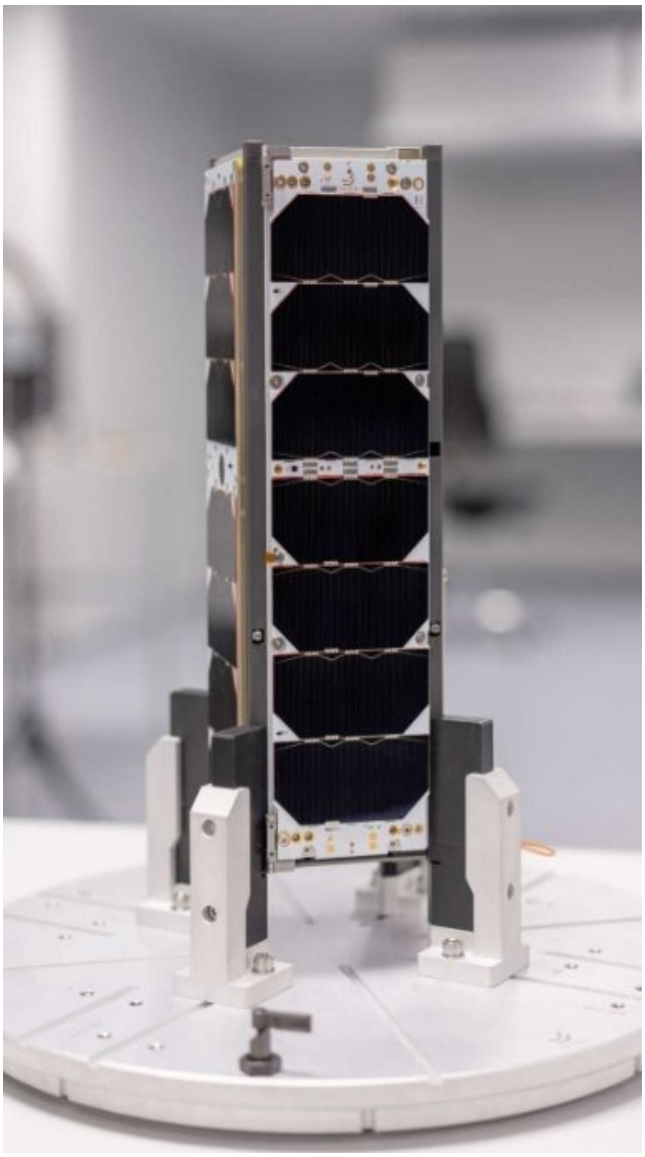

Figure 10: Kenya's Taifa 1 Satellite[32]

31 https://ksa.go.ke/assets/files/REVIEWED--SECONDDRAFTKENYASPACEBILL2024.pdf
32 University of Nairobi, 2023

opportunities for joint missions like Kenya's 1KUNS-PF and 2KUNS-PF satellites[33], helping Kenya accelerate its space ambitions and integrate into the global space community. Italy has also provided 15 fully paid PhD scholarships in earth observation for Kenyan nationals and is establishing an International Training Centre for Space Education alongside their existing Luigi Brogilo Center near Malindi[34].

These partnerships aim to enable human capital development, which is a critical component of Kenya's space strategy. KSA prioritises science, technology, engineering and mathematics (STEM) education, training programs, and space science research, in line with the country's National Education and Training Strategy[35]. By nurturing a pipeline of space professionals and fostering innovation in space-related fields, Kenya is working toward creating a sustainable space industry that will drive economic growth, technological innovation, and scientific advancement. Educational partnerships with universities and research institutions are essential in creating a skilled workforce equipped to meet the growing demands of Kenya's space sector, including future local rocket launches.

TAIFA — 1 — KENYA'S FIRST SATELLITE

Taifa one is a 3U earth observation satellite that is set to be operational for 5 years (2023 – 2028). The satellite was designed and developed in Kenya, and manufactured at Endurosat in Bulgaria, costing £297,261 (Sh50 million).[36] It was launched by Space X Falcon 9 rocket from the Vandenberg Space Force Base in California, in 2023[37]. The "3U" designation refers to the number of "units" the satellite is made up of – each unit is equal to 10cm3 in size. This type of satellite can perform a wide range of tasks at a relatively low-cost and is quick to develop, which is why it's a popular option for space missions globally[38].

33 Mbuthia, M. 2018. Kenya's venture into outer space exploration. University of Nairobi. Figure 8: University of Nairobi, 2023
34 Faboade, D. 2024. Kenya and Italy to Strengthen Ongoing Collaborative Efforts. Space in Africa
35 https://www.education.go.ke/sites/default/files/2024-08/NATIONAL%20EDUCATION%20STRATEGIC%20PLAN%202023-2027-compressed.pdf
36 NACOSTI 2023 https://www.nacosti.go.ke/2023/04/16/kenyas-first-satellite-taifa-1-launches-to-space-after-three-attempts/
37 NACOSTI 2023 https://www.nacosti.go.ke/2023/04/16/kenyas-first-satellite-taifa-1-launches-to-space-after-three-attempts/
38 Spire, 2023. https://spire.com/spirepedia/nanosatellite-3u/

Taifa-1 satellite's primary goal is to collect agricultural and environmental data pertaining to floods, droughts, and wildfires to assist Kenya with disaster risk reduction (DRR) and increased food security.

Table 2: Facts about the Kenyan Taifa-1 Satellite

TAIFA – 1 SATELLITE. THE FACTS[39]	
Name	Taifa-1
Country of Origin	Kenya
Launch year	2023
Launch vehicle	SpaceX Falcon 9
Mission type	Earth Observation
Satellite type	Nanosatellite
Mission objectives	• Earth observation • Data collection for environmental monitoring • Technological demonstration
Operator	Kenya Space Agency
Orbit type	Low Earth Orbit (LEO)
Payload	• High-resolution imaging sensors • Communications equipment
Development partners	• Sayari Labs • Endurosat
Key features	• Compact design • Advanced imaging capabilities • Enhanced data transmission technology
Significance	• Represents Kenya's advancement in space technology • Supports Kenya's space program goals and international collaborations

A MODEL VIEW – KENYA'S COMPARATIVE ADVANTAGE IN SPACE LAUNCH

Kenya is well positioned for space launch sites due to its strategic geographic location along the equator, which provides a significant advantage for launching spacecraft into orbit. Launches from equatorial regions benefit from the Earth's rotational speed, allowing rockets to use less fuel to achieve orbit, making the process more efficient and cost-effective. Additionally, Kenya's proximity to large bodies of water like the Indian Ocean ensures safer rocket launches by providing vast areas for debris to fall without posing risks to populated regions.[40]

39 Kenya Innovation Agency. 2023. Taifa-1 Satellite; A look into Kenya's First EO satellite
40 Kenya Space Agency, 2023

2.3 RWANDA

A new force in the African space sector

Rwanda's space technology strategy, spearheaded by the Rwanda Space Agency (RSA) founded in 2020, is closely aligned with the nation's Vision 2050[41] and National Transformation Strategy (NST1)[42]. Both the Vision and NST1 aim to position Rwanda as a leader in innovation-driven development by using space-based technologies to tackle national challenges across sectors like healthcare, urban planning, resource management, and climate change adaptation/mitigation. By integrating satellite data into national development plans, Rwanda aims to enhance its ability to monitor environmental changes, manage resources, and improve governance outcomes.

A landmark achievement in Rwanda's space journey has been the launch of RwaSat-1, the country's first satellite, in September 2019. Despite the youth of the RSA, the agency has made remarkable progress in enhancing national capabilities through this launch. Rwanda's focus is now on the successful deployment and scalability of space solutions to maximise the impact the sector can have on society. Like Kenya, this inaugural satellite demonstrates Rwanda's emphasis on building local satellite capacity as part of a broader effort to reduce dependence on international technology. By developing its own satellite infrastructure, Rwanda seeks to enhance data sovereignty and generate geospatial data for sectors like smart city development and sustainable agriculture. Rwanda developed this satellite in partnership with the University of Tokyo, who trained their local engineers[43].

Rwanda's strategy places a strong focus on collaborative partnerships, both at the regional and international levels. RSA has partnered with global space agencies, such as the European Space Agency (ESA), and is actively involved in regional initiatives like building out the African Union's Space Strategy[44]. These partnerships provide Rwanda with access to advanced technologies, opportunities for joint missions, and facilitate knowledge exchange, accelerating the development of its space sector.

Education and talent development are key pillars of Rwanda's overall strategy for its space ambitions. Recognising the importance of human capital, RSA promotes STEM education through targeted programmes aimed at nurturing the next generation of space scientists, engineers, and entrepreneurs. Scholarships, internships, and research collaborations with global academic institutions accessible to Rwandan students are key to this effort, ensuring that Rwanda develops a skilled workforce capable of driving innovation within the space ecosystem. An example recent collaboration includes the creation of a world-leading AI algorithm by Rwandan students for the WJ-1A satellite, in collaboration with RSA and STAR.VISION Aerospace Limited[45]. This aligns with national goals of enhancing socioeconomic development and reducing inequality by creating opportunities for young Rwandans in the space industry.

41 Rwanda Vision 2050, available at: https://www.minecofin.gov.rw/fileadmin/user_upload/Minecofin/Publications/REPORTS/National_Development_Planning_and_Research/Vision_2050/English-Vision_2050_Abridged_version_WEB_Final.pdf
42 Mugisha, A. 2024. Rwanda Space Agency
43 Bizimungu, J. 2020. Rwanda Space Agency to be operational in July. The New Times
44 https://au.int/sites/default/files/documents/37434-doc-au_space_strategy_isbn-electronic.pdf
45 Rwanda Space Agency, 2024. Six Rwandan students develop tech to power China's first AI satellite

Table 3: Facts about the Rwandan Satellite – RwaSat-1

RWASAT – 1. THE FACTS[46]	
Name	RwaSat-1
Country of Origin	Rwanda
Launch year	2019
Launch vehicle	SpaceX Falcon 9
Mission type	Earth Observation
Satellite type	Nanosatellite
Mission objectives	• Collect and forward data to remote monitoring ground stations • Technology demonstrator • Assist in agricultural and environmental modelling
Operator	Rwanda Space Agency
Orbit type	Low Earth Orbit (LEO)
Payload	• Communications equipment • Earth observation cameras
Development partners	• University of Tokyo • 15 Rwandan Engineers
Key features	• Compact design • High-resolution imaging capabilities • Advanced data transmission technology
Significance	• Highlights Rwanda's commitment to space technology • Supports Rwanda's space program development and international collaboration

RWASAT – 1 – RWANDA'S FIRST SATELLITE

Rwanda's focus is now on the successful deployment and scalability of space solutions to maximise the impact the sector can have on society. As an example, satellite-based high-speed internet provided by Starlink is now granting students and teachers across 500 schools in Rwanda access to educational resources and digital tools[47].

RSA is now working to develop an indicator system capable of streamlining complex satellite data into actionable insights. The data will facilitate informed decision-making and track the implementation of national goals, such as the strategy for national transformation and Vision 2050 as well as the Sustainable Development Goals (SDGs). Such evidence-based policymaking is already having an impact, supporting significant strides in the agriculture and urbanisation sectors as well – both key components of Rwanda's Vision 2050.[48]

Figure 11: Paula Ingabire, Minister of ICT and Innovation of Rwanda holds the RWASAT-1 Satellite, in 2019[49].

[46] Oni, DD. 2019. Space in Africa. Rwanda and Egypt Launch Africa's Latest Satellites in Space

[47] Xinhua. 2023. Rwanda launches high speed satellite internet. https://english.news.cn/20230223/1be7c277c7ee41318392b351ca20b482/c.html#:~:text=23%20(Xinhua)%20%2D%2D%20Rwanda%20has,resolve%20to%20ensure%20digital%20inclusion.

[48] Ngabo, C. 2024. Forbes Africa. https://www.forbesafrica.com/brand-voice/2024/04/22/rwandas-emerging-space-sector-and-its-global-contributions/ Figure 11: Kagina, A. 2024. The Untapped Potential in Rwanda's Space economy. The New Times

[49] Kagina, A. 2024. The Untapped Potential in Rwanda's Space economy. The New Times

2.4 SOUTH AFRICA

Expanding on a legacy of space innovation and pioneering achievements

South Africa's space strategy focuses on using space technology to advance socio-economic development and environmental sustainability. According to the South African National Space Agency (SANSA) Strategic Plan and National Space Policy[50], SANSA prioritises earth observation, satellite communications, and navigation systems. These technologies are aimed at improving disaster management, enhancing agricultural productivity, and supporting urban development. SANSA's role extends to hosting the International Civil Aviation Organisation (ICAO) designated Regional Space Weather Centre[51], which provides space weather forecasts for the African continent, aiding in safer aviation and better preparedness for space weather events.

A cornerstone of South Africa's space strategy is the development and deployment of a new generation of locally produced satellites. The ZACube series, a set of South African nanosatellites developed as part of the country's space technology efforts, were specifically focusing on capacity-building and space science research. These CubeSats were developed by the French South African Institute of Technology (F'SATI) in collaboration with the South African National Space Agency (SANSA).[52] The development of these satellites exemplifies the country's commitment, aiming to improve data accuracy, availability, and accessibility for essential applications such as water resource management, climate change monitoring, and national security. This focus on local satellite development reflects South Africa's goal of reducing reliance on international technologies and establishing itself as a regional leader in space innovation – this is reflected in the number of NewSpace companies located in the country, as well as the number of launched satellites as indicated in table 4 below. Additionally, it aligns with the government's broader National Development Plan (NDP)[53], where space technology is seen as a key driver of economic transformation and infrastructure development.

Table 4: A list of all 13 satellites

SOUTH AFRICA – A LIST OF ALL 13 SATELLITES[54]

Satellite	Launch	Type	Mission	Key Features	Status
SunSat-1	1999	Cubesat	Earth observation, technology demonstration	Pioneering South African satellite	Decommissioned
SumbandilaSat	2009	Microsatellite	Earth observation, remote sensing	High resolution imaging, data collection	Decommissioned
Platform-2	2010	Microsatellite	Earth observation, technology demonstration	Advanced imaging capabilities	Decommissioned
Intelsat New Dawn	2013	Communications Satellite	Satellite communications across Africa	High-capacity communications and coverage	Decommissioned
ZACube-1	2013	CubeSat	Technology demonstration, Earth Observation	Compact design, basic imaging capabilities	Decommissioned

50 https://www.sansa.org.za/wp-content/uploads/2018/05/National-Space-Strategy.pdf
51 SANSA, 2024. https://www.sansa.org.za/products-services2/spacescience/#:~:text=SANSA's%20Space%20Weather%20Centre%20is,sector%2C%20along%20four%20global%20centres.
52 Eo Portal. 2024. https://www.eoportal.org/satellite-missions/zacube-1#launch
53 https://www.gov.za/sites/default/files/gcis_document/201409/ndp-2030-our-future-make-it-workr.pdf
54 SpaceHubs Africa, 2024. https://spacehubs.africa/south-africa

SOUTH AFRICA – A LIST OF ALL 13 SATELLITES[54]

Satellite	Launch	Type	Mission	Key Features	Status
Kondor-E	2013	Earth Observation Satellite	Radar imaging for military and environmental monitoring	Synthetic Aperture Radar Capabilities	Active
MDASAT-1a	2015	Earth Observation Satellite	Multispectral Earth Observation	High-resolution multispectral imaging	Decommissioned
MDASAT-1b	2015	Earth Observation Satellite	Multispectral Earth Observation	Complementary to MDASAT-1a	Decommissioned
MDASAT-1c	2015	Earth Observation Satellite	Multispectral Earth Observation	Completes the MDASAT-1 constellation	Decommissioned
ZA-AeroSat	2015	CubeSat	Aerospace and earth observation	Advanced sensors, focused on aerospace data	Decommissioned
XinaBox ThinSAT	2018	CubeSat	Technology demonstration, educational purposes	Modular design, educational applications	Active
ZACube-2	2018	CubeSat	Advanced Earth observation, communication	Enhanced imaging sensors, improved data transmission	Active
nSIGHT-1	2020	CubeSat	Earth observation, technological demonstration	Compact design, advanced imaging sensors	Active

Collaboration with international space agencies and set up of public-private partnerships (PPPs) are a critical element of SANSA's approach to the sector. South Africa maintains active cooperation with the US National Aeronautics and Space Administration (NASA), the European Space Agency (ESA), and other global and regional organisations, allowing it to tap into cutting-edge technologies and participate in collaborative efforts. As an example, SANSA collaborated with ESA's Space Data Highway, which uses Eutelsat and Airbus technologies to create an advanced data relay system employing laser communication for high-speed, reliable data transfer in Earth observation and space missions. SANSA contributed to the development and implementation of space-based data solutions, leveraging this infrastructure for South African space missions, while ESA, Airbus and Eutelsat provides the necessary technological and infrastructural support, including the development of satellite systems and communication technologies[55]. These partnerships are essential for advancing space science research and accelerating technological progress South Africa.

In line with its vision for long-term sustainability, South Africa's strategy places a strong focus on capacity building and human capital development. SANSA has prioritised initiatives to promote STEM education and create opportunities for students, educators, and researchers in space science and technology. Programmes such as the Space Science and Engineering Internship, South African Radio Astronomy Observatory's Graduate in – training programme[56], and partnerships with universities help build a pipeline of skilled professionals ready to support the country's growing space sector. By nurturing homegrown talent and fostering a culture of innovation, SANSA and local companies aim to drive economic growth, contribute to job creation, and ensure that the benefits of space technology reach all communities across South Africa.

55 Airbus, 2024. Space data highway. https://www.airbus.com/en/products-services/defence/space-data-highway

56 SARAO 2024. Young Professionals Development Programme. https://www.sarao.ac.za/students/young-professionals-development-programme/

SANSA'S SPACE WEATHER CENTRE

SANSA operates the only 24/7 operational space weather center in Africa and is designated by the International Civil Aviation Organisation as a regional centre to provide space weather information to the aviation sector. It monitors the Sun and its activity, providing space weather forecasts, warnings, alerts, and data on space weather conditions to government, private companies, defense, and transport sectors to mitigate the effects of space weather on technological systems. This centre was launched in 2010 and upgraded in 2018, with its 24/7 centre in Hermanus being launched in 2022.[57]

Figure 12: SANSA's Space Weather Center in Hermanus, South Africa[58]

SOUTH AFRICA'S BURGEONING NEWSPACE ECOSYSTEM

The Sunsat mission introduced the era of space exploration in South Africa. The Sunsat satellite was constructed by post-graduate engineering students at Stellenbosch University and the project grew to a full-fledged mission, providing a unique experience for future space engineers. This programme aimed to train students in the technologies and sciences of spacecraft construction and to build a working satellite equipped with a high-performance Earth Observation camera. It ran for almost 10 years, and in that time, approximately 100 students earned their Graduate (or Post-Graduate) degrees on some aspect of the satellite.[59] Being closely involved with the operational aspects of a satellite project gave the students a strong understanding of how it should be designed. This programme was immensely successful, with the Sunsat's life expectancy being four times longer than the expected lifespan of a student – built satellite. Usually, more than 50% of student satellites never respond, and of those that do, they only last up to 6 months.[60]

This programme birthed the thriving industry currently present in South Africa, providing world-leading technologies of cubesats, antennae, cameras, and other satellite components. Some of these companies include NewSpace Systems, Dragonfly Aerospace, AAC Clyde Space, Simera Sense, and Swift Geospatial – they have had significant impact on the South African economy and continue to provide world-class technological expertise in the international space sector. To date, no specific economic impact assessment of NewSpace companies in South Africa has been done, but according to Simera Sense, combined these companies contribute ~ZAR 235 million (>£10 million) a year to the South African economy.[61]

57 Legacy of Impact. SANSA, 2024, www.sansa.org.za/products-services2/spacescience/
58 SANSA Space Weather center. SANSA. 2024
59 Steenkamp, N. 2021. Dragonfly Aerospace. https://dragonflyaerospace.com/inside-sunsat-the-first-ever-south-african-satellite/
60 Steenkamp, N. 2021. Dragonfly Aerospace. https://dragonflyaerospace.com/inside-sunsat-the-first-ever-south-african-satellite/
61 Louw, A. 2024. National Space Conference, panel.

2.5 UNITED KINGDOM

Pushing the frontiers of space innovation

The UK's space technology strategy aims to position the nation as a global leader in the industry by fostering both commercial and strategic growth. Laid out in the 2021 National Space Strategy and updated in 2022[62], this vision is driven by the UK Space Agency (UKSA) and focuses on scaling up domestic space capabilities in earth observation, telecommunications, navigation services and space domain awareness. These efforts aim to tackle national challenges and enhance the UK's economic competitiveness internationally within the industry. The UK also plays a leading role in downstream space applications, using satellite technology across various sectors. Through organisations such as Satellite Applications Catapult[63], the UK harnesses space data for industries such as agriculture, urban planning, and climate monitoring. The OneWeb constellation is a flagship project that exemplifies the UK's efforts to improve global telecommunications and internet access[64].

The UK space sector is worth over £17.5 billion to the UK economy and employs around 48,800 people[65]. The growth of the sector at a projected long term growth rate of 6.4%, is outpacing the growth of the wider economy and the global space economy[66].

The UK is investing in space infrastructure to support its goal of becoming a hub for satellite launches. New spaceports across the region will enable low-earth orbit satellite launches, with the goal of capitalising on the growing global space market, expected to reach £490 billion by 2030[67]. For instance, Spaceport Cornwall hosted the UK's first satellite launch attempt in January 2023 through a partnership with Virgin Orbit[68]. Through the agency, the government is investing £50 million into a new Space Clusters and Infrastructure Fund, which will see up to £100 million of investment from private sector as well, to collaborate towards an improvement of UK's space research and development infrastructure[69].

The UK is a leader in space sustainability, focusing on reducing space debris and promoting responsible space operations. Its Clean Space Initiatives, developed in collaboration with ESA and companies like ClearSpace[70] and LumiSpace[71], are advancing the technology to safely remove defunct satellites from orbit, ensuring the long-term sustainability of space activities. In 2022, UKSA awarded £4 million to two companies to design missions to remove space waste from orbit[72].

Talent development is critical to the UK's space strategy, ensuring a strong workforce for the future. The Space Industry Act 2018[73] and National Space Strategy promote STEM education and space-related research through scholarships, training programs, and grants. Initiatives such as Space for All aim to engage young people and foster future space leaders, and the Space Placements in Industry (SPIN) programme managed by UKSA, and supported by the Satellite Applications Catapult, enable placement industry opportunities for students to gain new insights into business and career opportunities[74].

62 UK government, 2024. https://www.gov.uk/government/publications/national-space-strategy/national-space-strategy
63 Satellite Applications Catapult: https://sa.catapult.org.uk/space-capabilities-catalogue/#3
64 https://oneweb.net/
65 Know.Space. 2023. The case for Space
66 Know.Space. 2023. The case for Space
67 Department of Business and Trade. 2024. Space. https://www.great.gov.uk/international/content/investment/sectors/space/#:~:text=With%20the%20global%20space%20economy,Global%20Britain%20becoming%20Galactic%20Britain%E2%80%9D.
68 https://www.gov.uk/government/case-studies/first-launch-from-the-uk
69 UK government, 2023. National Space Strategy in Action. https://www.gov.uk/government/publications/national-space-strategy-in-action/national-space-strategy-in-action#:~:text=Through%20the%20UK%20Space%20Agency,up%20UK%20space%20R%26D%20infrastructure.
70 https://clearspace.today/
71 https://www.lumi.space/
72 UK Space agency. 2022. UK builds leadership in space debris removal and in-orbit manufacturing with national mission and funding boost
73 Space Industry Act 2018. https://www.legislation.gov.uk/ukpga/2018/5/contents
74 Robinson, G. Garrity, H. 2024. UK space sector skills shortage: How can organisations develop talent.

UK'S EXPLOSION OF SPACE PORTS

The UK's recent advancements in space launch capabilities are largely driven by the development of two key spaceports in Scotland: SaxaVord and Sutherland. SaxaVord, located in the Shetland Islands, is set to become the UK's first operational vertical-launch spaceport, targeting small satellite launches. It has received significant government backing, including £10 million to boost its infrastructure[75]. This investment aligns with the UK's ambition to develop a sustainable and competitive space industry. Sutherland Spaceport, located in the Scottish Highlands, will further contribute to this ecosystem, enabling Scotland to play a crucial role in the UK's emerging launch sector. These spaceports are expected to handle around 42 launches annually, focusing on small satellite constellations for applications such as Earth observation, climate monitoring, and telecommunications. This marks a significant step toward building a sustainable launch sector in the UK, which is expected to create hundreds of high-skilled jobs and stimulate regional economic growth[76].

Figure 13: SaxaVord Spaceport, located at the northernmost part of Scotland's Shetland Islands[77]

[75] Mirage news. 2024. https://www.miragenews.com/scotlands-space-sector-fuels-uk-ambitions-1314238/ Figure 13: Space News, 2023
[76] Osborne, T. 2023. UK to publish National space Sector plan in 2024. Aviation Week Network.
[77] Space News, 2023.

COPERNICUS EARTH OBSERVATION

Copernicus is the Earth observation component of the European Union's Space programme, looking at our planet and its environment to benefit all European citizens. It offers information services that draw from satellite Earth Observation and terrestrial data.

This programme enables the use of great amounts of global data from satellites and ground-based, airborne, and seaborne measurement systems to help service providers, governments, and international organisations improve European citizens' quality of life and beyond. The information services provided are free and openly accessible to users, which is a great example of how data access enables social benefits. A similar programme called Digital Earth Africa is available for the African region.[78]

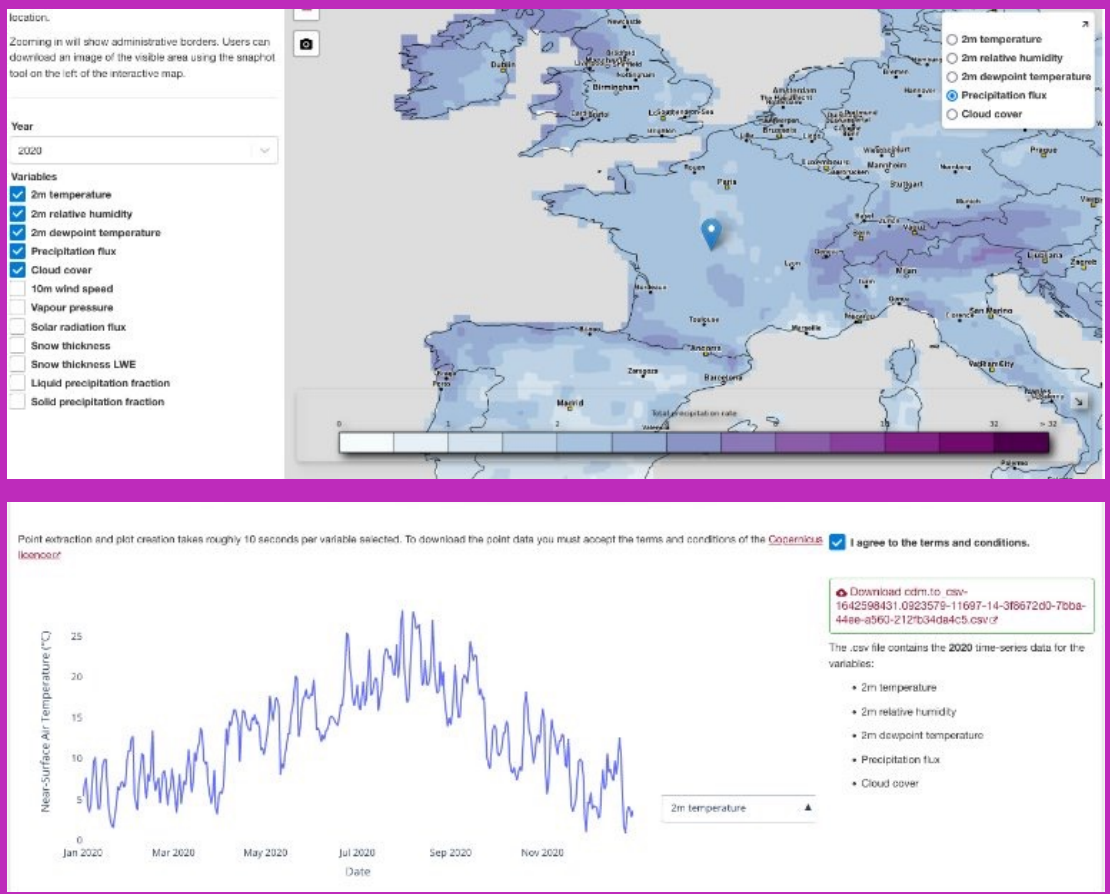

Figure 14: A snapshot of the Copernicus dashboard: Agrometeorological indicators[79]

78 EU Space, 2024. Copernicus Services Catalogue. https://www.copernicus.eu/en/accessing-data-where-and-how/copernicus-services-catalogue?combine=&cc_source_service_target_id%5B2778%5D=2778

79 Copernicus Dashboard, 2024.

PART 3
APPLICATIONS OF SPACE TECHNOLOGY IN AFRICA

Innovate UK Global Alliance Africa

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3.1 Harnessing Space Technology to Combat Food Insecurity

Ending hunger and malnutrition remains one of Africa's greatest challenges, with approximately 149 million Africans currently facing acute food insecurity, according to the Food and Agriculture Organisation (FAO). Addressing this crisis requires £3.96 billion to eliminate hunger caused by conflicts across the continent[80]. The United Nations Development Programme (UNDP) warns that climate change could reduce agricultural yields in some African countries by up to 30% by 2050[81], potentially putting 200 million people at risk of extreme hunger[82].

Globally, between 20% and 40% of crop production is lost to pests each year, costing the global economy an estimated £197.6 billion from plant diseases and £62.9 billion from invasive insects[83]. In Africa, crop losses from insects alone account for up to 49% of the expected total yield loss annually, meaning that half of the continent's harvest lost to pests, including insects, pathogens, nematodes and weeds[84].

Collaborative programmes in food security

AfriCultuReS

AfriCultuReS, funded by the European Union's Horizon 2020 Research and Innovation Programme, was designed to develop an agricultural monitoring and early warning system aimed at improving food security in Africa. By integrating geospatial products and maps into the AfriCultuReS Platform, it enhances decision-making based on precise risk assessment. The use of Earth Observation data has become crucial in food security strategies, providing valuable insights to farmers, insurance companies, financial institutions, and other stakeholders, helping to optimise crop yields and meet market demands[85].

SAT4Farming – Ghana

The SAT4Farming programme, co-funded by Rainforest Alliance, Grameen Foundation, Touton, the University of Ghana's Department of Agricultural Economics and Agribusiness, and Netherlands-based Satelligence and WaterWatch, aimed to support smallholder cocoa farmers in Ghana through Farm Development Plans (FDPs) to boost productivity. The initiative helped 240,000 farmers increase their yields from 400kg/hectare to 1,500kg/hectare over an 8 to 10-year period. Notably, 30% of participants were under the age of 35, supporting youth empowerment in the sector[86].

80 Space in Africa, 2024.
81 Center for Global Development (2024, Feb) https://www.cgdev.org/sites/default/files/socioeconomic-impact-climate-change-developing-countries-next-decades.pdf
82 Ibid
83 Space in Africa, 2024.
84 Ibid
85 Space in Africa, 2024.
86 Grameen Foundation. 2023. https://grameenfoundation.org/stories/press-releases/grameen-foundation-and-partners-bringing-satellite-technology-to-benefit-smallholder-cocoa-farmers-in-ghana

Pest Risk Information Service – Kenya

The UK Space Agency co-funded the £6.38 million Pest Risk Information Service (PRISE) project to reduce pest-related losses by providing farmers in sub-Saharan Africa with data-driven pest management tools. PRISE model outputs were integrated into the Kenyan Ministry of Agriculture's two-way SMS platform to deliver actionable information directly to farmers.

In 2019, the service reached over 40,000 farmers. During Kenya's 2019/2020 short rainy season, 59% of farmers who received PRISE recommendations for fall armyworm (an insect that feeds on maize mostly, and 80 other crops including sugar cane, wheat, and vegetable crops)[87] adjusted their practices, leading to reduced pest populations and increased maize harvests. In 2021, PRISE partnered with iCow, a maize SMS service, further improving results. Farmers reported a 109% increase in maize yields and a 70% reduction in pest damage[88].

Figure 15: The PRISE solution being used by Farmers in Kenya[89]

87 Food and Agriculture Organization of the UN. 2024. About Fall Armyworm
88 PRISE. 2024. https://prise.org/about/
89 cabi.org/projects/prise-a-pest-risk-information-service/

3.2 Leveraging Space Technology for Climate Mitigation and Enhanced Disaster Management

Africa loses £5.5 billion to £11.8 billion annually due to the impact of climate change and this is projected to rise to £39.2 billion by 2050[90]. According to Africa's climate commitments and plans (nationally determined contributions – NDCs), the region requires an annual investment of £41.9 billion from 2020 to 2035 to effectively mitigate and adapt to climate change, representing nearly 2.5% of Africa's Gross Domestic Product (GDP). The funding is needed to bridge the gap between current adaptation efforts and what is necessary to effectively cope with the impacts of climate change, ensuring that the region can implement necessary measures to protect its environment, economies, and communities[91].

The African continent is highly vulnerable to a range of natural disasters, including cyclones in Malawi, Mozambique, and Madagascar; floods in Libya; earthquakes in Morocco; and prolonged droughts across the Horn of Africa in recent years. These events cause significant economic damage, with an estimated total economic impact exceeding £30 billion in 2022 alone[92].

Collaborative space data projects for disaster management

FANFAR – West Africa

The FANFAR project[93], funded by the European Union, aims to improve flood management in West Africa. The project collaborated with over 30 organisations including hydrological services, emergency management services, and river basin organisations scattered across 17 countries. FANFAR developed a pre-operational system that has been delivering openly accessible daily forecasts and alerts since September 2018 throughout the West African region. This system integrates meteorological forecasts, hydrological models, satellite and gauge observations, flood hazard assessments, and multiple distribution channels.

Between 2019 and 2024, multilateral development banks, including the African Development Bank (AfDB), committed £46.7 billion to climate finance, with the AfDB focusing 67% of its funding on adaptation initiatives in 2021 and 2022[94]. The AfDB alone invested approximately $23 billion during this period, with 45% of its total investments in 2021 and 2022 dedicated to climate initiatives. About 80% of this financing came from AfDB's own resources, while partners such as the Global Environment Facility and the Green Climate Fund contributed the rest[95]. This funding supported initiatives that utilised space data and earth observation technologies to monitor environmental changes and provide critical insights, allowing African nations to better adapt to climate challenges. Space-based solutions help governments and companies to identify climate change patterns and risks, enabling them to implement effective strategies to protect populations and resources from extreme environment changes.

90 World Stage News. (2024, May) https://worldstagenews.com/africa-loses-7b-to-15b-yearly-to-climate-change-afdb-boss/
91 Global Center on Adaptation. (2023). https://www.climatepolicyinitiative.org/wp-content/uploads/2023/09/GCA-CPI-Accelerating-Adaptation-Finance.pdf
92 Space in Africa, 2024.
93 FANFAR. 2024 https://fanfar.eu/ivp/
94 African Development Bank. Joint MDB Climate Finance Report 2023. https://www.afdb.org/pt/documents/joint-mdb-climate-finance-report-2023
95 Inter-American Development Bank. 2024. https://publications.iadb.org/en/2023-joint-report-multilateral-development-banks-climate-finance

SatDRR – Kenya

Kenya is highly vulnerable to slow-onset natural disasters like droughts and famine, as well as rapid-onset events such as floods, landslides and disease outbreaks[96]. The country is projected to lose approximately 7.2% of its GDP (c.£14.2 billion) annually due to climate-related disasters[97].

The Satellite Enablement for Disaster Risk Reduction in Kenya (SatDRR Kenya)[98] project, a £5 million initiative funded under the UK International Partnerships Programme (IPP), provided secure fixed and mobile satellite communications via Avanti's HYLAS satellite for emergency situations, including conflict, famine, floods, and disease outbreaks. This programme established a resilient, always-on infrastructure for emergency communications and situation assessments, enhancing disaster preparedness and response at both management and operational levels across Kenya.

FireSat – Southern Africa

Africa is often referred to as the 'fire continent' given that it experiences 70% of the world's wildfires[99]. In South Africa, wildfires have costed the country's economy approximately £225 million over the past 5-7 years[100], with a £1million loss in 2021 alone[101].

The £5 millionFireSat Project[102] aimed to showcase the capabilities of nanosatellite technology for improved fire detection, integrating this technology into the existing Advanced Fire Information System (AFIS), developed by the Council of Scientific and Industrial Research (CSIR). Implemented by Clyde Space across Kenya, Namibia, and South Africa, the project provided near real-time wildfire alerts. Additionally, it provided extensive capacity building, advancing technology development for masters students from the participating countries.

UK INTERNATIONAL PARTNERSHIPS PROGRAMME

The IPP was the UK Space Agency's sustainable development initiative run from 2016 – 2022[103]. It was designed to use UK expertise in satellite technology and data services to create innovative solutions for global challenges in partnership with developing countries.

96 ICPAC. https://www.icpac.net/documents/871/ClimSA_socio-economic_policy_brief_Final_version_Qw cQzz7.pdf
97 UK Government. https://www.gov.uk/government/case-studies/satellite-enablement-for-disaster-risk-reduction-i n-kenya-satdrr
98 SATDRR project: https://www.gov.uk/government/case-studies/satellite-enablement-for-disaster-risk-reduction-in-kenya-satdrr
99 WorldBank https://thedocs.worldbank.org/en/doc/167241475273172973-0010022016/original/AfricaTheFireContinent.pdf
100 UK Space Agency https://www.gov.uk/government/case-studies/clyde-space-southern-africa-wildfire-detection
101 Ilemobade, A. 2023. The status of water for firefighting in South Africa
102 UK Space Agency https://www.gov.uk/government/case-studies/clyde-space-southern-africa-wildfire-detection
103 UK Space Agency. 2022. IPP: Using Space to deliver sustainable development

3.3 Revolutionising Healthcare Access through Space Technology

Sub Saharan Africa bears 25% of the global disease burden, but it has only 2% of the world's doctors[104,105]. This indicates a huge gap in the availability of medical care to those that need it most. As an example, rural areas in Nigeria face significant health challenges, including high mortality rates, due to limited access to quality health information, inadequate training for health workers, and insufficient disease surveillance and health system management. The lack of infrastructure and reliable communication channels exacerbates these issues, hindering efforts to improve health outcomes and deliver effective healthcare services[106].

Collaborative telemedicine programmes

Below are examples of collaborative programmes that have had an impact on Telemedicine using space technology: General health management programmes

- The Global Polio Eradication Initiative (GPEI) coordinated and monitored polio immunisation activities in 140,000 settlements across 11 states in Nigeria. They utilised remote sensing, satellite imagery, primary data collection, and Geographic Information Systems (GIS).
- Algeria implemented a nationwide initiative to connect 4,000 healthcare facilities within its territory through the Algerian Communications satellite Alcomsat-1.
- During the COVID-19 pandemic, South Africa, Kenya, Nigeria, Rwanda, and Ghana utilised a combination of satellite communication applications, remote sensing,satellite imagery, primary data collection, and Geographic Information Systems (GIS) to monitor outbreaks and inform disaster strategies.[107]

SatCom for Nigerian Health Services

The SatCom for Nigerian Health Services-Inmarsat Project is a £2.83 million initiative designed to improve healthcare delivery in rural Nigerian communities through the use of satellite technology. The project provides clinics with satellite-enabled mobile medical applications to bridge the digital divide in areas with limited internet access[108].

More than 75 medical centers in Kano and Ondo States and the Federal Capital Territory (FCT) were supplied with satellite terminals and tablets loaded with mobile health applications. A case study highlights that the State Ministries of Health in Nigeria are now receiving more complete and accurate data, leading to improved policy decisions and more proactive disease surveillance.

104 United Nations. www.un.org/development/desa/dspd/wp-content/uploadsd/sites/22/2019/06/MARGARET-UN-PRESENTATION.pdf
105 WHO.www.afro.who.int/sites/default/files/2017-06.english—health_systems_in_africa---2012.pdf
106 UK government. www.devtracker.fcdo.gov.uk/programme/GB-GOV-13-GCRF-UKSA_NG_UKSA-039/summary
107 Kenu, E. Barradas, D. 2022. National Library of Medicine. V28(Suppl 1).
108 UK government. 2023 www.devtracker.fcdo.gov.uk/programme/GB-GOV-13-GCRF-UKSA_NG_UKSA-039/summary

CONCLUSION

Innovate UK Global Alliance Africa

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Africa's space technology sector is poised to drive significant socioeconomic growth across multiple industries. Valued at £16.16 billion in 2021[109], the sector is expected to grow rapidly, led by nations like South Africa, Kenya, and Rwanda. This report highlights key initiatives such as South Africa's ZACube Satellites and Kenya's Taifa-1, which showcase Africa's effort to build local capabilities through both national and international support.

The UK is well-positioned to complement Africa's advancing space capabilities. As a global leader in space technology with a sector valued at over £17.5 billion[110], the UK excels in global telecommunications, space sustainability and earth observation – areas that align with and enhance Africa's current strengths. Projects such as AfriCultuReS, SAT4Farming, and PRISE have demonstrated the transformative impact of Earth Observation data, including (i) increased crop yields by up to 20% in Kenya[111], (ii) improving pest management, and (iii) enhancing access to medical care. These initiatives provide critical data and innovative solutions, empowering African communities to address local challenges.

Collaboration between African nations and international partners is essential for unlocking the full potential of space technology. Over the last three years, 89 bilateral space agreements have been signed between Africa and other countries[112], indicating the promise of a unified approach to developing the industry. These collaborative efforts will not have only benefited the continent but also have continued to contribute towards global advancements in space science and technology.

Developing local capabilities is crucial for the global sustainability of the sector. Capacity-building efforts in space science are crucial, with substantial gains expected in STEM education and innovation. As Africa's population approaches 830 million by 2050[113], space science programs could boost STEM graduates by 30-40% over the next decade[114] driving technological innovation and economic growth. International support for training and knowledge transfer is key in building a pipeline of skilled professionals. In addition, satellite and launch capabilities in strategic locations like Kenya and South Africa can reduce deployment costs by up to 40%[115] once in-country expertise is fully established which provides Africa with comparative advantage.

Despite local challenges, Africa's space industry is anticipated to grow steadily[116]. With the continent's industry value expected to be at £18.77 billion by 2026[117], it represents a market that grows despite local challenges, indicating an immense opportunity for UK companies and government bodies to collaborate with the African counterparts. This report highlights some of the key stakeholders, and how collaborative initiatives to date have leveraged space technology for economic and societal benefits.

109 Space in Africa, 2024
110 Know.Space. 2023. The case for Space
111 World bank, 2019. Earth observation for sustainable development.
** Except where stated otherwise, all data was retrieved from Space in Africa's proprietary database
112 Adetola, A. 2023. African Space Industry Annual Report, 2023 Edition
113 UN Economic Commission for Africa, 2022. Africa's Demographic Trends
114 UNESCO, 2021. Global Education Monitoring report
115 African Union, 2021. The Africa Governance Report 2021
116 Faleti, J. 2024. Space in Africa Releases its 2024 African Space Budget Report. Space Watch Global
117 Space in Africa, 2024
** Except where stated otherwise, all data was retrieved from Space in Africa's proprietary database

ABOUT INNOVATE UK

Innovate UK, part of UK Research and Innovation (UKRI), is the UK's innovation agency. We work to create a better future by inspiring, involving and investing in businesses developing life-changing innovations. Our mission is to help companies grow through the development and commercialisation of new products, processes and services, supported by an outstanding innovation ecosystem that is agile, inclusive and easy to navigate.

ABOUT THE UK-AFRICA SPACE TECHNOLOGY FOR SUSTAINABILITY GLOBAL INNOVATION NETWORK (GIN)

The UK-Africa Space Technology for Sustainability GIN is a collaborative platform connecting the UK, South Africa, Rwanda, and Kenya to unlock cross-sector and international opportunities within the space technology industry. Its key focus areas include Earth Observation applications, optimising access to geospatial data, and fostering space technology entrepreneurship. The network facilitates funding programmes for space technology solutions – including the novel Lead Customer Programme (LCP) – as well as knowledge and technology transfer, and collaborative initiatives aimed at industry growth and capacity development. These efforts are supported by partnerships with the UK Space Agency, Kenya Space Agency, Rwanda Space Agency, and the South African National Space Agency, guided by Innovate UK and the Foreign, Commonwealth and Development Office (FCDO).

CONTACT US

To discuss this report further, please contact Alana Kruger – UK-Africa Space Lead (*alana.kruger@iukbc.org.uk*) or visit our website (*https://iuk-business-connect.org.uk/programme/uk-africa-space-global-innovation-network/*).

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