Prioritising space and satellite technology interventions for targeted use-cases achieving societal benefit and business impact

We work with UKRI Innovate UK

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KSA

CATAPULT Satellite Applications

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CLASSIFICATION

Commercial in Confidence

CUSTOMER

UK Foreign, Commonwealth and Development Office

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1. Executive Summary

This report describes an evidence-backed prioritised intervention set to achieve Kenya space and satellite technology ambitions at pace and scale.

Through a two-phase engagement, led by the Satellite Applications Catapult (Catapult) and supported by the Kenya Space Agency (KSA), FCDO, and expert stakeholder groups, the Catapult has identified and validated space and satellite technology challenge areas (phase one), then defined and prioritised challenge areas for detailed examination and solution intervention high-level definition (phase two).

From these solution definitions, the Catapult proposes eight for detail definition, prioritisation, consortium building, and funding identification (proposed phase three) to subsequently test proof of concept technology, then at scale adoption (proposed phases four and five).

The Catapult thanks all stakeholders for their active participation through this engagement, and especially KSA and FCDO.

1.1 Catapult Context

The Catapult Network is a collaborative ecosystem of nine technology and innovation centres located across more than 50 sites in the UK. These centres, known as “Catapults,” operate as independent, non-profit organisations focused on accelerating innovation capacity. Each Catapult specialises in a key area of technology, driving advances that enable UK industries to stay competitive and sustainable. The areas of expertise across the Catapults include:

- Cell & Gene Therapy
- Compound Semiconductor Applications
- Connected Places
- Digital
- Energy Systems
- High-Value Manufacturing
- Offshore Renewable Energy
- Satellite Applications

1.2 Satellite Applications Catapult

The Satellite Applications Catapult has the objective to support UK industry by accelerating the growth of satellite applications . The Catapult will achieve this objective by maximising the innovation potential in the industrial and academic communities, and by acting as a focal point where small and medium enterprises, large industry, and end-users can work together with researchers to explore, develop, and commercialise new ideas.

1.3 Priority Areas

Through research and engagement effort, detailed through this report, the Catapult has identified eight interventions for prioritisation, detail definition, consortium building, and funding identification to subsequently land proof-ofconcept trialling, then at-scale adoption.

Intervention areas are grouped:

- Agriculture and food security
- Urban and spatial planning
- Disaster preparedness and response

Following stakeholder engagement, detailed in section three, the Catapult identified a number of cross-cutting recommendations:

Strengthen Data Ecosystems

- Establish centralised Kenyan data repositories and shared licensing models to improve data accessibility and usability.
- Develop interoperability standards and validation mechanisms to ensure data reliability and foster cross-sectoral integration.

Support Multi-Sectoral Partnerships

- Create dedicated working groups that include representatives from government, academia, industry, and local communities. These groups should align on policies, funding priorities, and project execution strategies.
- Encourage joint ventures between UK and Kenyan stakeholders, such as partnerships between technology firms and local organisations, collaborations between academic institutions for research and development, or alliances with community groups and NGOs to address sector-specific challenges while leveraging complementary expertise and resources.

Capacity Building Investment

- Implement training programs tailored to specific sectors, focusing on EO technologies, data analysis, and practical applications.
- Develop initiatives to engage students and professionals, ensuring a skilled workforce to sustain sectoral growth.
- Governments should play a facilitative role by creating policies and incentives that encourage private sector investment in capacity-building initiatives, such as co-funding training programs, providing tax benefits for skill development projects, and supporting public-private partnerships to drive innovation and workforce development.

Promote Community Engagement & Awareness

- Design outreach campaigns to demystify space technologies and their benefits, fostering public trust and adoption.
- Incorporate citizen science initiatives to enhance data collection while involving communities in problem-solving processes.

Leverage EO Technologies

- Enhance the utilisation of existing Earth Observation (EO) data by developing user-friendly tools and platforms that integrate and analyse this data alongside local sources, ensuring stakeholders can derive actionable, context-sensitive insights for agriculture, disaster management, and urban planning.
- Explore opportunities for joint development of advanced analytical tools and platforms, enabling actionable insights for stakeholders.

Policy & Funding Alignment

- Establish a central funding organisation to pool resources and distribute them strategically for high-impact projects.
- Align policies between UK and Kenyan institutions to streamline collaboration, reduce bureaucratic hurdles, and support innovation.

Ranking achieved via evaluating intervention proposals according to effort and impact:

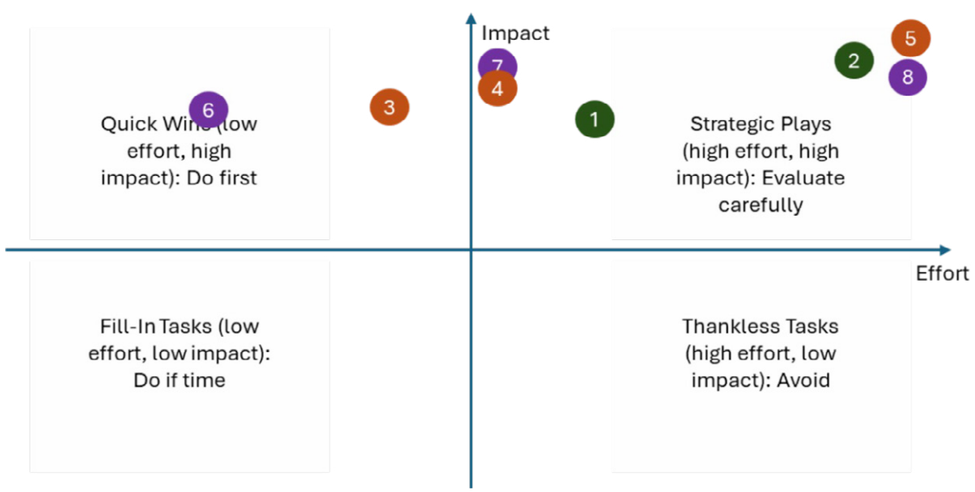


Figure 1 - Intervention priority

Separate to this prioritised intervention set is development of an in-country spaceport, discussed in appendix one. The Catapult recommends further analysis to assess the viability of establishing an in-country spaceport.

Additionally, through in-country engagement, the Catapult identified eight project proposals for further scoping:

1. Develop a framework for effective communication and coordination between government agencies and disaster preparedness and response teams.
2. Secure sustainable funding for an Earth observation system by demonstrating its alignment with government priorities and showcasing its benefits through research and development organisations.
3. Implement an effective Earth observation strategy to support disaster preparedness and response initiatives.
4. Empower leaders to create and design solutions that leverage Earth observation for improved urban and spatial planning decision-making.
5. Identify and prioritise Earth Observation (EO) use cases, including stakeholder analysis and business case development, to facilitate informed decision-making and demonstrate measurable value.
6. Unlock catalytic funding models through collaboration among industry, academia, and government entities.
7. Formulate a working group comprising government, industry, and citizen representatives to develop and coordinate space and satellite technology capabilities for urban and spatial planning.
8. Establish a centralised system that utilises Earth observation and sensor technologies to enhance flood prediction and modelling.

The above proposals further refined in an online session:

Proposal summary	Votes (%)
Agri Challenge 1: Prioritise Earth Observation (EO) use cases through stakeholder analysis and business case development to support decision-making and showcase value.	25%
Disaster challenge 1: Develop and deploy a system to improve communication and coordination among government agencies and emergency teams for a unified, rapid crisis response.	20%
Agri Challenge 2: Develop innovative funding models by partnering with industry, academia, and government, fostering collaboration and communication for sustainable and impactful outcomes.	20%
Disaster challenge 2: Develop a sustainable Earth Observation (EO) system integrating EO and in-situ data for flood mapping, modelling, and strengthened national disaster resilience	15%
Urban Challenge 1: Secure sustainable funding for an operational Earth Observation (EO) system by aligning value propositions with government priorities and leveraging research institutions, ensuring sustainable investment and impact.	10%
Urban Challenge 2: Empower key champions to design innovative solutions that promote data adoption, enhancing decision-making and driving implementation across critical areas.	10%

Figure 3 - challenge prioritisation

From the cross-cutting and highly targeted interventions above, the Catapult will work with KSA to review prioritisation, build winning consortia, and identify funding routes (proposed phase three) to subsequently test and scale technology (proposed phase four).

Separate to this prioritised intervention set is development of an in-country spaceport, discussed in appendix two.
The Catapult thanks all stakeholders for their active participation through this engagement, and especially KSA and FCDO.

2. Research Context

Kenya's space and satellite innovation operates within a framework of policy, delivery, technical, commercial, and research stakeholders, which collaboratively drive technological advancements in the country.

This section summarises desk research that informs the subsequent engagement method (section four).

2.1 Policy

2.1.1 Government

Kenya's government is a presidential representative democratic republic with a unitary system, where the National Government comprises executive, legislative, and judicial branches.

2.1.1.1 Kenya Space Agency

Kenya Space Agency Strategic Plan 2023 - 2027[2] sets the agency vision:

> *"Effective utilisation of space capabilities for national development"*

Mission:

> *"To coordinate, nurture, and develop Kenya's space sector to maximise the utilization of space opportunities"*

Six Key result areas:

1. Coordination and Regulation of Space Activities
2. National Space Capability Development
3. Utilisation of Space Services and Technologies
4. Space Research, Innovation, and Development
5. Resource Mobilisation
6. Strengthening Institutional Capacity

The following core values:

- Excellence
- Professionalism
- Integrity
- Commitment

(EPIC)[3]

Kenya Space Agency ("KSA") is funded by the Kenya Government, and aims to partner regionally and internationally, and establish an ecosystem to attract foreign investment.[4]

[2] *KSA_POPULAR_VERSION_October_Compressed.pdf*

[3] Mwangi, C. 2024. KSA Activities. KSEC 2024. 19th June 2024, Nairobi

[4] *Kenya Launches Blueprint, Funds Local Innovation in Ambitious Space Development Plan - KahawaTungu*

2.1.1.2 Ministry Context

Analysis of the following Ministries' priorities informed research themes; Ministry priorities are detailed in Appendix Two: Ministry Priorities.

- Ministry of Agriculture and Livestock Development
- Ministry of Defence
- Ministry of Education
- Ministry of Environment, Climate Change & Forestry
- Ministry of Information, Communications, and The Digital Economy
- Ministry of Land, Public Works, Housing, and Urban Development
- Ministry of Mining, Blue Economy, and Maritime Affairs
- Ministry of Roads and Transport
- Ministry of Tourism & Wildlife
- Ministry of Investments, Trade and Industry
- Ministry of Water and Sanitation

[5] State Department For Agriculture - MoALD

2.2 Delivery

Kenya state departments are responsible for implementing ministry policy; analysis of the following state department priorities informed research themes:

2.2.1 State Department for Agriculture

"The State Department for Agriculture leads Kenya's efforts to build a resilient and productive agricultural sector. Focused on food security, economic growth, and rural livelihoods, the department drives policy, research, and resource allocation to empower farmers and agribusinesses. Through its various institutions, the department works to modernize agriculture, enhance market access, and ensure agriculture remains a cornerstone of the national economy." [5]

2.2.2 State Department for Livestock Development

Vision:

> *"A leading public agency in creating a sustainable and globally competitive livestock industry."*[6]

2.2.3 State Department for Basic Education

The State Department for Basic Education has the following mandate[7]:

- Education Policy Management
- Management of Continuing Education
- Administration of Early Childhood Education
- Standards and Norms
- Management of Education Standards
- Management of National Examinations and Certification
- Curriculum Development
- Quality Assurance in Education
- Primary and Secondary Education Institutions Management
- Teacher Education and Management
- School Administration and Programmes
- Registration of Basic Education and Training Institutions
- Special Needs Education Management Representation of Kenya in UNESCO
- Adult Education Management Tertiary Institutions and State Corporations
- University Education
- Commission for Higher Education (CHE)
- Higher Education Loans Board (HELB)
- To promote and integrate Information and Communication Technology (ICT) at all levels of education and training

[6] *State Department For Livestock Development - MoALD*
[7] *State Departments | Ministry of Education - Kenya*

2.2.4 State Department for Higher Education and Research (SDHER)

The State Department for Higher Education and Research (SDHER) has the following core functions[8]:

- University education policy
- University education management
- Management of continuing education (excluding TVETS)
- Science, technology and innovation Policy
- Public universities and constituent colleges
- Governance of public universities
- Biosafety management

The functions of the State Department are also guided by the Universities Act 2012 Revised (2015, 2016 and 2018), the Science, Technology, and Innovation Act 2013 and the Sessional Paper No. 1 of 2019 on a Policy Framework for Reforming Education and Training for Sustainable Development in Kenya.

2.2.5 State Department for Technical Vocational Education

Vision:

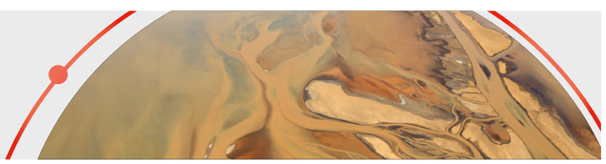
> *"The vision for the TVET sub-sector is to provide skilled and globally competitive employable human resource."*

[8] *State Departments | Ministry of Education - Kenya*

Mission:

"To provide, promote and co-ordinate the training sector by assuring quality, inclusiveness and relevance for the enhancement of the national economy and global competitiveness."

2.2.6 State Department for Environment and Climate Change



The State Department for Environment and Climate Change[9] has the following functions:

- National environmental policy and management
- Climate change / action policy
- Promotion of low-carbon technologies to reduce emissions
- Restoration and protection of strategic water towers
- Protection and conservation of the natural environment
- Pollution control
- Restoration of Lake Naivasha basin
- Meteorological services
- Conservation and protection of wetlands

2.2.7 State Department for Forestry

The State Department for Forestry[10] has the following functions:

- Forestry development policy
- Forestry management
- Support in climate change / action policy
- Development of forests, re-afforestation, and agroforestry

[9] *State Department for Environment and Climate Change – Ministry of Environment, Climate Change and Forestry*
[10] *State Department for Forestry – Ministry of Environment, Climate Change and Forestry*

2.2.8 State Department for ICT and Digital Economy

The State Department for ICT and Digital Economy has the following functions:

- To facilitate the development of the information and communications sector (including broadcast, multimedia)
- Data protection policy and regulation of personal data services
- National ICT policy
- Promotion of ICT innovation and digital economy
- Promotion of E-Government
- Promotion of the software development industry
- Provision of ICT technical support to MDAs
- Policy on automation of government services
- Development of national communication capacity and infrastructure
- Management of national fibre optic installation

2.2.9 State Department of Broadcasting and Telecommunication

The State Department of Broadcasting and Telecommunication has the following functions:

- Telecommunication policy
- Broadcasting policy
- Language policy management
- Public communication
- Government advertising agency
- Coordination of national government advertising services
- Postal and courier services
- Government telecommunication services

2.2.10 State Department for Housing and Urban Development

The State Department for Housing and Urban Development has the vision:

> *"To be a globally competitive organisation in provision of adequate and decent housing in a sustainable environment and coordinated urban development"*

Mission:

> *"To facilitate access to adequate and decent housing and prepare urban plans for sustainable development"*

With functions including:

- Housing policy
- Development and management of affordable housing
- Management of building and construction standards and codes
- Shelter and slum upgrading
- Registration of contractors and materials suppliers
- Building research services

2.2.11 State Department for Lands and Physical Planning

The State Department for Lands and Physical Planning has the vision:

> *"To be a globally competitive organisation in sustainable land management"*

Mission:

> *"To facilitate improvement of the livelihood of Kenyans through efficient land administration, equitable access, secure tenure, and sustainable management of land resource"*

With the following objectives:

- Ensure accessibility, equity, and sustainable management of land resource for socio-economic development
- Strengthen institutional capacity for efficient and effective service delivery

2.2.12 State Department for Public Works

The State Department for Public Works[11] has the following mandate:

- Public works policy and planning
- National building inspection services
- Setting and management of building and construction standards and codes
- Supplies branch
- Coordination of procurement of common user items by government ministries
- Registration and regulation of contractors, consultants for buildings, civil works, and material suppliers
- Registration of architects and quantity surveyors
- Provision of mechanical and electrical building services
- Building research services
- Registration and regulation of civil, building, and electro-mechanical contractors
- Development and management of public buildings
- Other public works

2.2.13 State Department of Mining

The State Department of Mining has the vision[12]:

"A vibrant mining sector contributing to broad-based growth for socio-economic transformation"

Mission:

"To maximise benefits accruing from mineral resources' value chains for socio-economic development in a sustainable environment"

Values:

- Professionalism
- Efficiency
- Teamwork
- Innovation and creativity
- Transparency, integrity, and accountability
- Effective governance

Mandate:

1. Development of policies on the extractive industry
2. Undertaking mineral exploration and mining policy management
3. Maintaining an inventory and mapping of mineral resources
4. Development of mining and minerals development policies and standards
5. Maintenance of geological data (research, collection, collation, analysis)
6. Policies on the management of quarrying of rocks and industrial minerals
7. Mining capacity development and value addition
8. Management of health conditions and health and safety in mines

2.2.14 State Department of Blue Economy

"To facilitate sustainable management and development of fishery resources, aquaculture, and the Blue Economy for accelerated socio-economic development"

Vision:

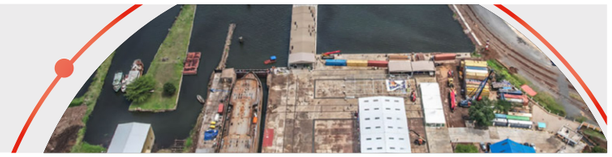
"To be a regional leader in governance of fisheries resources, aquaculture, and the Blue Economy"

Functions:

- Coordinate development of national oceans and blue economy strategy and policy
- Fisheries and aquaculture policy
- Coordination development of policy, legal, regulatory, and institutional framework for the fisheries industry and the blue economy
- Drive sustainable transformation and diversification of the ocean's economy by prompting research and innovation
- Increase local participation and investment in the blue economy through private sector engagement and partnerships
- Fisheries marketing policy
- Fishing licencing
- Development of fisheries
- Promote fish consumption
- Fish quality assurance
- Enhancement of technical cooperation with partner states

- Management and licencing of local and foreign fishing trawlers in Kenya waters
- Overall policy of exploitation of agro-based marine resources
- Policy on development of fishing ports and associated infrastructure
- Capacity building for sustainable exploitation of agro-based marine resources
- Protection of aquatic ecosystems

2.2.15 State Department of Maritime Affairs



The State Department of Maritime Affairs has the vision[13]:

"A leader in the promotion of shipping and maritime"

Mission:

"To promote and development the shipping and maritime industry in Kenya"

[13] *Vision, Mission & Core Values | Shipping and Maritime (shippingmaritime.go.ke)*

Values:

- Integrity: The Department will promote uprightness and reliability while executing its mandate
- Efficiency and Effectiveness: The Department will strive to use minimal resources to achieve maximum results in service delivery. The Department will strive to provide timely and accurate information at all times
- Innovativeness: The Department will be open to new ideas, creativity and resourcefulness in service delivery
- Inclusiveness: The Department will strive to ensure comprehensive participation of all stakeholders and will observe the rule of law in all undertaking
- High Standards of Professional Ethics: The Department will support and facilitate teamwork by recognising both team and individual effort, adhere to best practices, meritocracy, professional ethics and standards
- Equity and Equality: The Department will promote patriotism, impartiality, fairness and equal distribution of resources and services at all levels. The Department will also champion devolution ideals.
- Accountability and Transparency: The Department will strive to conduct its business and lend its services to stakeholders in an open and responsible manner. The Department commits to be accountable for administrative acts

Mandate:

1. Development of policies on the extractive industry
2. Undertaking mineral exploration and mining policy management
3. Maintaining an inventory and mapping of mineral resources
4. Development of mining and minerals development policies and standards
5. Maintenance of geological data (research, collection, collation, analysis)
6. Policies on the management of quarrying of rocks and industrial minerals
7. Mining capacity development and value addition
8. Management of health conditions and health and safety in mines

2.2.16 State Department for Roads

The State Department for Roads has the vision[14]:

"Global leader in the provision of cost-effective road transport infrastructure facilities and services"

Mission:

"To provide efficient, affordable, and reliable road transport infrastructure facilities and services for sustainable socio-economic development"

Values:

- Integrity
- Teamwork
- Innovation
- Customer focus
- Inclusiveness and equity

With the following strategic objectives:

- To formulate / review and coordinate implementation / compliance of requite policies, legal, regulatory and institutional framework for road transport infrastructure development

[14] *SDR Vision & Mission | Ministry of Roads and Transport*

- To develop and enforce regulations and standards to ensure safe, secure, and efficient road transport infrastructure systems
- To enhance and undertake research, build capacity, and development for efficient road transport infrastructure systems
- To expand, modernise, and maintain integrate, safe, efficient and sustainable road transport infrastructure systems and network
- To strengthen institutional framework for road transport infrastructure development and accelerating completion of sector projects
- To undertake research build capacity and development for efficient road transport infrastructure systems

2.2.17 State Department for Transport

The State Department for Transport has the vision[15]:

"To become a global leader in provision of transport, infrastructure services, maritime economy, built environment, and urban development for socio-economic development"

Mission:

"To provide efficient, safe, and integrated transport systems, robust maritime economy, built environment and urban development for sustainable development"

Values:

- Respect and courtesy
- Professionalism

[15] SDT Vision & Mission | Ministry of Roads and Transport

- Integrity
- Transparency
- Accountability
- Impartiality
- Teamwork

2.2.18 State Department of Tourism

"The State Department of Tourism is mandated with provision of strategic policy direction and leadership in tourism development and management in the country as provided for in the Executive Order No.2 of 2013. In this regard, the Ministry plays the oversight role of coordinating and overseeing policy direction and planning; product diversification and experience; tourism marketing and promotion; synergy building and improving the alignment between supply and demand; enhancing competitiveness and investment potentials and monitoring and evaluation of tourism programmes and activities in the country." [16]

2.2.19 State Department for Wildlife

The core mandate of the State Department for Wildlife (SDW) is provision of strategic policy, direction and leadership in wildlife conservation and management in Kenya as provided for under Executive Order No. 2 of 2023 on Organization of the Government of the Republic of Kenya." [17]

Functions:

- Wildlife conservation and protection policy
- Protection of wildlife heritage
- Management of national parks, reserves, and marine parks
- Wildlife biodiversity management and protection
- Sustainable wildlife biodiversity economy
- Collaboration with wildlife clubs of Kenya
- Management of wildlife dispersal areas in collaboration with partners
- Wildlife conservation training and research
- Wildlife conservation education and awareness
- Wildlife biodiversity international obligations and multilateral agreements
- Human-wildlife conflict mitigation and response policy
- Wildlife sector governance and coordination

2.3 Technology

Kenya has a vibrant and rapidly evolving technology innovation ecosystem well-placed to build on existing and emerging innovation capability and ambition, with the following opportunity areas informing research themes.

2.3.1 Earth Observation

Kenya is a country of 583,000 km² and features diverse landscapes, including 536 km of coastline and extensive protected areas. These varied landscapes present challenges such as, food security issues, droughts, and and land degradation, which place pressure on the environment and society. With a population of approximately 55 million, Kenya has a 40:60 rural-urban distribution. Satellite Earth observation provides an effective means to monitor these environments consistently and at scale, presenting opportunities for significant satellite data use.

Kenya has its own Earth Observation capabilities, demonstrated by the TAIFA-1 satellite launched in 2023 by the Kenyan Space Agency. This 3U Earth Observation satellite, equipped with a multispectral payload, was developed in-country by Sayarilabs in partnership with Endurosat. Kenya aims to continue developing satellites to reduce reliance on external data sources while fostering growth in the space sector.

Kenya also accesses datasets from global space agencies including NASA and ESA. One initiative, Digital Earth Africa, offers data and services to African governments and industries, enabling them to use Earth observation data throughout Africa, including Kenya.

In addition, Kenya hosts key institutions centred around Earth Observation data that serve both national and international needs. The IGAD Climate Prediction and Applications Centre, based in Nairobi, provides climate services to Eastern Africa, including warnings about risks such as drought, heavy rainfall, and crop conditions. The RCMRD is an intergovernmental organisation based in Nairobi, serving 20 member states across Eastern and Southern Africa. Its mission is to promote sustainable development through the generation, application, and dissemination of geo-information and ICT services. The RCMRD offers a range of services including surveying, research and development, geospatial data dissemination, advisory services, and capacity building. Its projects focus on key areas such as agriculture, climate change, disaster risk reduction, and natural resource monitoring.

2.3.2 Connectivity

Communication networks can be broadly classified as Terrestrial Networks (TN) and Non-Terrestrial Networks (NTN). During the last few decades, TN has flourished through the deployment of cellular networks, also commonly known as ‘mobile’,and initiatives including the National Optic Fibre Backhaul Initiative (NOFBI). On the other hand, NTN refers to the use of satellite infrastructure and high-altitude platforms (HAPS) orbiting the Earth to provide connectivity Historically, these two types of networks have been used in conjunctions, but not in a unified and standardised way. Initiatives such as 6G aim to achieve unified universal connectivity by leveraging both terrestrial networks (such as 5G) and non-terrestrial networks (such as satellite connectivity).

NTNs enhance the connectivity and coverage of traditional terrestrial networks, offering services such as enhanced mobile broadband and ubiquitous coverage. By integrating NTN technology into 4G/5G terrestrial networks, unique capabilities can be unlocked, creating new opportunities for both consumers and businesses. In a hybrid system, Low Earth Orbit (LEO) and Medium Earth Orbit (MEO) satellites address specific low-latency needs, promoting both efficiency and sustainability, as depicted below.

Geostationary Earth Orbit (GEO) satellites are critical to the satellite industry due to their support for large-scale, long-term infrastructure with fewer launches and replacements. Their fixed, stationary positions simplify ground station operations, making them cost-effective for broadcasting and essential military communications. By reducing the need for dense mega-constellations in LEO, GEO satellites help mitigate space debris and minimize the environmental impact of frequent launches.

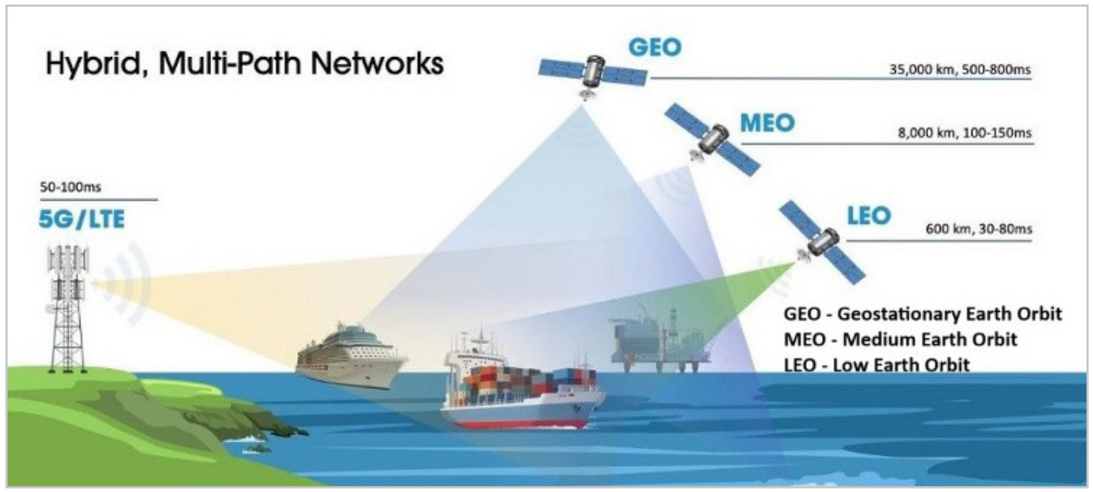


Figure 2 - Hybrid, multi-path network scenarios

The satellite industry involves applying the strengths of various orbits to address the increasing demand for global connectivity. Satellite-based solutions work alongside terrestrial networks (such as 4G/5G and fibre) to provide a global broadband experience for users in both urban and rural areas. Applications are transformative and include:

- Refugee camps
- Schools
- Hospitals
- Remote areas
- Urban slums

The mobile ecosystem comprises three categories: mobile operators, infrastructure and equipment providers; and content and services.

2.3.2.1 Operator Consolidation

Investors in the telecom industry need to make investment decisions based on available resources and sustainable returns. Operators are considering market consolidation and, in some cases, a market exit to address the current situation.

2.3.2.2 Aerial Connectivity

Telecoms networks remain the primary form of connectivity, supported by the wide area coverage of wireless networks and the mass production and adoption of mobile devices. In recent years, however, technological advances in satellite and other non-terrestrial networks (NTNs) have helped to overcome certain limitations associated with aerial connectivity.

Low Earth orbit (LEO) satellite and high-altitude platform system (HAPS) providers have attracted a lot of attention following significant investments and technical breakthroughs that improve the business case for delivering connectivity at scale. Through standardisation, 3GPP (3rd generation partnership project) has laid the foundation for satellite-based connectivity to extend the reach of 4G/5G to regions lacking terrestrial infrastructure. Although satellite solutions have been offered in the region for several decades, LEO and HAPS have spurred interest in NTN solutions.

2.3.2.3 Operator Strategy

Satellites play a crucial role in many operator networks, particularly for backhaul connectivity to terrestrial networks (TNs) in areas where fibre or microwave links are impractical due to challenging terrain. While TNs are vulnerable to environmental disruptions like fibre cuts, Non-Terrestrial Networks (NTNs) provide alternative communication paths, boosting overall network resilience. Satellite coverage, typically focused on low-population density areas, allows multiple mobile network operators (MNOs) to share the same spectrum, reducing operating expenses (OPEX). Satellite providers can act as neutral host operators, enabling different MNOs to share their infrastructure and spectrum for improved monetisation.

2.3.3 Opportunities

Space and satellite technology initiatives include:

- Africa Earth Observation (AEO) Challenge, an annual open innovation contest for space technologies, aiming to boost entrepreneurship and raise awareness of earth observation use-cases for sectors including water security, mining, logistics, and insurance [18]
- Ground receiving station in Kasarani, enhancing Kenya capabilities for Earth observation: The system is designed to receive, process, and extract information from satellite imagery in real-time, to facilitate real-time data acquisition and manage the reception, processing, and storage of data. The system supports timely access to essential data, enhances the production of imagery information, and allows for the creation of customised geospatial products [19]
- International engagement and collaboration efforts, including
  - Engagement with European partners to assess opportunities, needs, and gaps for Earth observation (e.g., https://www.linkedin.com/posts/kenya-space-agency-official_earthobservation-eo-stakeholderengagement-activity-7236670336505700353-FpeA)
  - Ongoing collaboration with India to explore strategic partnerships and innovation drivers (e.g., https://www.linkedin.com/posts/ciidigital_spacecollaboration-indiaafrica-innovation-activity-7231741877882920960-EpJe)
- Kenya Nakuja rocket programme, establishing in-country launch capability aligned to KSA strategy [20]
- TART (Transient Array Radio Telescope) installation, positioning Kenya as a continental leader for radio astronomy, supporting capacity building and engagement from an early age, international collaboration (Kenya, South Africa, New Zealand), and driving research opportunities [21]

General innovation initiatives include:

- Kenya Earth Observation Data Centre, dedicated to enhancing Kenya's capabilities in Earth observation and satellite imagery. The centre receives, processes, and extracts information from satellite imagery in real-time, providing autonomy for data acquisition and ensuring control over the reception, processing, and storage of data
- Luigi Broglio Malindi Space Centre International Centre for Space Education, located in Ngomeni, Kilifi County, which is instrumental in building capacity for Kenya space engineers
- Refurbishment of the X-band antenna at the Luigi Broglio Malindi Space Centre, improving the antenna's ability to acquire remote sensing data from various satellites, thereby enhancing the centre's capacity for Earth observation and supporting climate change monitoring and other scientific missions; the X-band station is equipped with a 6-meter dish used for acquiring data from satellites including ERS2, Spot, and Landsat
- Emerging technology regulation ensuring the right balance between fostering innovation and user safety[22]
- Enabling government policy, including the Kenya National Innovation Agency, KeNIA, discussed previously, and the Digital Economy Blueprint [23]
- Fibre optic broadband roll-out, including development of the National Backbone Fibre Infrastructure (NOFBI)[24],[25]

[18] *Home - Olkaria Ecocloud Data Centre*
[19] *Geographical locations of the IGS GPS receivers*
[20] *Kenya National Innovation Agency*
[21] *Kenya Praises Italy for Establishing International Centre for Space Education - Space in Africa Home - Young Scientists Kenya (ysk.co.ke)*
[22] *Defunct Italian Space Center in Kenya Revived After 36 years - Kenyans.co.ke*
[23] *Starlink Introduces Kit Rental Option to the Kenyan Market - Space in Africa*
[24] *Safaricom wants satellite ISPs like Starlink blocked | TechCabal*
[25] *Kenya Must Update its Regulatory Frameworks to Keep Pace with AI | TechPolicy.Press*

- Increasing affordability of end-user technologies (e.g., smartphone) and connectivity (e.g., 3G, 4G)
- Kenya Digital Literacy programme [26]
- Kenya National Innovation Agency (KeNIA)[27], tasked with developing and managing the National Innovation System. KeNIA builds connection among ecosystem participants and supports innovation from concept through successful delivery

KSA opportunities:

- SMALL-SCALE CROP MAPPING RESEARCH GRANT: The Kenya Space Agency awarded five universities a research grant in FY 2021/2022 to work on small-scale crop mapping using AI and machine learning. After evaluating their solutions, three universities—Dedan Kimathi University of Technology, Jomo Kenyatta University of Agriculture and Technology, and Taita Taveta University—advanced to Phase Two. This phase focuses on uniting their efforts to create a consolidated solution, compare it with open-source tools like Cop4GEOGLAM and NASA Harvest OpenMapFlow, and develop a web platform for accurate crop mapping and monitoring. The universities are collaborating on the Murang'a County agriculture project with government organizations.
- COURSE ON REMOTE SENSING AND GIS FOR AGRICULTURE INFORMATICS: The Kenya Space Agency, in collaboration with the Indian Space Research Organisation (ISRO), held a four-week course in 2024 on "Remote Sensing and GIS for Agriculture Informatics" to enhance Kenya's capacity in space-based agricultural applications. The training covered topics like crop yield modeling, soil resource mapping, and drought response, blending theory with practical sessions. Twenty participants from Kenyan public institutions and academia gained hands-on experience to support the development of an Agriculture Decision Support System. This initiative aims to strengthen data-driven decision-making and improve food security in Kenya.

2.3.4 Challenges

Challenges are detailed subsequently and are summarised:

- Complex regulatory landscape, potentially placing high barriers to entry for new entrants to the market
- Connectivity challenges, discussed subsequently
- Connectivity is not ubiquitous; remote areas are underserved
- Cost of access remains prohibitive for many; limited provider options
- Marketplace navigation for new entrants can be challenging: Starlink Introduces Kit Rental Option to the Kenyan Market - Space in Africa and Safaricom wants satellite ISPs like Starlink blocked | TechCabal
- People and skills challenges, discussed subsequently
- Regulatory lag, potentially hindering emerging technology adoption [28]

2.4 People & Skills

Kenya has a strong people and skills pipeline, and the Kenya government recognises the requirement to set and retain talent in-country to support capability building. Opportunities and challenges include:

[26] *STMIC-Call-For-Application (ksa.go.ke)*
[27] *Space for Women Expert Meeting 2024 (unoosa.org)*
[28] *Home - Young Scientists Kenya (ysk.co.ke)*
[29] *Kenya Must Update its Regulatory Frameworks to Keep Pace with AI | TechPolicy.Press*

2.4.1 Opportunities

Opportunity initiatives include:

- KSA Space Tech Mission Idea Concept (ST-MIC) 2024 Training Bootcamp, a contest for a Nanosat Training Boot Camp for Kenyan university students, hosted by KSA and the Italian Space Agency (ASI)[28].
- United Nations Office for Outer Space Affairs Space4Women Expert Meeting series, promoting gender equality and enhancing women's inclusion in space-related disciplines. This initiative motivates women and girls to engage in Science, Technology, Engineering, and Mathematics (STEM) education and highlights career prospects within the space industry.[29]
- Young Scientists Kenya[30], an initiative that gives young people across Kenya an opportunity to demonstrate and showcase scientific talent through a national science and technology competition
- STEM prioritisation under the Kenya Government Vision 2030 Medium-Term Plan IV [31]

2.4.2 Challenges

quitable education access remains a barrier to building capability; challenges include[32], [33], [34],

- Accessing school facilities, which may be distant from a learner's place of residence, and consequently time-consuming and dangerous to make the journey
- Addressing gender disparity, in context of poverty and cultural attitudes, insecurity and potentially dangerous school environments, and lack of female role models
- Lacking water and sanitation, where learners and especially girls are required to fetch water, which can lead to missing at least two days' education per week
- Paying for schooling, which may be a lower priority to putting food on the table when much of the country's population lives in poverty; funding intended for schooling may be mismanaged and depleted before it reaches the learners
- Training the teachers, in context of cost-constraints, outdated curricula, quality assurance and monitoring, and job insecurity

Retaining STEM talent then becomes a challenge: highly-qualified Kenyans may look for opportunities outside their home country; the UK – South Africa DARA (Development in Africa with Radio Astronomy) project[36] had a 50% returnee rate from a PhD and Masters cohort.[37]

[28] *STMIC-Call-For-Application (ksa.go.ke)*
[29] *Space for Women Expert Meeting 2024 (unoosa.org)*
[30] *Home - Young Scientists Kenya (ysk.co.ke)*
[31] *CEMASTEA unveils 5-year strategic plan to steer STEM Education – Kenya News Agency*
[32] *Challenges of getting Education in Kenya | SchoolForAfrica.org — Giving Children a Fighting Chance*
[33] *Quality education under threat in teacher training.pdf (ku.ac.ke)*
[34] *STEM Education in Kenya: A New Frontier | Makini School*
[35] *The Plight of Girls in Kenya: Overcoming Challenges for a Brighter Future. (coachabilityfoundation.org)*
[36] *DARA Home Page (dara-project.org)*
[37] Hoare, M. 2024. Development in Africa with Radio Astronomy: Lessons. KSEC 2024. 20th June 2024. Nairobi.

2.4.3 Research

Kenya has a globally recognised space and satellite teaching, and research and development capability; key organisations include:

- Jomo Kenyatta University of Agriculture and Technology (JKUAT)
- Kenyatta University
- Machakos University
- Mount Kenya University
- Pwani University
- Regional Centre for Mapping of Resources for Development (RCMRD)
- Taita Taveta University
- Technical University of Kenya
- University of Nairobi

3. Engagement

This section builds on the findings from desk-based research described in sections two and three of this report, which analysed current capabilities, identified gaps, and highlighted strategic opportunities for innovation, collaboration, and commercial activities.

These insights provided the foundation for stakeholder engagement, where interviews and workshops were conducted to gather detailed insights and various perspectives, ensuring that the analysis accurately reflected real-world experiences and sectoral needs.

3.1 Approach

The research methodology combined stakeholder engagement, interviews, and workshops to explore challenges and identify opportunities in Kenya's space sector. Work was carried out in two phases:

	2024								2025
	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan
Phase 1									
Scoping Workshop									
Stakeholder Interviews									
UK Round Table									
Phase 2									
Workshop Series									
Bilateral Event									
Reporting									

Figure 3 - Work phasing

3.1.1 Phase One

- **Scoping Workshop:** A scoping workshop was held with the Kenya Space Agency (KSA) to prioritise which of the five identified sectors had the greatest potential, and to map stakeholders by reviewing existing networks collaborating with the Kenya Space Agency (KSA).
- **Stakeholder Interviews:** The Catapult partnered with the Research Institute for Innovation and Sustainability (RIIS) to conduct a series of interviews to gain a deeper understanding of relevant stakeholder's challenges and priorities to identify and inform future opportunities.
- **UK Roundtable:** The Catapult hosted an online UK roundtable session to explore UK stakeholder priorities for future UK-Kenya collaboration.

3.1.2 Phase Two

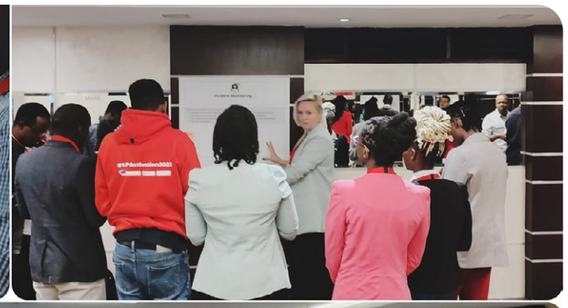
- **Workshop Series:** Three sector-specific workshops were conducted to deepen understanding, prioritise challenges, and develop project outlines for actionable collaborative opportunities.
- **Reporting:** Following the analysis of the collected data, a bilateral event was held presenting the findings to a range of UK and Kenyan stakeholders to further encourage and support future collaboration.

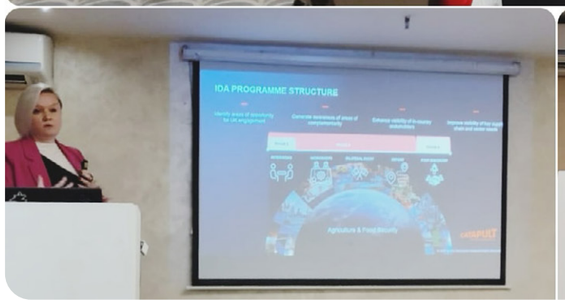
3.2 Phase One Scoping Workshop

Prior to conducting interviews, the Catapult held a scoping workshop with representatives from the Kenya Space agency. The objectives of the workshop were to:

- Identify relevant stakeholders in Kenya that are applying or would benefit from applying space-based technologies or data.
- Select key stakeholders for interviews before or after the Kenya Space Expo and Conference 2024.
- Prioritise sectors with the greatest potential for economic and ecological impact through space-sector engagement.
- Identify existing areas of development and explore opportunities for further development and collaboration

Prior to the workshop KSA had engaged RIIS for the purposes of developing a Space Innovation roadmap for the Kenya space sector; because of the overlapping interests, RIIS attended the scoping workshop.





3.2.1 Stakeholder Identification

The scoping workshop identified key stakeholders involved in or benefiting from Kenya's space sector. Stakeholders identified during the scoping workshop were categorised into the following groups:

- **Government and Policymakers:** Kenyan government bodies and regulators currently working with one or more of the five key sectors identified
- **Industry and Commercial Entities:** UK and Kenyan companies operating in the space and satellite sector, including small and medium enterprises (SMEs) and large corporations. These also include stakeholders working in related fields such as finance and investment that may have an interest in collaborating with or supporting businesses utilising space technologies or data
- **Academic and Research Institutions:** Universities and research centres with expertise in space technology and applications, especially within the Kenyan context
- **End-Users and Beneficiaries:** Organisations and communities in Kenya that stand to benefit from the application of space technologies
- **Funding and Investment organisations:** Organisations that provide finances from private or public funds directed toward the development of the Kenyan space sector or related sectors
- **NGOs and Charities:** Non-governmental organisations and charitable entities involved in activities related to the five key sectors identified, particularly those that could benefit from or support the application of space technologies in Kenya.

3.2.2 Sector Challenges

The scoping workshop identified several overarching challenges facing Kenya's space sector:

- **Investment Gaps:** There is a lack of investment opportunities for start-up and developing businesses
- **Skills Shortage:** There is a perceived lack of skills in the Kenya space sector, and there is a need for greater skills identification and development support
- **Public-Private Transition Barriers:** There are gaps in the process of transitioning public sector projects into the private sector, partly due to a lack of communication mechanisms and partly due to a lack of transitional funding
- **Information Deficit:** There is a lack of information supporting the sector in navigation and positioning
- **Collaboration Needs:** There is a need for further discussions within thematic areas: collaboration, co-design (upstream and downstream partners), e.g., Earth observation (EO), spinning in and spin out technologies

3.2.2.1 Technology & Infrastructure

Key challenges related to technology and infrastructure included:

- **Data regularity:** Regularity of EO data and services is low
- **EO Data Accessibility:** There is a lack of data available in a format that end users can understand and apply
- **Satellite Development:** KSA launched its first satellite in 2023: the Taifa-1 satellite is a 3U Earth observation CubeSat with a 30m pixel resolution. Representatives commented that there had been some challenges with the payload but did not elaborate on this further, commenting that they were concentrating on the development of a 6U satellite in partnership with the African Space Agency

3.2.2.2 Technology Adoption

Adoption of space technology by businesses and government entities has increased, but progress is constrained by:

- **Upskilling Needs:** Broader training initiatives are essential to bridge knowledge gaps and enhance adoption
- **Awareness Gaps:** Many stakeholders still struggle to grasp the value and practical applications of space technologies.
- **"Demystification" Requirement:** Greater efforts are needed to simplify and communicate the benefits of space technologies to end-users and decision-makers.

3.2.3 Priority Sectors

The Kenya Space Agency (KSA) prioritised three of the five selected sectors for analysis:

- **Agriculture and Food Security:** A critical sector supporting 60–70% of livelihoods, with opportunities to enhance decision-making and productivity using space-based technologies.
- **Spatial and Urban Planning:** Essential for national development, requiring precise data for surveying, construction, insurance, and finance.
- **Disaster Management:** Addressing the growing impact of climate-related disasters such as floods, droughts, and wildfires.

3.2.3.1 Opportunity Areas

During the discussion with KSA team representatives, key challenges for the prioritised sectors and the broader Kenyan space sector were identified:

Identifying and responding to challenges and opportunities as regards data acquisition, usage, and portability / interoperability

- Kenya has a vibrant IT and fintech sector, with a good foundation in AI technologies and applications
- Articulating technology in a value context, for example the use of Earth observation for better decision-making (e.g., insurance for crops and property)

Agriculture & Food Security

- Translation of products and services supporting farmers' day-day decision making (Primary)
- Cropland identification and yield (Primary)
- Disease detection and potential crop failure (Secondary)

Spatial & Urban Planning

- Using land cover data for accurate land use decision making (Primary)
- Spatial plans for development, in context of relevant planning best-practice (e.g., The County Integrated Development Plan (CIDP) in Kenya) [38]

Disaster Preparedness & Response

- Flooding: management and supporting in insurance decision making and social planning (e.g., school closures) (Primary)
- Rapid decision making and response systems (Secondary)

Additional Opportunity Areas

- Launch capability, spaceport consultation, ground station infrastructure, satellite subsystem development
- Data infrastructure, including Sentinel and Landsat data sets, storage, computing, processing of satellite data; dashboards and services for communicating data
- R&D infrastructure

Secondary Opportunities

- Developing in-country capability and achieving the right balance of internal and external
- Leveraging in-flight programmes of work
- Improving connectivity for schools

Key Challenges

- Limited R&D infrastructure and capability
- Limited ground station infrastructure and capability
- Limited launch infrastructure and capability
- Limited start-up, scale-up, and private sector support

Figure 4 – opportunity areas identified, phase one

[38] *https://blog.afro.co.ke/county-integrated-development-plan/* The County Integrated Development Plan (CIDP) in Kenya

3.3 Phase One Stakeholder Interviews

The Catapult conducted interviews with a diverse range of stakeholders, selected based on their involvement in the three priority sectors prioritised during the scoping workshop or their connection to the Kenyan or broader space sector. Stakeholders were engaged through three main channels: direct outreach by the Catapult, connections within the Kenya Space Agency's network, and collaborative interviews conducted jointly with RIIS.

The interviews explored the following key themes:

- Stakeholder backgrounds and ties to priority sectors
- Impressions of Kenya's space sector
- Sector challenges
- Universities' role in space industry development
- Workforce skills and training opportunities
- Funding for technology and business development
- National and international collaboration
- Stakeholders' reflections after discussion

During the project, South Africa based organisation RIIS were conducting a sectoral mapping activity in collaboration with the Kenya Space Agency. To avoid participant fatigue, it was agreed that of the 22 interviews held, RIIS would lead 11 of the interview sessions, while the Catapult would lead the other 11.

Stakeholders were divided:

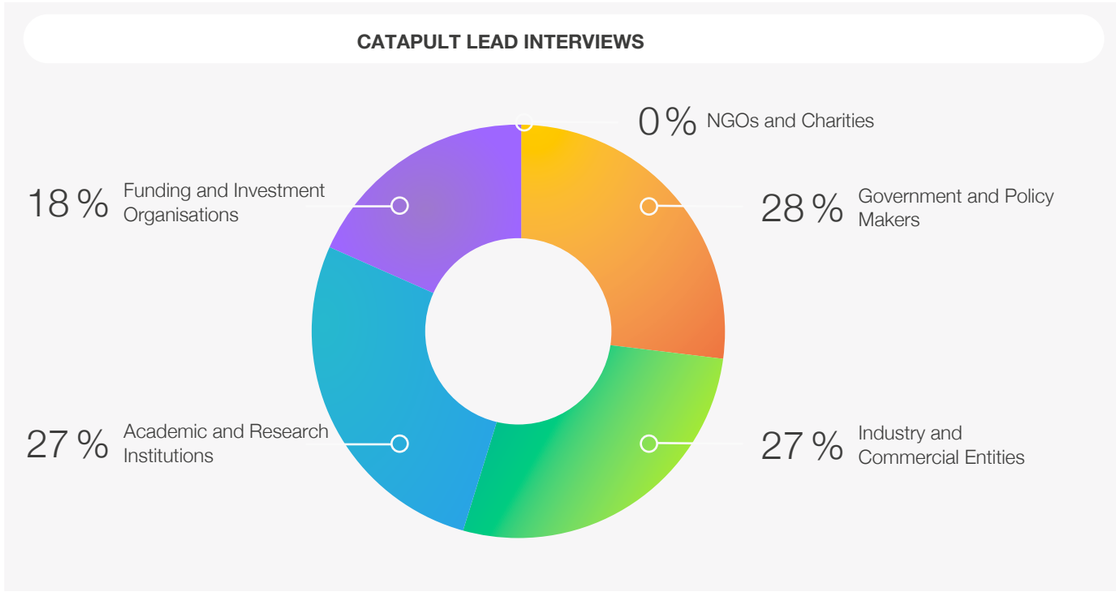


Figure 5 - Catapult-led interviews

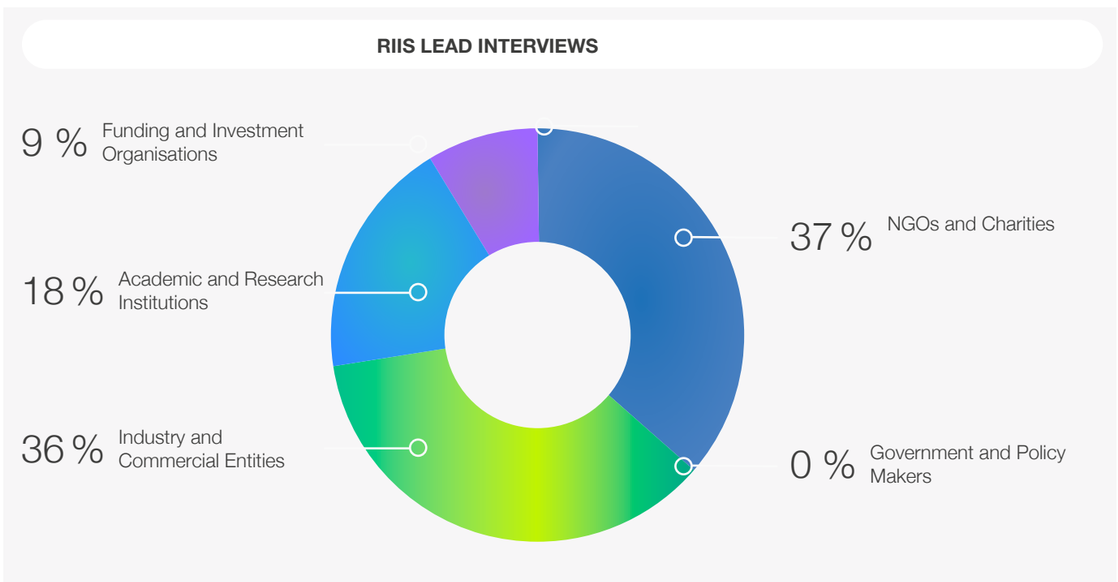


Figure 6 - RIIS-led interviews

3.3.1 Interview Insights

This section summarizes interview findings, highlighting barriers, innovation potential, and the broad impacts of space-based technologies. These insights aim to guide strategies for using Kenya's space capabilities to meet national goals and enhance collaboration.

The analysis is divided into sector-specific findings and ends with broader challenges affecting all sectors. These insights support actionable recommendations for advancing Kenya's space sector.

3.3.1.1 Agriculture & Food Security

Interviews conducted with stakeholders in the agriculture and food security sectors identified the following challenges:

Education & Training
Limited education, awareness, and training hinder the use of space-derived technologies and data in agriculture. This affects the workforce's ability to create solutions, especially in crop mapping and yield identification for smallhold farmers.
Infrastructure & Technology Access
While it is generally understood that connectivity has significantly improved in recent years, communication infrastructure and limited access to technology hinder digital training, information-sharing, and innovation uptake.
Innovation Support
Challenges include limited funding, start-up support, and investment opportunities for agricultural innovators. More broadly, although innovation mechanisms such as incubator and accelerator programs are available, the knowledge required for a comprehensive understanding of space-related technologies and data applications is limited. This knowledge gap prevents programs and investors from fully recognising the value of emerging in-country innovations.
Collaboration & Partnerships
Stronger partnerships between governments, private actors, and farming communities are needed to enhance resource sharing and solution co-creation.
Technology & Digital
Greater access to tools such as drone technologies, terrestrial data collection, and tailored digital products (e.g., apps for crop mapping and pest management) is crucial.

Figure 7 - challenges identified, agriculture and food security, phase one

3.3.1.2 Urban & Spatial Planning

Interviews conducted with stakeholders in the urban and spatial planning sectors identified the following challenges:

Monitoring & Growth Management
The ability to monitor population growth and informal urban development remains challenging. This challenge hinders effective urban planning and the capacity to predict and manage expansion in a sustainable manner.
Technology Access
Limited access to machine learning and data processing technologies, along with insufficient training data and digital models, restricts the ability to address national urban planning challenges. The lack of high-quality, space-derived tools and resources further compounds these issues.
Data Quality & Application
Urban and spatial planning activities require higher-quality data for development, utilities, and infrastructure planning. Similarly, the lack of robust data and expertise affects related sectors, such as insurance and financial services, which struggle to apply space-derived data effectively.
Policy & Regulation
The absence of comprehensive policies, regulations, and standards complicates safety assessments and building regulation compliance. The lack of information in this area undermines the potential of space-derived data to contribute to safe and sustainable urban environments.
Funding & Investment
Insufficient development funding and limited investment in the sector pose significant barriers. A lack of targeted investment prevents the acquisition and application of advanced technologies essential for modern urban and spatial planning.

Figure 8 - challenges identified urban and spatial planning, phase one

Weather & Climate Modelling
Insufficient modelling capabilities hinder accurate predictions and preparedness for climate and weather-related disasters. This limits the ability to forecast and respond to threats effectively.
Infrastructure & Resource Monitoring
The lack of robust systems for infrastructure monitoring and pest identification/tracking reduces resilience against both natural and biological disasters. Additionally, limited resources hinder comprehensive damage assessments and insurance processes.
Inter-Ministry Cooperation
Coordination among ministries is limited, impeding a unified and effective disaster management strategy. This gap exacerbates inefficiencies and delays in disaster response.
Data & Resources
The absence of critical climate datasets, coupled with limited resources for developing systems and tools, constrains effective disaster planning. Challenges in using and accessing existing technologies further hinder progress.
Communication & Coordination
Inadequate communications infrastructure and insufficient disaster relief coordination impede timely and efficient responses to emergencies.
Technology & Cost
The high costs associated with developing and deploying advanced technologies remain a significant barrier. Limited technological development further reduces the capacity to mitigate and manage disasters.

Figure 9 - challenges identified, disaster preparedness and response, phase one

3.3.1.4 Cross-Sectoral Challenges

Several challenges affect multiple sectors, revealing systemic barriers to progress. These issues, which are interconnected, require coordinated solutions across sectors:

Regulatory & Administrative
Complex bureaucratic structures and overlapping regulatory frameworks present challenges for organisations operating within the sector. Additionally, unclear data ownership policies and slow permitting procedures can discourage both local and international investments.
Infrastructure & Resources
Kenya faces challenges such as insufficient ground stations, limited data processing capabilities, and a need for more robust satellite systems. These issues affect the effective generation and utilisation of satellite data. Additionally, regional variations in infrastructure and power system limitations in remote areas impact the scalability of solutions. Kenya's efforts to develop its own launch capabilities also encounter obstacles, including the need for infrastructure, technical expertise, and investment.
People & Skills
The sector's growth is limited by a lack of trained professionals and technical skills. Many space-related graduates struggle to find relevant jobs, and organisations often need to provide extensive additional training. The skills gap is worsened by few specialised programs, insufficient hands-on experience, and a lack of mentorship. Greater collaboration between academia and industry is essential to develop a skilled workforce that can drive innovation and sustain long-term growth.

Awareness & Engagement
Many stakeholders struggle to understand the practical applications of satellite data and its potential benefits. This results in underinvestment and low adoption rates, hampering the sector's ability to demonstrate its transformative potential.
Funding & Investment
Start-ups and smaller organisations often face difficulty accessing early-stage capital, which limits their ability to innovate and scale. While some funding programmes exist, a lack of awareness of the prevalence and value of space derived data and technologies often inhibits organisation's ability to be selected for funding. Moreover, the high costs associated with satellite development, data acquisition, and infrastructure maintenance deter sustained investment in the sector.
Technology & Adoption
Kenya is often reliant on external sources for technological expertise and resources. Challenges in accessing high-resolution satellite imagery, obtaining cloud-free data, and operational constraints hinder progress in critical areas such as environmental monitoring and disaster response. Additionally, many stakeholders lack the technical knowledge required to interpret and operationalise geospatial data effectively. This creates a bottleneck in technology adoption, particularly for small and medium enterprises and local government agencies.
Collaboration & Coordination
Limited coordination between government ministries, private organisations, and international partners prevents the development of unified strategies for addressing cross-sectoral challenges. The absence of cohesive frameworks and platforms for resource sharing and joint innovation further hinders the sector's ability to achieve its full potential.
Reliance & Sustainability
As Kenya's space sector develops, ensuring its resilience against external pressures and long-term sustainability remains a critical challenge. Dependence on foreign partnerships for resources and expertise makes the sector vulnerable to shifting international priorities and market fluctuations. Balancing international collaboration with the development of local autonomy and capacity is essential to mitigate these risks.

Figure 10 - cross-sector challenges, phase one

3.4 Provide Phase One UK Roundtable

In the first phase, six stakeholders from the UK, including representatives from industry, academia, and the UK Space Agency, participated in a roundtable discussion. Their goal was to provide insights and identify gaps in the selected priority sectors. These stakeholders had expertise in space-derived data, technology, and services, and represented institutions that have collaborated with Kenyan entities. Additionally, the session was utilized to validate which three out of the five identified sectors were appropriate for prioritisation.

The session aimed to address the following objectives:

- Identify areas where space-based technologies or data could support these sectors
- Define opportunities for UK-Kenya collaboration
- Validate the business case for UK-Kenya space business and research engagement
- Inform the design of Kenya workshops scheduled for autumn 2024

3.4.1 Challenge Areas

To begin the session, stakeholders shared their experiences engaging with the Kenya space sector and their motivations for collaboration. They were then asked to identify perceived gaps in the sector and highlighted the following challenges:

- Greater satellite usage for communication purposes
- Inadequate power systems and computing resources
- Insufficient Global Navigation Satellite System (GNSS) capabilities for upper-atmosphere studies
- Limited terrestrial and in-situ data for model development
- Poor connectivity and internet access in remote areas
- The need for more sensors in equatorial regions

Unlike in the interviews conducted with regional stakeholders, there was considerably more emphasis placed on the need for improved connectivity and terrestrial data acquisition within the nation.

3.4.2 Opportunity Areas

After identifying gaps, stakeholders evaluated how the UK space sector could address Kenyan challenges in the five priority sectors:

Agriculture & Food Security
• Support the management of downstream data
• Provide nowcasting weather services (eg, African SWIFT project)
• Assist with the management of biodiversity data
Disaster Preparedness & Response
• Assist in gaining membership to the International Disaster Charter
• Make satellite data available for assessing the impact of coral reef bleaching due to heat
• Manage biodiversity data
• Assess drought-related biodiversity issues and their human impacts
• Conduct research sprints to bring together academics and stakeholders
Forestry
• Manage biodiversity data effectively
Natural Resource Management
• Support in exploring and accounting for natural resources and capital
• Assist in acquiring and managing biodiversity data
• Address the shortage of human resources for monitoring the natural environment by prioritising on-ground resources
Spatial & Urban Planning
• Optimise route planning and infrastructure development
Cross-Cutting
• Establish test sites for radiometric data validation
Additional Opportunity Areas
• Support education and skills development tailored to the space sector
• Collaborate on implementing a Very Long Baseline Interferometry (VLBI) radio dish to provide precision geodesy for anchoring a GNSS network
• Enhance data capabilities to reduce the cost of data acquisition
Challenges
• · Hierarchical structures in government departments may hinder progress unless there is unanimous agreement
• · The need for in-country knowledge of local contexts and ways of working
• · Challenges in managing infrastructure
• · The need for UK Space Agency (UKSA) engagement at the Egypt Space Conference and with Kenyan stakeholders
• · Permits take a long time to be granted, with a runway of at least six months required for research

Figure 11 - opportunity areas identified, UK roundtable

3.4.3 Challenges & Collaboration Opportunities

UK stakeholders shared the following challenges and needs for future collaboration with the Kenyan space sector:

- Data Models: Adaptation of models to ensure reliable data
- Funding: Funding to support projects, along with access to alternative funding streams
- Local Partnerships: Stronger connections with local partners
- Long-Term Support: Long-term support to facilitate the permanent implementation of project outcomes, ensuring sustained use both in the UK and overseas

The stakeholders noted that their interactions with Kenyan organisations have generally been positive. Effective working practices with Kenyan entities have helped mitigate challenges when UK partners are unable to be physically present in the country. The session also identified technical challenges, such as the need for improved connectivity, reliable power systems, and enhanced data collection capabilities within Kenya. These gaps highlight significant opportunities for collaboration between the UK and Kenyan space sectors to further develop technological infrastructure and expertise.

Stakeholders pointed out potential challenges, including bureaucratic obstacles, the importance of local knowledge, and effective infrastructure management, which must be resolved to ensure successful cooperation. There was a strong emphasis on the advantages of strategic partnerships, long-term support, and capacity building through skills development and educational initiatives. The session suggested that collaborative projects between the UK and Kenya should focus on using satellite technologies to address specific sectoral challenges, promote sustainable development, and enhance local capabilities.

3.5 Phase One Insight Summary

The stakeholder engagement process provided several critical lessons for advancing Kenya's space sector:

- **Collaborative Frameworks:** Effective partnerships between government, academia, and private sectors are essential for innovation and addressing challenges across sectors.
- **Investment and Funding Needs:** Limited access to funding restricts growth, particularly for start-ups. Targeted financial mechanisms are crucial to support innovation and scaling.
- **Skill Development:** A significant skills gap exists, with insufficient training in industry and academia. Building a skilled workforce is vital for sectoral progress.
- **Awareness and Accessibility:** Many stakeholders lack understanding of space technologies' applications. Simplifying and communicating their benefits is necessary to drive uptake
- **Infrastructure Gaps:** Deficiencies in ground stations, satellite systems, and data processing capabilities limit Kenya's ability to leverage space technologies effectively.
- **Sectoral Integration:** Addressing challenges across sectors requires tailored applications of space-based data and technologies that align with local needs and priorities to amplify impact.
- **Regulatory and Administrative Challenges:** Streamlined policies and clearer frameworks are needed to reduce bureaucratic hurdles and attract investment.
- **Sustainability and Local Autonomy:** Developing local autonomy and capabilities will ensure resilience and reduce dependency on international expertise over time.

3.6 Phase Two In-Country Workshops

In phase two, the Catapult conducted three workshops in Nairobi. Each workshop focused on a specific theme, aligned with priority sectors identified in the scoping workshop:

- Agriculture and Food Security
- Spatial and Urban Planning
- Disaster Preparedness & Response

The objective of these workshops was to:

- Engage with local stakeholders
- Further explore themes identified in phase one interviews
- Identify key challenges within each theme

Then prioritising these challenges to generate preliminary project proposals for further exploration.

3.6.1 Delivery

The in-country workshops were designed based on insights from phase one stakeholder interviews and the Catapult's attendance at the KSEC 2024 conference. Each workshop focused on one of the three prioritised sectors and followed a consistent structure:

- **Introductions:** Led by the Catapult and KSA teams
- **Expert Presentations:** Delivered by sector specialists to provide context for discussion
- **Challenge Exploration:** Participants explored and ideated on sector-specific challenges
- **Challenge Prioritisation:** Key challenges were refined into "How Might We" questions to guide problem-solving
- **Group Proposal Development:** Teams worked collaboratively to create actionable solutions
- **Proposal Presentations:** Groups shared their ideas and received feedback
- **Impact and Effort Analysis:** Proposals were evaluated using an Impact and Effort Matrix to determine feasibility and potential impact

3.6.1.1 Workshop One: Agriculture & Food Security

3.6.1.1.1 Activity One: Challenge Exploration

The first activity required participants to identify challenges in four thematic areas

Theme	Challenge
 Earth Observation	• Awareness of data and technology value is limited • Awareness of data and its utilisation is lacking • Accessing and processing data presents challenges • Data quality, availability, and cost are limited or poor • Conducting crop mapping, plant species identification, and yield predictions is difficult • Weather forecasting accuracy is currently insufficient
 Connectivity	• Limited access to drone technologies and utilisation • Limited tool and information access for farmers • Lacking training and skills opportunities across sectors • Poor infrastructure and internet access, especially in rural areas
 People & Skills	• Limited skills in the current workforces • Limited opportunities/support for collaboration • Lack of available funding • Limited support and guidance for start-ups • Limited training / skills development opportunities for data collection and interpretation • Limited training / skills development opportunities for technology • Required improvement of existing education and training resources at all levels.

Figure 12 - agriculture and food security challenge exploration

3.6.1.1.2 Activity Two: Challenge Prioritisation

Using three stickers, participants were asked to vote on the most impactful individual challenges. The results of this voting exercise are collated below.

Earth Observation		
Sub-Theme	**Prioritised Challenges**	**Votes**
Awareness of data and technology value	Awareness and access to tooling	3
Data accessibility and processing	Hidden and siloed data sources	1
Data quality, availability and cost	Need for improved data storage	1
	Need for improved data quality	2
	Access to historical data	1
Crop mapping, plant species identification and yield predictions		
	Need for better application and design of data models	1
	Need for crop yield prediction	1
	Improved crop mapping and species identification	2
Earth Observation		
Weather forecasting		
	Uncertainty in weather forecasts important for crop management	1
	Need for weather forecasts at a local scale for basic farming units	2
Total votes		**15**
Connectivity		
Awareness of data and technology value Data accessibility and processing Data quality, availability and cost	Insufficient internet connectivity in rural areas	3
	Insufficient funds to improve the existing communications infrastructure	2
	Lack of infrastructure or outdated ground stations	2
	Terminal data collection; ease of access; reliability of data; updating of / and data	1
	Information access for farmers	1
Crop mapping, plant species identification and yield predictions	High data cost	3
	Profitability / business models for digital advisory services	1
	Connectivity training with applications	1
	Underuse of drone tech in production and surveys	1
	Low uptake of research outputs for drone technologies	1
Total votes		**16**
People & Skills		
Funding	Limited funding for research and development	4
	Government agency budget cuts	1
Training	Insufficient access to globally aligned, practical training opportunities in universities	5
Technology	Technology awareness	1
Total votes		**11**

Figure 13 - agriculture and food security challenge prioritisation

3.6.1.1.3 Activity Three: Challenge Definition

Participants were grouped based on their areas of interest to select and discuss three prioritised challenges. Using the “How Might We” (HMW) method, teams reframed these challenges into opportunities for innovation, selecting one HMW question to guide the generation of project proposals.

Earth Observation

"How might we raise awareness of the benefits of data-driven decision making to enable collaborative data access?"

People & Skills

"How might we address food security & agriculture through unlocking various catalytic funding models and encourage industry, academic, government and communications collaboration and communication?"

Figure 14 - agriculture and food security, challenge definition

3.6.1.1.4 Activity Four: Proposal Generation

Each team used a proposal generation canvas to develop a project plan fostering collaboration between Kenyan and UK space sector stakeholders. Guided by their selected "How Might We" (HMW) question, teams created theoretical project proposals to address their chosen challenges. The next section outlines the proposals generated by each team.

Earth Observation

Challenge Statement

How might we raise awareness of the benefits of data-driven decision making to enable collaborative data access?

Pain & Cause

The main obstacles in advancing data-driven decision-making and facilitating collaborative data access include the scarcity of information, lack of transparency, and absence of cohesive frameworks. Competition and data silos within government departments hinder data sharing, exacerbated by fragmented infrastructure and intricate regulatory landscapes. There is limited awareness of tools, services, and geo-portals, with many stakeholders unclear about the benefits, leading to inconsistent buy-in. Challenges related to scalable architecture, sustainable funding, and authoritative oversight further complicate collaborative data access. However, international examples and existing frameworks such as the National Spatial Data Infrastructure (NSDI) could offer valuable guidance. A unified approach is essential to address these gaps, ensuring a shared understanding and demonstrating clear value for all stakeholders.

Stakeholders

The challenges raised involve international NGOs, data providers along with their wider tech stack, data license consumers, the Kenyan government, farmers, the Kenyan space ecosystem, universities, and champions in policy.

Solution Approach

To address the challenge of raising awareness for data-driven decision-making focus on securing government involvement and long-term funding, emphasising the need for sustainable financial support. They identified the importance of clear communication strategies that translate technical concepts into accessible language for non-technical stakeholders, aiming to bridge the knowledge gap and foster wider engagement. A central objective is creating a supportive environment where government backing and ongoing investment make collaborative data access viable and beneficial over time.

Roadmap

- Activities: Identify champions within the community, map stakeholders, and generate use cases for impactful implementation. Focus on stakeholder engagement, champion identification, and collaboration to address key challenges.
- Resources Needed: Secure funding frameworks, including government support, to unlock opportunities for public sector engagement and project sustainability.
- Inputs Needed: Foster co-development processes to ensure collaborative and inclusive project design.
- Risks: Address potential lack of government buy-in, which could hinder project adoption and scaling.
- Outputs: Establish a central hub for satellite data to facilitate actions to enhance food security. Deliver compelling, impactful, and financially beneficial use cases that highlight the project's value. Map current and future capabilities across people, platforms, and providers to chart a clear path forward for the utilisation of the newly generated Satellite data hub.

Roadmap

- **Activities**: Identify champions within the community, map stakeholders, and generate use cases for impactful implementation. Focus on stakeholder engagement, champion identification, and collaboration to address key challenges.
- **Resources Needed:** Secure funding frameworks, including government support, to unlock opportunities for public sector engagement and project sustainability.
- **Inputs Needed:** Foster co-development processes to ensure collaborative and inclusive project design.
- **Risks:** Address potential lack of government buy-in, which could hinder project adoption and scaling.
- **Outputs:** Establish a central hub for satellite data to facilitate actions to enhance food security. Deliver compelling, impactful, and financially beneficial use cases that highlight the project's value. Map current and future capabilities across people, platforms, and providers to chart a clear path forward for the utilisation of the newly generated Satellite data hub.

Project Stakeholders

- KSA (Kenya Space Agency) led – would take a lead role in the initiative, with broader involvement from other government bodies, industry stakeholders, and end-user representatives.
- Wider Government involvement – Other government bodies and departments should be included to ensure broad representation and support.
- Industry and end-user representation – Private sector (industry) stakeholders and end-users should also be involved, ensuring that diverse perspectives and needs both up and downstream are represented and addressed.

Project Summary

Capture and prioritise Earth Observation (EO) use cases, including stakeholder analysis and business case development, to drive informed decision-making and demonstrate tangible value.

Figure 15 - project proposal one, agriculture and food security

People & Skills

Challenge Statement

How might we address food security & agriculture challenges by unlocking various catalytic funding models and encouraging industry, academic, government and communications and collaboration?

Pain & Cause

The primary challenges to addressing food security and agriculture through catalytic funding models arise from fragmented coordination and communication among key stakeholders. Partners often work in silos with limited collaboration, leading to duplicated efforts and inefficient resource allocation. The funding landscape is fragmented, with political influences further complicating alignment. Additionally, there is minimal technology transfer from research institutions to communities and private sector stakeholders, limiting practical application. A lack of co-creation and engagement with end-users results in solutions that do not meet community needs and fail to attract sustained funding. Finally, inconsistent policy application, such as in Kenya, further hinders cohesive, impactful action across sectors.

Stakeholders

The problem primarily affects national, regional, and county governments, local communities, financial institutions like banks and impact investors, academia, and various funding organisations. Key stakeholders include government bodies, the private sector, development partners, and research institutions, all of whom could benefit from stronger coordination, clearer leadership, and consistent policies to effectively address food security challenges.

Solution Approach

Proposed solutions include establishing ecosystems that support co-creation, actively engaging communities, and building trust among diverse stakeholders to enable sustainable, collaborative approaches to food security.

Roadmap

- Activities: The roadmap for success includes organising hackathons and similar events, creating working groups, and aligning priorities across policies and strategies.
- Resources: Key resources needed include funding from government bodies, development partners, private institutions, and agricultural donor groups.
- Inputs: Essential inputs involve leveraging incubation centres, digital hubs, supportive regulations, co-created products and services, and engaging small to medium enterprises (SMEs).
- Risks: Primary risks to address are potential mis-coordination, lack of commercial viability, trust issues among government, funders, and academics, and misaligned government priorities.
- Note: The participants felt at this stage that involving the Agriculture Sector Network (ASNET) will be crucial to fostering collaboration and ensuring strategic alignment.

Project Stakeholders

The ideal leadership for the project would be a consortium involving KALRO, universities, and key organisations in agriculture and technology, alongside the Kenya Space Agency (KSA).

Project Summary

Figure 16 – project proposal two, agriculture and food security

3.6.1.2 Workshop Two: Urban & Spatial Planning

3.6.1.2.1 Activity One: Challenge Exploration

The first activity required participants to identify challenges in four thematic areas:

Theme	Challenge
 Earth Observation	Funding Data cost Data management Data accuracy Capacity Infrastructure Awareness and use of existing data

Theme	Challenge
 Mapping & Applications	Difficulty acquiring data of good quality; challenges in data availability and high costs Difficulty mapping and assessing urban changes Low investment in the sector Poor infrastructure A lack of coordination and cooperation between government and sectoral partners A lack of skills development and training opportunities / resources Currently a lack of systems and frameworks in place to support climate resilience
 Practice, Policy & Regulation	Poor implementation of policy from government stakeholders A lack of understanding and application of space data for informing policy Limited stakeholder engagement Poor enforcement of policy and standards Limited understanding from government stakeholders regarding practice and knowledge

Figure 17 - urban and spatial planning challenge exploration

3.6.1.2.2 Activity Two: Challenge Prioritisation

Using three stickers, participants were asked to vote on the most impactful individual challenges. The results of this voting exercise are collated below.

Mapping & Applications		
Sub-Theme	**Prioritised Challenges**	**Votes**
Awareness of data and technology value Data accessibility and processing	Poorly controlled urban growth; lack forward planning resulting in large numbers of informal settlements	1
	High and sometimes unpredictable migration impacts in population modelling	2
Data quality, availability and cost	Lack of data sharing	3
	Increased awareness of data platforms, including open platforms	2
	Inter and intra-government join-up	2
Total votes		10

Practice, Policy & Regulation		
Implementation	Timeline and linking up policy, technology, academia	5
	Policy knowledge-sharing	1
	Lack of implementation of the building code	1
	Dissemination of information regarding existing policies	1
Space data	Lack of requisite policy	6
	Policy makers lacking appropriate technical knowledge	3
Enforcement	Political, economical, enforcement; lack of resources	1
	Lacking standards enforcement	2
	Lacking departmental policy enforcement	2
Funding	Insufficient funding routes	2
Stakeholder engagement	Challenges engaging stakeholders	4
	Political interference	1
Implementation	Benefits for EO integration to business workflows not yet clear	1
Total votes		30

Earth Observation		
Sub-Theme	**Prioritised Challenges**	**Votes**
Capacity	Capacity building	8
	Technical knowledge to support and scale activities	1
Data accuracy	Poor EO data accuracy	1
Data management	Requirement for data centralisation	1
	Data management coordination	2
	Fragmented services and uncoordinated sources	2
Funding	Value proposition by sector	1
Infrastructure	Infrastructure gaps / challenges	3
Data cost	Cost of high-resolution data	2
	Agency collaboration	3
	Awareness of the value of EO	1
Awareness and use of existing data	Understanding of data availability	3
Total votes		33

Figure 18 - urban and spatial planning, challenge prioritisation

36.1.2.3 Activity Three: Challenge Definition

Participants were grouped based on their areas of interest to select and discuss three prioritised challenges. Using the “How Might We” (HMW) method, teams reframed these challenges into opportunities for innovation, selecting one HMW question to guide the generation of project proposals.

Earth Observation
“How might we raise awareness of the benefits of data-driven decision making to enable collaborative data access?”
Mapping & Data
“How might we address food security & agriculture through unlocking various catalytic funding models and encourage industry, academic, government and communications collaboration and communication?”
Practice, Policy & Regulations
“How might we identify where the relevant policy ownership lies?”

Figure 19 - urban and spatial planning, challenge definition

3.6.1.2.4 Activity Four: Proposal Generation

Each team used a proposal generation canvas to develop a project plan fostering collaboration between Kenyan and UK space sector stakeholders. Guided by their selected "How Might We" (HMW) question, teams created theoretical project proposals to address their chosen challenges. The next section outlines the proposals generated by each team.

Earth Observation
Challenge Statement
How might we leverage funding to enable or enhance the use of EO for urban planning, to improve quality of life?
Pain & Cause
The main issues hindering the use of Earth Observation (EO) for urban planning include a lack of awareness, limited understanding of its benefits and business cases, and insufficient capacity and skills. Challenges are compounded by fragmented EO budgets, lack of funding, poor continuity, weak value propositions, and misplaced priorities, leading to underutilisation and ignorance of EO’s potential benefits.
Stakeholders
This problem affects county governments (seeking transferable solutions), citizens (impacting quality of life), infrastructure management, various government departments, MDAs under the Ministries of Agriculture and Lands, the private sector, universities, and stakeholders involved in bilateral agreements.
Solution Approach
Proposed solutions include unlocking budgets for centralised EO procurement, implementing multi-user licensing, and supporting local solution development. Additional suggestions involve securing non-space-specific funding and developing use cases to demonstrate EO’s value. The desired outcome is a sustainable funding model that enhances EO utilisation in urban planning to improve quality of life.
Roadmap
◉ Activities: Develop value proposition use cases, generate diverse use cases to demonstrate EO’s benefits, and implement centralised procurement to reduce waste. ◉ Resources Needed: Engage universities for research support and involve policymakers to define relevant use case challenges. ◉ Inputs Needed: Establish accessible data for the planning sector and create an operational system for integrating EO in urban planning.
Project Stakeholders
Ideal leadership for this project would come from the government, specifically involving the Kenya Space Agency (KSA), the State Department for Land Physical Planning (SDLPP), and the Ministry of ICT, supported by a dedicated working group.

Project Summary

Unlock long-term funding into an operational system to use EO by presenting value propositions through research institutions, linking to government requirements.

Figure 20 - project proposal three, urban and spatial planning

Mapping & Data

Challenge Statement

How might we harness available data and design solutions that may be used by multiple stakeholders for different purposes/ application allowing data to be shared to satisfy the specific requirements and needs of a given location.

Pain & Cause

The problem arises from limited collaboration between academia and industry, data being isolated in dashboards, poor sector coordination, lack of awareness about available data, inadequate resources, misaligned interests, scattered data, absence of a central coordination system, lack of data sharing, and no framework policies for coordination.

Stakeholders

Those currently affected by this problem include government bodies like the Ministry of Lands, local governments, MDAs, humanitarian agencies, and decision-makers. Other impacted stakeholders include local communities, finance and insurance sectors, academia, NGOs, researchers, commercial industry players, and media at both mainstream and regional levels. Those who could benefit from improved data sharing include spin-off initiatives with community impact, as well as NGOs and other agencies that currently lack coordination and mutual data access.

Solution Approach

Proposed solutions include conducting a needs assessment and leveraging AI for deeper insights, particularly with location-based and multi-source data. Key actions involve raising awareness of available data, improving coordination within MDAC, fostering partnerships among data collectors and agencies, and engaging executives to ensure stakeholder buy-in. Establishing a dedicated data agency, along with a framework and policies for data sharing, is essential. Strengthening the Bureau of Statistics to coordinate data across MDAs and local governments and increasing awareness among affected communities are also critical steps.

Roadmap

- Activities: Engage executives through champions within ICTA, KSA, Statistics, and Lands departments, conduct stakeholder mapping, and perform needs assessments.
- Resources Needed: Secure funding and assemble an organisational team to drive the initiative.
- Inputs Needed: Assess available data, gather specific requirements, and deploy trained personnel.
- Outputs: Aim for political support, establish clear data-sharing standards and policies, create a central data repository, and set up a dedicated data agency.
- Risks: Potential issues include excessive regulations, having too many “champions” without clear roles, and challenges in securing sustained political backing.

Project Stakeholders

Ideal leadership would come from the Statistics Agency, with essential support from policymakers, private sector partners, and civil society organisations.

Project Summary

We will empower champions to create and design solutions to promote, use and uptake utilisation of data for decision support.

Figure 21 - project proposal four, urban and spatial planning

Policy, Practice & Regulation

Challenge Statement

How might we identify where relevant policy ownership lies?
Pain & Cause

Pain & Cause

The problem stems from poor coordination between agencies, limited understanding of space capabilities in spatial and urban planning, inadequate legal frameworks, fragmented policy ownership, insufficient government capabilities, and a lack of standardised terminology.

Stakeholders

Those affected by this problem include the private sector, county governments, state departments (such as physical planning and housing), urban development, and the public. Key stakeholders who could benefit from clearer policy ownership include NEMA, academia, the physical planning department, the Attorney General, Kenya Law Reform, and professional associations like the Kenya Institute of Planners (KIP) and the Architectural Association of Kenya (AAK). The Kenya Space Agency and the National Land Commission are also relevant stakeholders.

Solution Approach

Proposed solutions include building capabilities in both general and space-specific areas, demystifying space, and fostering sector engagement across public and private stakeholders. Key actions involve enhancing collaboration, ensuring accountable public participation, supporting research and innovation, and creating harmonised laws and policies to streamline policy ownership and implementation.

Roadmap

- Activities: Develop a government-public space engagement strategy and digitise land titles using a decentralised ledger for secure documentation.
- Resources Needed: Establish a clear funding route and a collaboration mechanism, such as a working group, alongside an accountability-driven space engagement strategy.
- Inputs Needed: Increase awareness of the value of space-enabled services within the relevant context.
- Risks: Address potential risks, including ambiguity in land ownership, political interference, and the risk of losing expertise and momentum due to political changes.

Project Stakeholders

The ideal leadership for this project would come from the Cabinet Secretary of the Ministry of Urban Lands Development, with strong support from residents’ associations (such as Metro Alliance) and professional associations.

Project Summary

Establish a government, industry and citizen working group to develop & coordinate (space) policy in urban planning.

Figure 22 - project proposal five, urban and spatial planning

3.6.1.3 Workshop Three: Disaster Preparedness & Response

3.6.1.3.1 Activity One: Challenge Exploration

The first activity required participants to identify challenges in three thematic areas:

Theme	Challenge
 Connectivity & Coordination	• Lack of funding • Stakeholder engagement and partnership development • Data storage • Skills development • Communication and collaboration challenges
 Earth Observation	• Data availability challenges • Data access challenges, including timeliness • Systems integration • Demonstrating RoI • Expertise • Data storage
 Incident Monitoring	• Coordination • Air quality • Flood, droughts, pests • Systems and tools • Awareness • Capacity

Figure 23 - disaster preparedness and response challenge exploration

3.6.1.3.2 Activity Two: Challenge Prioritisation

Using three stickers, participants were asked to vote on the most impactful individual challenges. The results of this voting exercise are collated below.

Connectivity & Coordination		
Sub-Theme	**Prioritised Challenges**	**Votes**
Stakeholders and partnerships	Insufficient leadership	2
	Challenges in government and private sector collaboration	1
	Limited interdisciplinary partnerships	3
Data storage	Lack of data storage and use for pattern prediction	1
Skills development	Education gaps	2
	Lack of education	1
Total votes		10

Earth Observation		
Sub-Theme	**Prioritised Challenges**	**Votes**
Data availability	Data validation and verification (ground truthing)	1
Data cost	High cost of data acquisition	1
	High costs of data tooling	1
Data availability (timeliness)	Availity of sufficiently tempo'd data for weather and climate modelling	1
Systems integration	Requirement to combine satellite data with additional data sources	5
	Complex data access mechanisms	7
RoI	RoI not clear	4
	Political interference	2
Expertise	Technical understanding limiting insight	1
Data storage	Data storage and use challenges	3
Total votes		23

Incident Monitoring		
Sub-Theme	**Prioritised Challenges**	**Votes**
Coordination	Data sharing challenges	1
	Ineffective coordination, including disaster response	3
Flood, droughts, pests	Requirement for flood monitoring tools at county level	2
Insurance (damages)	Damage assessment for insurance claims	2

Systems and tools	Only global systems are available; more local models are required	2
	Localised, and granular information is required to inform weather risk modelling	1
	Requirement for systems to support specific disasters	1
	Requirement for up-to-date inventory of events and incidences	1
	Requirement for seamless workflows for data collection and reporting	1
Awareness	Requirement for improved community awareness	2
Capacity	Requirement for a step-change in policy formulation	2
	Requirement for viable disaster mitigation strategies	1
Total votes		24

Figure 24 - disaster preparedness and response, challenge prioritisation

3.6.1.3.3 Activity Three: Challenge Definition

Participants were grouped based on their areas of interest to select and discuss three prioritised challenges. Using the "How Might We" (HMW) method, teams reframed these challenges into opportunities for innovation, selecting one HMW question to guide the generation of project proposals.

Connectivity & Coordination
“How might we effectively coordinate disaster response during emergencies?”
Earth Observation
“How might we develop a sustainable EO system for disaster response?”
Practice, Policy & Regulations
“How might we incorporate in-situ local / data/ sensors/ historical data/ citizen science, and combine with global systems to get better prediction models? (for flooding)”

Figure 25 - disaster preparedness and response, challenge definition

3.6.1.3.4 Activity Four: Proposal Generation

Each team used a proposal generation canvas to develop a project plan fostering collaboration between Kenyan and UK space sector stakeholders. Guided by their selected "How Might We" (HMW) question, teams created theoretical project proposals to address their chosen challenges. The next section outlines the proposals generated by each team.

Connectivity & Coordination

Challenge Statement

How might we effectively coordinate disaster response during emergencies?

Pain & Cause

Key issues affecting disaster response include slow response times, poor coordination, and the absence of designated safety collection points. Additional challenges involve insufficient predictive measures, lack of trust in the system, limited coordination between county responders and government agencies, and skill gaps among National Youth Service (NYS) responders. These factors collectively contribute to severe consequences, including loss of lives, property damage, and infrastructure degradation.

Stakeholders

The problem currently affects a wide range of stakeholders, including county governments, local communities, school managers, students, and parents. Other impacted parties include emergency response teams, the National Government (particularly the National Disaster Operations Centre), and humanitarian agencies. Business owners and mobile app platforms providing safety services with emergency features (such as a “RED button” for immediate assistance) also have a vested interest and could benefit from improved disaster response coordination.

Solution Approach

Suggested solutions for improving disaster response coordination include ensuring adequate medical supplies, fostering effective communication between stakeholders, and building capacity within response teams. Community awareness, timely coordinated responses, and military support in emergencies were also emphasised. Additional recommendations include knowledge transfer initiatives and investing in local infrastructure to enhance resilience and preparedness.

Roadmap

Activities and Milestones

Establish Early Warning Systems: Implement early warning technologies and protocols for timely alerts and disaster prediction.

- **Develop Proper Infrastructure:** Invest in resilient infrastructure, including safe collection points and transport routes to facilitate quick evacuation and access.
- **Training and Capacity Building:** Provide thorough training for first aiders and coordinators, focusing on skill-building in emergency response and communication.
- **Create Communication Protocols:** Establish clear communication channels from first responders to the emergency response team to ensure smooth information flow during crises.

Required Inputs

- **Early Warning Systems:** Technology, data sources, and operational protocols to anticipate and alert communities to potential disasters.
- **Proper Infrastructure:** Investments in shelters, accessible evacuation routes, and necessary supplies such as medical kits.

Stakeholders for Involvement

- **First Aiders and Coordinators:** To serve as on-ground responders, delivering initial aid and managing early response actions.
- **Trainers of Trainers:** To provide continued education, helping first aiders maintain and develop crucial emergency skills.
- Emergency Response Team (ER Team): To manage and direct large-scale response efforts.
- **Communication Facilitators:** Individuals or systems designated to ensure reliable, real-time communication between first aiders and the ER Team.

Expected Outputs

- **Established Early Warning Infrastructure:** Functional systems that provide timely alerts and allow proactive responses to potential disasters.
- **Well-trained First Responders:** A network of skilled first aiders and coordinators who can effectively respond to emergencies.

Potential Risks

- **Lack of Skills Among First Aiders:** Risk of insufficient training, which could impede initial response effectiveness.
- **Poor Emergency Response Coordination:** Possible delays or miscommunication between responders and emergency teams.
- **Insufficient Funding:** A lack of financial resources could limit infrastructure development and training programs.

Project Stakeholders

Participants suggested that the most suitable leaders for this project would include the county, local, and national governments, given their existing responsibilities in disaster management and public safety. Additionally, international organisations such as the United Nations and the World Bank were recommended for their expertise, resources, and experience in coordinating large-scale emergency response initiatives and supporting infrastructure development in high-risk areas.

Project Summary

System for effective communication & coordination with wider network of Gov. & Emergency response teams.

Figure 26 - project proposal six, disaster preparedness and response

Earth Observation

Challenge Statement

How might we develop a sustainable EO system for disaster response?

Pain & Cause

Key challenges in developing a sustainable Earth Observation (EO) system for disaster response include a lack of understanding among stakeholders, the complexity of emerging technologies, insufficient evidence supporting effectiveness, unsustainable funding, and the use of technical jargon that limits accessibility and engagement.

Stakeholders

The challenges surrounding the development of a sustainable Earth Observation (EO) system for disaster response currently affect insurers, communities, national and local governments, public utilities, private businesses, local industries, and aid organisations. These stakeholders would benefit significantly from a reliable EO system, as it would enhance disaster preparedness, risk assessment, and response capabilities across sectors.

Solution Approach

Key strategies for developing a sustainable EO system for disaster response include prioritising disaster prevention, ensuring system sustainability, and enhancing disaster preparedness. Comprehensive data collection on various disasters, effective knowledge transfer, and scaling successful practices are essential. Establishing sustainable partnerships, coordinating stakeholders, and securing consistent funding are also critical to achieving a resilient and reliable EO system.

Roadmap

Activities and Milestones

- **Generate Use Cases:** Study and document successful EO disaster management systems in other countries to inform best practices and potential adaptations.
- **Conduct Cost-Benefit Analysis:** Evaluate the economic feasibility of the EO system, identifying long-term savings and risk mitigation benefits.
- **Develop Structure and Workflows (Standardised Disaster Protocols - SDPs):** Establish clear operational structures, including workflows and response protocols, to streamline disaster response using EO data.

- **Develop Structure and Workflows (Standardised Disaster Protocols - SDPs):** Establish clear operational structures, including workflows and response protocols, to streamline disaster response using EO data.

Required Resources

- **Economic Insurance Database:** Build an integrated database to support economic assessment and risk calculation, providing insights into the financial impacts of disasters.

Key Inputs

- **Stakeholder Management Feedback:** Actively engage stakeholders to gather insights, ensuring the system aligns with user needs and encourages broad adoption.

Expected Outputs

- **Benchmark EO Disaster Management Systems:** Create a set of benchmarks based on the performance of EO systems in other regions, helping to evaluate and refine the project's effectiveness.
- **Export Potential:** Establish a framework with the potential for replication and export to other regions, enhancing global disaster response capabilities.

Potential Risks

- **High Initial Costs:** The cost of developing, implementing, and maintaining the system could pose financial challenges.
- **Stakeholder Engagement Challenges:** Lack of buy-in or active participation from stakeholders may hinder the system's adoption and effectiveness.
- **Data Integration Issues:** Difficulty integrating diverse data sources into a cohesive and accessible system could affect functionality

Project Stakeholders

Participants identified the National Disaster Operations Centre (NDOC) and the National Drought Management Agency (NDMA) as well-suited to lead this project. Both organisations possess relevant expertise in disaster response and management, making them capable of coordinating the development of a sustainable Earth Observation (EO) system.

Project Summary

Sustainable operational EO system for disaster response management.

Figure 27 - project proposal seven, disaster preparedness and response

Incident Monitoring

Challenge Statement

How might we incorporate in-situ local / data/ sensors/ historical data/ citizen science, and combine with global systems to get better prediction models? (for flooding)

Pain & Cause

The problem arises from attempting to apply global models locally without integrating local data and models, coupled with poor coordination among government and NGOs. Challenges include limited adoption of emerging technologies in policy, high costs of rain stations, connectivity issues with sensors, and low public awareness of the value of data collection. Additionally, the lack of relevant policy frameworks, the area-specific nature of floods, and continued reliance on manual data collection hinder progress.

Stakeholders

This problem affects local governments, citizens in affected areas, the Red Cross, NGOs, and agencies like the National Disaster Operations Centre (NDOC), KSA, and WRA. Other relevant stakeholders include organisations in the space industry (e.g., KEE, HornAid), the research community, policymakers, and insurance and financing institutions, all of whom could benefit from improved flood prediction models.

Roadmap

Activities:

- Conduct capacity-building initiatives to strengthen skills and knowledge among stakeholders.
- Engage stakeholders through regular meetings and collaborative events.
- Lobby for political support to ensure sustained commitment to flood prediction interventions.
- Review and evaluate existing technology solutions and conduct pilot project assessments.

Resources Needed:

- Strong political backing and influential champions.
- A skilled leader to drive the project effectively.
- A software platform to centralise data and facilitate collaboration.
- Sufficient funding for development and operational needs.

Inputs Needed:

- Access to free satellite rainfall products (e.g., CHAPS) to enhance data accuracy.

Expected Outputs:

- A centralised coordination system for streamlined data integration and accessibility.
- A supportive policy framework for citizen science initiatives.
- Clearly defined ownership of the system to ensure accountability and long-term management.

Risks:

- Limited feasibility of educational outreach, potentially affecting public engagement.
- Risk of sensor vandalism, which could disrupt data collection and monitoring efforts.

Project Stakeholders

The participants identified the ideal leadership for this project as coming from a collaboration between the Kenya Space Agency (KSA), ICPAC (IGAD Climate prediction and Application Centre), the Water Authority, local governments, the Kenya Bureau of Statistics, and the Red Cross.

Project Summary

Create a central system for EO and in-situ sensor data for flood mapping and modelling for resilience.

Figure 28 - project proposal eight, disaster preparedness and response

3.6.1.4 Bilateral

The Catapult hosted an online event aimed at promoting UK-Kenya collaboration by highlighting project progress, fostering partnerships, and validating proposals from in-country workshops. This event served as a platform to align objectives and drive impactful outcomes.

Key organisations, including the Satellite Applications Catapult, Kenya Space Agency, Innovate UK Business Connect, and the Foreign, Commonwealth & Development Office, delivered presentations emphasising their roles in advancing innovation and international cooperation.

Research findings were shared, featuring case studies that demonstrated the feasibility and impact of proposed projects. Additionally, a company showcase included organisations such as Pixalytics Ltd, Omanos Analytics, Spatial Collective Limited, and Esri East Africa, illustrating the practical value of combined expertise in addressing mutual challenges. During the session, participants responded to a series of questions using an online survey tool. The questions and corresponding responses are summarised below.

Participants were asked to identify which of the three key sectors were most relevant to their organisation. The weighted responses highlighted the importance of each sector: Agriculture & Food Security ranked highest with 41%, followed by Disaster Management at 33%, and Urban and Spatial Planning at 26%.

Challenges identified during the in-country workshops were consolidated into six key areas and prioritised by the bilateral audience. The results, ranked by significance based on attendee votes, are presented below:

Proposal summary	Votes (%)
Agri Challenge 1: Prioritise Earth Observation (EO) use cases through stakeholder analysis and business case development to support decision-making and showcase value.	25%
	20%
Disaster challenge 1: Develop and deploy a system to improve communication and coordination among government agencies and emergency teams for a unified, rapid crisis response.	20%
Agri Challenge 2: Develop innovative funding models by partnering with industry, academia, and government, fostering collaboration and communication for sustainable and impactful outcomes.	20%
Disaster challenge 2: Develop a sustainable Earth Observation (EO) system integrating EO and in-situ data for flood mapping, modelling, and strengthened national disaster resilience	15%
Urban Challenge 1: Secure sustainable funding for an operational Earth Observation (EO) system by aligning value propositions with government priorities and leveraging research institutions, ensuring sustainable investment and impact.	10%
Urban Challenge 2: Empower key champions to design innovative solutions that promote data adoption, enhancing decision-making and driving implementation across critical areas.	10%

Figure 29 - challenge prioritisation, bilateral

Following the presentations, attendees were asked to list three new insights they had gained during the session. The majority of respondents noted learning about opportunities for collaboration. Other comments were broadly distributed, focusing on the impact and applications of EO technologies and a deeper understanding of the challenges facing Kenyan sectors.

When asked whether they were interested in advancing an idea incorporating space technology, 100% of respondents indicated their willingness and readiness to develop such ideas.

Attendees were asked to identify organisations best positioned to fund future proposals. The majority of responses were evenly distributed among the United Kingdom Space Agency (UKSA), private sector actors, and collaborative funding efforts between

space agencies and other funding bodies. The remaining votes were distributed across the following organisations:

- European Space Agency (ESA)
- United Nations (UN)
- FCDO
- Kenya Space Agency (KSA)
- Downstream data users
- Regional authorities
- East Africa community
- Global Environment Facility
- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
- World Bank
- Ford Foundation
- Kenyan National Research Fund (NRF)
- UK Department for International Development (DFID)
- United Nations Office for Disaster Risk Reduction (UNDRR)
- Innovate UK

These outcomes aligned with findings from earlier stakeholder engagement activities, emphasising the necessity of a collaborative funding approach involving government and private sector actors to drive development.

Finally, attendees were asked to share their reflections on the materials presented during the event. The majority of respondents expressed their enthusiasm for the inspiring and impactful potential of the topics discussed. Others highlighted the numerous opportunities for UK-Kenya collaboration and stressed the importance of continued partnership to achieve shared goals.

3.7 Stakeholder Insights & Recommendations

The stakeholder engagement process was structured to iteratively narrow down insights across its stages, culminating in stakeholder driven actionable recommendations for advancing collaborations between the UK and Kenya. This section reflects on the key findings, the methodology for synthesising insights, and oWers recommendations to strengthen future partnerships and project outcomes.

3.7.1 Key Findings

Key findings were identified as:

Data Accessibility & Integration

- The workshops and interviews underscored the persistent challenges surrounding data accessibility, including high costs, fragmented sources, and the need for centralised repositories.
- Participants emphasised shared licensing models and collaborative frameworks to reduce costs, enhance usability, and foster equitable access to Earth Observation (EO) data.

Stakeholder Collaboration & Coordination

- Effective partnerships emerged as a linchpin for success, with repeated calls for multi-sectoral engagement involving public agencies, private enterprises, academia, and local communities.
- Dedicated working groups were proposed as a mechanism to align policies, drive innovation, and ensure sustained funding and stakeholder buy-in.

Capacity Building & Public Awareness

- The process highlighted significant gaps in technical expertise, stakeholder awareness of EO technologies, and the lack of robust training programs tailored to sector-specific needs.
- Building trust with local communities and raising public awareness were deemed vital, particularly in disaster preparedness and agricultural adoption of space-based solutions.

Technology Priorities

- EO technologies were unanimously recognised as essential, with specific applications in flood prediction, urban planning, and localised weather monitoring.
- Data integration and advanced analytical tools, including machine learning, were identified as critical for generating actionable insights and improving decision-making.

Figure 30 - key findings

3.7.2 Key Recommendations

The following recommendations will strengthen UK-Kenya collaborations by addressing identified challenges, fostering sustainable partnerships, and maximising the impact of space sector initiatives across both nations.

Strengthen Data Ecosystems

- Establish centralised Kenyan data repositories and shared licensing models to improve data accessibility and usability.
- Develop interoperability standards and validation mechanisms to ensure data reliability and foster cross-sectoral integration.

Support Multi-Sectoral Partnerships

- Create dedicated working groups that include representatives from government, academia, industry, and local communities. These groups should align on policies, funding priorities, and project execution strategies.
- Encourage joint ventures between UK and Kenyan stakeholders, such as partnerships between technology firms and local organisations, collaborations between academic institutions for research and development, or alliances with community groups and NGOs to address sector-specific challenges while leveraging complementary expertise and resources.

Capacity Building Investment

- Implement training programs tailored to specific sectors, focusing on EO technologies, data analysis, and practical applications.
- Develop initiatives to engage students and professionals, ensuring a skilled workforce to sustain sectoral growth.
- Governments should play a facilitative role by creating policies and incentives that encourage private sector investment in capacity-building initiatives, such as co-funding training programs, providing tax benefits for skill development projects, and supporting public-private partnerships to drive innovation and workforce development.

Promote Community Engagement & Awareness

- Design outreach campaigns to demystify space technologies and their benefits, fostering public trust and adoption.
- Incorporate citizen science initiatives to enhance data collection while involving communities in problem-solving processes.

Leverage EO Technologies

- Enhance the utilisation of existing Earth Observation (EO) data by developing user-friendly tools and platforms that integrate and analyse this data alongside local sources, ensuring stakeholders can derive actionable, context-sensitive insights for agriculture, disaster management, and urban planning.
- Explore opportunities for joint development of advanced analytical tools and platforms, enabling actionable insights for stakeholders.

Policy & Funding Alignment

- Establish a central funding organisation to pool resources and distribute them strategically for high-impact projects.
- Align policies between UK and Kenyan institutions to streamline collaboration, reduce bureaucratic hurdles, and support innovation.

Figure 31 - key recommendations

3.7.3 Conclusion

The stakeholder engagement process provided valuable insights into the challenges and opportunities within Kenya's space sector. By narrowing down priorities through a collaborative and iterative approach, the project identified actionable strategies to address critical needs while fostering sustainable UK-Kenya partnerships. These recommendations aim to build on the momentum generated, ensuring that future collaborations maximise impact and deliver mutual benefits for both nations.

4. Appendix One:

4.1 Introduction

Kenya’s aspirations to establish a spaceport for vertical rocket launches present a significant opportunity to capitalise on its unique geographical advantages, develop its economic and technological capabilities, and become a regional leader in space exploration and satellite services. Significant challenges exist, however, including the need for substantial investment, technical expertise, and the development of a regulatory and operational framework. Success will depend on strategic international partnerships, effective infrastructure development, and mitigating environmental and societal risks. If these factors are carefully managed, Kenya could position itself not only as a player in the global space industry but also as a leader in Africa’s space sector, leveraging the spaceport for national development, economic growth, and regional leadership.

4.1.1 SWOT

The following SWOT summarises Strengths, Weaknesses, Opportunities, Threats:

Strengths

Geographic location

- Proximity to the equator: Kenya’s proximity to the equator is advantageous for launch
- Favourable climate: Kenya’s relatively stable weather conditions, including coastal conditions, can provide suitable launch windows

Strategic position

- Sea access: launches from coastal regions enhance safety by reducing launch overpopulated areas
- Global reach: launch from Kenya could offer strategic access for both eastward and polar satellite launches

Economic impact

- Revenue generation: a Kenya spaceport could attract global space agencies and private investment, and generate revenue through launch and ancillary services
- Job creation and economic growth: establishing a spaceport will directly and indirectly create jobs, including ancillary jobs (e.g., tourism)

Weaknesses

Limited infrastructure

- (Lack of) existing launch facilities: Kenya does not have the specialised infrastructure required for rocket launch; building this infrastructure would require significant investment
- Underdeveloped transport networks: transporting rockets and launch components to a launch site may be challenging because of the limited state of the road, rail, and port infrastructures

High upfront cost

- Capital investment: development of a spaceport would require substantial investment as regards construction, technology, and skills development
- Limited in-country expertise: Kenya has nascent domestic space capability and closing the people and skills gap will require investment across education and training

Regulatory and safety

- Space policy development: Kenya would need to strengthen its regulatory framework governing space activity, requiring legislative efforts that could take time

Opportunities

International partnerships

- Collaborative work: Kenya can seek to build partnerships with the international space community including NASA, ESA, and the private sector
- Space hub: Kenya could work to further position itself as a leader in Africa's space sector, setting a launch site for that region of the continent

Emerging space economy

- Demand for satellite launches: with the global increase of demand for satellite constellations, a Kenya launch capability could tap into a strong market
- Green space: Kenya could elect to incorporate "green" practices in spaceport development as position itself as a leader in sustainable space initiatives

Tourism and education

- Space tourism and science promotion: a Kenya spaceport could position itself as a hub for space tourism and space-themed educational programmes
- Boosting higher education and innovation: Development of a spaceport could lead to specialised academic programmes, fostering in-country innovation and R&D efforts

Threats

Geopolitical and security

- Regional instability: East Africa has experienced periods of political instability, terrorism, and regional conflicts that could pose security risks to a spaceport facility
- Competition: Kenya would face competition from both established and emerging launch sites, including French Guiana and India

Environmental and social

- Environmental impact: development of a spaceport could lead to environmental degradation, and may engender opposition from environmental groups and / or require costly mitigation
- Social displacement: depending on the location chosen, local communities could be displaced

Technological and market

- Requirement to buy-in capability: if Kenya relies heavily on foreign technology and expertise, the country could face risks relating to technology transfer, or the inability to sustain operations without external support
- Market volatility: the global space economy is highly competitive and fluctuates, and changes could reduce the viability of a Kenya spaceport

4.2 Analysis

Kenya's potential development of a spaceport has advantages and challenges. From the SWOT above, factors for further analysis include:

4.2.1 Strategic

Kenya's geographic location near the equator is a strength that positions it well to take advantage of more efficient rocket launches, particularly for missions aimed at geostationary orbits. This provides a natural competitive edge that could attract global satellite operators and launch service providers seeking cost-effective solutions. Additionally, the country's coastal access allows for safer launches over the Indian Ocean, reducing risk to populated areas and minimising the likelihood of debris affecting land-based regions. These factors give Kenya an inherent geographical advantage over other potential spaceport sites, particularly those further from the equator.

4.2.2 Economic & Technology Opportunities

A Kenyan spaceport would represent economic opportunity, with the potential to catalyse the development of a space industry in East Africa. The growing demand for satellite launches offers significant market opportunities. Kenya could serve as a regional hub for space activities, attracting international clients for small satellite launches. Furthermore, the spaceport could stimulate local technological advancements, fostering innovation and creating high-skill job opportunities in fields like aerospace engineering, data analysis, and satellite technology.

Beyond immediate economic gains, a spaceport would position Kenya to play a pivotal role in addressing regional challenges, such as climate change, natural resource management, and disaster response. Satellites launched from Kenya could be used for Earth observation, providing valuable data for agriculture, forestry, urban planning, and environmental monitoring. This would not only contribute to Kenya's own national development goals but also strengthen the country's leadership in addressing sustainable development challenges across Africa.

4.2.3 Challenges & Mitigation

The lack of existing advanced infrastructure and technical expertise in rocket launch technology could present considerable hurdles in establishing the spaceport. Building out the necessary infrastructure (including launch pads, tracking stations, and mission control centres) will require substantial financial investment and technical partnerships. Kenya would need to attract international collaborators, possibly through public-private partnerships or cooperation with established space agencies, to help fill technical gaps and provide necessary expertise. Engaging companies from established spacefaring nations, as well as emerging private space companies, could fast-track the development process.

In terms of financing, the high initial capital costs could be mitigated by exploring foreign investments, leveraging the country's strategic location as a unique selling point. Kenya may also consider seeking funding from multilateral development organisations, such as the African Development Bank or the World Bank, which could provide financial backing for a project of this scale, particularly if it is framed as an investment in infrastructure, innovation, and sustainable development.

4.2.4 Competition & Geopolitical Risk

Kenya would also face significant competition from established spaceports around the world, particularly those that already have the capacity to conduct frequent launches and provide comprehensive services. To address this, Kenya should focus on niche markets, such as the growing small satellite sector and regional space operations. By specialising in lower-cost launches for small satellite constellations, Kenya could position itself as a competitive alternative to larger spaceports, particularly for African and emerging-market clients looking for cost-effective and reliable launch services.

Geopolitical factors could pose another challenge: Kenya operates in a region that has experienced periods of political instability, which could make foreign investors cautious. Furthermore, as space becomes increasingly weaponised, Kenya would need to navigate the complex dynamics of international space law and geopolitics, ensuring it maintains neutrality and security within its space operations. Strengthening domestic governance frameworks around space activities, including safety, environmental standards, and security protocols, would be essential to build credibility and trust with potential international partners and investors.

4.2.5 Environmental & Social

A major consideration for the development of a spaceport would be its potential environmental impact, particularly in terms of pollution, noise, and the disturbance of coastal ecosystems. Careful environmental planning and the adoption of sustainable technologies could help mitigate these concerns. Engaging local communities early in the planning process, conducting environmental impact assessments, and investing in environmentally friendly technologies—such as reusable rockets or green propellants—could help to address public concerns and reduce opposition.

Additionally, managing public perception will be crucial: local communities may raise concerns about the safety and long-term societal impacts of the spaceport. Kenya will need to ensure transparent communication and emphasise the broader national benefits of the project, such as job creation, educational opportunities, and national prestige in the growing space sector. Public engagement and corporate social responsibility initiatives would be essential in securing public support and minimizing resistance.

4.3 Case Study: French Guiana Spaceport

To evaluate Kenya's potential spaceport development, a useful comparison can be made with the Guiana Space Centre (Centre Spatial Guyanais, CSG) in French Guiana, which is widely regarded as one of the most successful spaceports in the world. French Guiana, like Kenya, benefits from a prime equatorial location, making it an excellent benchmark for Kenya's proposed spaceport.

Figure 32 - French Guiana

4.3.1 Geographic Advantage

- **Kenya:** Kenya's proximity to the equator (1° south) provides an optimal location for launching rockets into geostationary orbit. This is similar to French Guiana and enables rockets to take advantage of the Earth's rotational speed, resulting in lower fuel consumption and higher payload capacity for eastward launches.
- **French Guiana:** Located at 5° north of the equator, the Guiana Space Centre offers nearly identical geographic advantages. The site allows for efficient launches and is surrounded by the Atlantic Ocean, providing safe launch trajectories over water, much like Kenya's Indian Ocean coast.

Comparison: Both Kenya and French Guiana share nearly identical geographic advantages for space launches, with their proximity to the equator providing an edge for launching payloads into geostationary and polar orbits. French Guiana's Atlantic Ocean access mirrors Kenya's coastal location along the Indian Ocean, providing a natural advantage for over-water launches.

4.3.2 Infrastructure & Industry

- **Kenya:** Kenya has limited current infrastructure and expertise in large-scale space launch operations, though it does have some historical experience through the Italian-managed Broglio Space Centre in Malindi. Kenya would need to invest significantly in building spaceport infrastructure and developing a skilled workforce capable of supporting high-tech vertical launch operations.
- **French Guiana:** The Guiana Space Centre has been operational since 1968 and is one of the most advanced spaceports globally. It is used by the European Space Agency, Arianespace, and other commercial partners. The spaceport boasts well-developed infrastructure, including multiple launch complexes, payload integration facilities, and a highly skilled workforce. It supports the Ariane, Soyuz, and Vega launch vehicles.

Comparison: French Guiana has an established and mature spaceport with decades of experience in vertical launches, supported by strong European and international partnerships. In contrast, Kenya would need to build a spaceport from scratch and develop the necessary infrastructure, partnerships, and expertise. Kenya could look to French Guiana as a model for what can be achieved with the right investments and international collaboration.

4.3.3 Economic & Strategic Importance

- **Kenya:** A spaceport in Kenya would serve as a gateway for the African space industry, allowing for the development of satellite launches, telecommunications infrastructure, and Earth observation capabilities. This could position Kenya as a regional leader in space exploration and satellite services, particularly for African nations seeking affordable launch solutions. In the long term, it could attract foreign direct investment, foster innovation, and create a high-tech job market.

- **French Guiana:** The Guiana Space Centre plays a key role in the global space industry, handling a large share of commercial satellite launches, particularly for geostationary orbits. Its strategic location and operational reliability have made it a critical asset for Europe and the global space market. It generates significant revenue for the region and bolsters French Guiana's economic standing, contributing to local employment and technological development.

Comparison: Both spaceports are strategically located near the equator and would serve as hubs for their respective regions. French Guiana's spaceport is deeply integrated into the global space economy, particularly in the European and commercial satellite sectors, while Kenya's spaceport could become a key player in Africa and emerging markets. The success of French Guiana highlights the long-term economic and strategic value a spaceport can bring to its host nation.

4.3.4 Challenges & Risks

- **Kenya:** Kenya faces numerous challenges, including the lack of established infrastructure, high upfront capital costs, and the need to develop a regulatory and legal framework for space activities. Additionally, Kenya would have to overcome the risks posed by regional instability and competition from other African nations with space ambitions (e.g., South Africa, Nigeria, Egypt).
- **French Guiana:** While French Guiana benefits from being part of France and the European Union, it has historically faced social and political challenges, including unrest related to economic inequality and labour strikes. Additionally, the remote location and tropical climate pose logistical challenges, such as weather-related delays.

Comparison: Both Kenya and French Guiana face risks, though they differ in nature. French Guiana's challenges are largely related to social issues and operational difficulties like weather, while Kenya's risks are primarily around infrastructure development and the political and economic environment. French Guiana benefits from its integration into the European Union, while Kenya would need to rely on international partnerships and investment to build a competitive spaceport.

4.3.5 Environmental

- **Kenya:** A spaceport in Kenya would need to address environmental concerns, including the impact of rocket launches on coastal ecosystems, potential pollution from rocket propellants, and noise disturbances. Given Kenya's biodiversity and reliance on eco-tourism, mitigating environmental impact will be a critical aspect of the project's success.
- **French Guiana:** The Guiana Space Centre is situated in a tropical rainforest, and careful measures have been implemented to minimise environmental impact. The spaceport's environmental management includes monitoring of local ecosystems, pollution controls, and efforts to limit the footprint of launch operations on surrounding wildlife habitats.

Comparison: Both regions are environmentally sensitive, and any spaceport development would need to adopt sustainable practices to mitigate environmental damage. French Guiana's spaceport serves as a model for managing space activities in sensitive environments, and Kenya could apply similar environmental protection protocols, especially given its tourism sector's reliance on ecological conservation.

4.3.6 International Partnerships & Collaboration

- **Kenya:** Kenya would likely need to form international partnerships to build its spaceport, given its limited experience and financial resources. Collaborations with spacefaring nations and private companies could provide the expertise and capital required for this venture. Additionally, cooperation with the African Union could position Kenya as a leader in Africa's space industry.
- **French Guiana:** The Guiana Space Centre is heavily supported by the European Space Agency (ESA), Arianespace, and international partners. Its success is largely due to the backing it receives from Europe's space sector and the strategic cooperation between multiple space agencies and commercial players.

Comparison: Both Kenya and French Guiana rely on international partnerships. French Guiana is embedded in the European space ecosystem, while Kenya would need to develop new partnerships. Kenya could leverage the growing interest in Africa's space capabilities and could attract investments from both public and private space players.

4.4 Conclusion

Kenya's proposed spaceport shares many geographical advantages with French Guiana's Guiana Space Centre, offering an ideal location for efficient rocket launches due to its proximity to the equator and coastal access. Kenya faces challenges, however, in terms of building infrastructure, securing financing, and developing expertise, while French Guiana benefits from decades of experience and established partnerships with global space agencies.

With international partnerships, careful planning, and investment, Kenya could replicate the success of French Guiana and establish itself as a key player in the global space industry, particularly within the African and emerging markets. Achieving this will require overcoming significant initial hurdles, however, including infrastructure development, environmental concerns, and the establishment of a skilled workforce.

5. Appendix Two: Ministry Priorities

Analysis of the following Ministries' priorities informed research themes.

5.1 Ministry of Agriculture and Livestock Development

The Ministry of Agriculture and Livestock Development[38] has the following strategic objectives:

1. To create an enabling environment for agricultural development
2. To increase productivity and outputs in the agricultural sector
3. To enhance national food security
4. To improve market access and trade
5. To strengthen institutional capacity

Underpinned by the following core functions:

1. Formulation, implementation, and monitoring of agricultural legislations, regulations, and policies
2. Supporting agricultural research and promoting technology delivery
3. Facilitating and representing agricultural state corporations in government
4. Development, implementation, and coordination of programmes in the agricultural sector
5. Regulating and quality control of inputs, produce, and products from the agricultural sector
6. Management and control of pests and diseases
7. Collecting, maintaining, and managing information on the agricultural sector

Supported by the following core values:

- Professionalism
- Integrity
- Efficiency and Responsiveness
- Partnerships

[38] *Ministry Overview – Ministry of Agriculture and Livestock Development (kilimo.go.ke)*

5.2 Ministry of Defence

The Ministry of Defence[39] is comprised of the Kenya Army, Air Force, Navy, Defence Forces Constabulary, and the Civilian Staff; with the vision:

"A premier, credible, and mission-capable force deeply rooted in professionalism"

With the primary mandate:

"To defend and protect the sovereignty and territorial integrity of the Republic of Kenya"

With the secondary mandate:

"To assist and cooperate with other authorities in situations of emergency or disaster and restore peace in any part of Kenya affected by unrest or instability as assigned."

With the commitment:

"The Ministry of Defence is committed to defending and protecting the people of the Republic of Kenya and their property against external aggression and also in providing support to the Civil Authority as per the Law."

With the following core values:

- Apolitical: The Defence Forces will steer clear of politics and will remain steadfastly apolitical
- The Civil Prerogative: The Defence Forces shall always subordinate itself democratic Civil Authority and exemplify civility in all its dealings with the people of Kenya
- Loyalty and Commitment: The Defence Forces will uphold its loyalty and commitment to the Commander in Chief and the people of Kenya through the chain of command
- Patriotism: The staff of the Ministry of Defence shall always be patriotic to the Government and the People of Kenya
- Professionalism: Service delivery will be based on the highest professional standards and will be blind to gender, ethic, race, or any other consideration
- Integrity: The staff of the Ministry of Defence will carry out their duties with the highest integrity and in accordance with the laid down rules and regulations
- Reliability: The Defence Forces pledges to be a reliable partner in attending to the needs of the nation, its people, and the general public at large
- Knowledge: The Ministry of Defence will pursue knowledge for its staff and endeavour to integrate new technology in its operations and management process
- Confidentiality: The staff of the Ministry of Defence will maintain high standards of confidentiality of the data and information in its possession, strictly adhering to the need-to-know principle
- Fairness: The Ministry of Defence will ensure fairness in all its activities especially in hiring, development, and disciple of personnel which will be undertaken with utmost impartiality

39 *Our Service Charter – Ministry of Defence – Kenya (mod.go.ke)*

5.3 Ministry of Education

The Ministry of Education[40] has the vision:

"A globally competitive education, training, research and innovation system for sustainable development"

Mission:

"To provide, promote, and coordinate quality education, training and research; and enhance integration of Science, Technology and Innovation into nation production systems for sustainable development"

With the following core values:

- Transparency, accountability and integrity – We are committed to delivering our services in an honest, accountable and transparent manner
- World-class benchmarking standards – We commit ourselves to deliver based on international standards for global competitiveness
- Excellence and team work – We embrace excellence in service delivery, teamwork and collaboration both among internal team members and with external stakeholders in the delivery of services
- Respect for human rights and gender sensitivity – We shall render services without any discrimination regardless of race, ethnic background, religion, gender and social status
- Professionalism, ethical and evidence-based decision making – Service delivery will be based on the highest professional standards and ethics. Decisions made will, as much as possible, be based on objectively verifiable facts
- Innovation and creativity – Service delivery will be improved through continuous and creativity in new and more efficient methods

40 *Vision & Mission | Ministry of Education - Kenya*

5.4 Ministry of Environment, Climate Change & Forestry

The Ministry of Environment, Climate Change & Forestry has the vision:[41]

"Clean, Safe, Healthy, Sustainably Managed Resilient Environment and Natural Resources"

Mission:

"To conserve, protect, sustainably manage the environment and natural resources to support biodiversity and socio-economic transformation"

Strategic goals:

1. Enhance environmental, climate change and forestry governance
2. Sustainably managed and resilient environment and forest ecosystems
3. Mitigate climate change impacts
4. Expand agroforestry and commercial forestry
5. Ensure adequate and sustainable resources

The Mistry is comprised of two state departments:

- State Department for Environment and Climate Change
- State Department for Forestry

[41] *Ministry of Environment, Climate Change and Forestry*

5.5 Ministry of Information, Communications & The Digital Economy

The Ministry of Information, Communications, and The Digital Economy[42] has the vision:

"An informed and digitally empowered Kenyan society"

Mission:

"To facilitate sustainable social economic transformation of Kenya by leveraging on ICT, universal access to information and communication services for global communication services for global competitiveness"

With the following policy priorities:

- Implementation of service charter
- Capacity building in the ICT sector
- Modernisation of equipment
- Mainstreaming of the HIV / AIDS, health and safety activities in the Ministry
- Facilitation of the development of knowledge-based information society
- Continuous review of the legal framework
- Promotion of regional and international cooperation in ICT issues
- Creation of employment through outsourcing of ICT services
- Periodically review and update national ICT policy to facilitate development of the ICT sector

The Ministry is comprised of two state departments:

- State Department for ICT and Digital Economy[43]
- State Department of Broadcasting and Telecommunications[44]

Key initiatives including:

- National Optic Fibre Backhaul Initiative (NOFBI), managed by the ICT Authority (ICTA), which will achieve enhanced connectivity across Kenya7
  - Scope: to lay 5,000km of terrestrial fibre optic cable
  - Purpose: to ensure maximum utilisation of capacity and connectivity in all districts

[42] *About the Ministry – Ministry of Information, Communications and The Digital Economy (ict.go.ke)*
[43] *ICT and Digital Economy – Ministry of Information, Communications and The Digital Economy*
[44] *National Optic Fibre Network Backhaul Initiative (NOFBI) | Kenya Vision 2030*

- Impact: to achieve improved national and international connectivity

- Konza Technopolis Development Authority (KoTDA), a flagship project managed under Kenya's Vision 20308:
  - Scope: to develop a world-class sustainable technology hub
  - Purpose: to create a global technology and innovation hub
  - Impact: to drive economic growth through ICT, education, and commercialisation

5.6 Ministry of Land, Public Works, Housing, and Urban Development

The Ministry of Land Public Works, Housing, and Urban Development[45] combines the Ministries of Lands, Housing, and Public Works[46]; three relevant State Departments are in scope:

- State Department of Housing and Urban Development[47]
- State Department for Lands and Physical Planning[48]
- State Department for Public Works

[45] *Ministry of Lands, Public Works, Housing, and Urban Development – The Official Website of the President of the Republic of Kenya*
[46] *Ministry of Land, Housing & Urban Development | Kenyans.co.ke*
[47] *Vision and Mission – Housing and Urban*
[48] *Home - State Department for Lands and Physical Planning*
[49] *Home | Ministry of Mining, Blue Economy and Maritime Affairs (mibema.go.ke)*

5.7 Ministry of Mining, Blue Economy, and Maritime Affairs

The Ministry of Mining, Blue Economy, and Maritime Affairs[49] comprises three state departments:

- State Department of Mining[50]
- State Department of Blue Economy[51]
- State Department of Maritime Affairs[52]

5.8 Ministry of Roads and Transport

The Ministry of Roads and Transport[53] combines two state departments:

- State Department for Roads
- State Department for Transport

[50] *Home | State Department for Mining*
[51] *Blue Economy and Fisheries Function | Ministry of Mining, Blue Economy and Maritime Affairs (mibema.go.ke)*
[52] *Homepage | Shipping and Maritime (shippingmaritime.go.ke)*

5.9 Ministry of Tourism & Wildlife

The Ministry of Tourism & Wildlife[54] has the vision:

"A vibrant and innovative tourism industry supported by sustainable wildlife resources"

Mission:

"To facilitate good governance for sustainable development, management, and marketing of tourism and wildlife"

With the following services in scope[55]:

1. Formulation of national tourism policies, plans, strategies, guideline, and goals
2. Formulation of national wildlife conservation and protection policies, plans, strategies, guidelines, and goals
3. Development and promotion of tourism
4. Wildlife conservation, research, and protection
5. Education and awareness
6. Training on tourism services
7. Tourism financing
8. Protection of wildlife heritage
9. Wildlife biodiversity management and protection
10. Management of national parks and game reserves and marine parks
11. Collaboration with wildlife clubs of Kenya
12. Management of wildlife dispersal areas in collaboration with partners
13. Development of legislation and enforcement of standards and quality
14. Provision of incentives to boost businesses in the tourism sector
15. Job creation
16. Provide technical assistance and advisory services to entities engagement in tourism product development, including County Governments, investors, community tourism enterprises and M / SMEs in tourism
17. Adoption of innovation
18. Open new areas for tourism development
19. Establish and facilitate and enabling environment for promotion of local and foreign investment in tourism
20. Adoption of innovation
21. Communication and information on tourism
22. Open new areas for tourism development

53 *Home | Ministry of Roads and Transport*
54 *Vision, Mission & Mandate – Ministry of Tourism and Wildlife*
55 *Services – Ministry of Tourism and Wildlife*

5.10 Ministry of Investment, Trade and Industry

The Ministry of Investments, Trade and Industry – State Department for Industry[56] has the vision:

"Globally competitive and sustainable investments, trade and industrial sector"

Mission:

"To facilitate an accelerated growth of the investments, trade and industrial sectors through the provision of an enabling, legal, and institutional framework"

With the following core values:

1. Customer focus: we are committed to upholding the highest standards in our service delivery to enhance customer satisfaction
2. Integrity and transparency: we are committed to honesty, impartiality and transparency while delivering services
3. Teamwork: we will deliberately nurture team spirit, collaboration, consultation and adopt participatory approach in discharging ministerial mandate
4. Professionalism: we will maintain high level of adherence to set standards through continuous competency development
5. Creativity and innovativeness: we will continuously be open and proactive in seeking better, acceptable, and efficient methods of production and service delivery
6. Effectiveness and efficiency: we will be guided by operational, rationalisation, and cost-saving measures
7. Equity and inclusivity: we will mainstream gender, youth and special groups' issues in the distribution of resources, responsibilities and opportunities in the ministry

56 *Vision, Mission & Mandate | Industry (industrialization.go.ke)*

5.11 Ministry of Water and Sanitation

The Ministry of Water and Sanitation[57] has the vision:

"To ensure water resources availability and accessibility by all"

Mission:

"To contribute to national development by promoting and supporting integrated water resource management to enhance water availability and accessibility"

th the following strategic objectives:

- Accelerating the implementation of water sector reforms
- Improving the sustainable management of water resources
- Improving the provision of water and sewerage services
- Improving utilisation of land through irrigation and land reclamation
- Strengthening institutions in the Ministry and the water sector
- Mobilising resources and promoting efficiency in their utilisation
- Improving the management access to water resources information

The Ministry runs a number of initiatives to support its work[58],[59],[60].

[57] *Vision, Mission and Strategic Objectives – Ministry of Water, Sanitation and Irrigation*
[58] *Irrigation – Ministry of Water, Sanitation and Irrigation*
[59] *Sanitation – Ministry of Water, Sanitation and Irrigation*
[60] *Water – Ministry of Water, Sanitation and Irrigation*

6. Appendix Three: Target Use-Cases

The following use-cases were provided as examples for evaluation in context of priorities identified through this document. Cases are structured:

As a <user> I want to <perform an action> so that <goal>

6.1 Agriculture

The following user stories are identified as relevant to Ministry of Agriculture and Livestock Development priorities as described previously:

As an urban planner, I want to use satellite imagery to monitor urban sprawl, so that I can plan sustainable city expansions.
As a city traffic manager, I want to analyse satellite data on traffic patterns, so that I can optimize traffic flow and reduce congestion.
As a public health official, I want to track air quality using satellite data, so that I can implement measures to improve urban air quality.
As a construction manager, I want to use satellite-based GPS for precise site measurements, so that I can ensure accurate and efficient construction projects.
As a disaster response coordinator, I want to use satellite imagery to assess damage after natural disasters, so that I can coordinate effective relief efforts.
As a utility manager, I want to monitor infrastructure such as power lines and water pipelines via satellite, so that I can detect and address issues promptly.
As a real estate developer, I want to use satellite data to identify potential development sites, so that I can make informed investment decisions.
As a city environmental officer, I want to track green spaces and vegetation health using satellite imagery, so that I can promote urban biodiversity.
As a transportation planner, I want to use satellite data to design efficient public transit routes, so that I can improve urban mobility.
As a smart city project manager, I want to integrate satellite technology into urban IoT systems, so that I can enhance city services and improve residents' quality of

6.3 Environment

The following user stories are identified as relevant to Ministry of Environment, Climate Change & Forestry priorities as described previously:

As an environmental regulator, I want to monitor air quality using satellite data, so that I can enforce pollution control measures effectively.
As a climate scientist, I want to analyse satellite imagery of polar ice caps, so that I can track the effects of global warming and advise on climate policies.
As a forestry official, I want to use satellite data to detect illegal logging activities, so that I can protect forest resources and biodiversity.
As a water resource manager, I want to monitor river and lake levels via satellite, so that I can manage water supply and prevent flooding.
As a coastal manager, I want to use satellite imagery to track coastal erosion, so that I can implement measures to protect coastal communities and ecosystems.
As an urban planner, I want to use satellite data to assess urban heat islands, so that I can develop strategies to mitigate heat and improve urban living conditions.
As a wildlife conservationist, I want to track animal migration patterns using satellite technology, so that I can create effective conservation plans.
As an agricultural policy maker, I want to monitor crop health and land use changes via satellite, so that I can support sustainable agricultural practices.
As a disaster response coordinator, I want to use satellite imagery to assess damage after natural disasters, so that I can allocate resources and aid more efficiently.
As an environmental educator, I want to use satellite data to create educational materials, so that I can raise public awareness about environmental issues and promote sustainable practices.

6.4 Information Communication & Digital

The following user stories are identified as relevant to Ministry of Information, Communications, & The Digital Economy priorities as described previously:

As a rural resident, I want to access high-speed internet via satellite, so that I can stay connected and access online services.
As a telecommunications provider, I want to use satellite technology to expand network coverage, so that I can offer reliable service in remote areas.
As an emergency responder, I want to use satellite communication systems, so that I can maintain communication during natural disasters when terrestrial networks are down.
As a digital entrepreneur, I want to leverage satellite data for market analysis, so that I can make informed business decisions and identify new opportunities.
As a government official, I want to use satellite technology to monitor and manage critical infrastructure, so that I can ensure public safety and efficient operation.
As a journalist, I want to access real-time satellite imagery, so that I can report accurately on global events and environmental changes.
As an educator, I want to use satellite-based educational platforms, so that I can provide interactive and engaging learning experiences for my students.
As a healthcare provider, I want to use satellite communication for telemedicine services, so that I can offer medical consultations to patients in remote areas.
As a disaster management coordinator, I want to use satellite data to track and predict natural disasters, so that I can plan and execute timely evacuations and relief efforts.
As a cybersecurity expert, I want to monitor satellite communication networks, so that I can detect and prevent cyber threats to critical infrastructure.

6.5 Urban Development

The following user stories are identified as relevant to Ministry of Land, Public Works, Housing, and Urban Development priorities as described previously:

As an urban planner, I want to use satellite imagery to monitor urban sprawl, so that I can plan sustainable city expansions.
As a city traffic manager, I want to analyse satellite data on traffic patterns, so that I can optimize traffic flow and reduce congestion.
As a public health official, I want to track air quality using satellite data, so that I can implement measures to improve urban air quality.
As a construction manager, I want to use satellite-based GPS for precise site measurements, so that I can ensure accurate and efficient construction projects.
As a disaster response coordinator, I want to use satellite imagery to assess damage after natural disasters, so that I can coordinate effective relief efforts.
As a utility manager, I want to monitor infrastructure such as power lines and water pipelines via satellite, so that I can detect and address issues promptly.
As a real estate developer, I want to use satellite data to identify potential development sites, so that I can make informed investment decisions.
As a city environmental officer, I want to track green spaces and vegetation health using satellite imagery, so that I can promote urban biodiversity.
As a transportation planner, I want to use satellite data to design efficient public transit routes, so that I can improve urban mobility.
As a smart city project manager, I want to integrate satellite technology into urban IoT systems, so that I can enhance city services and improve residents' quality of life.

6.6 Mining

The following user stories are identified as relevant to State Department of Mining priorities as described previously:

As a mining geologist, I want to use satellite imagery to identify mineral-rich areas, so that I can target exploration efforts more effectively.
As a mine safety officer, I want to monitor ground stability using satellite data, so that I can detect potential landslides or subsidence and ensure worker safety.
As an environmental manager, I want to track the impact of mining activities on surrounding ecosystems via satellite, so that I can implement measures to mitigate environmental damage.
As a logistics coordinator, I want to use satellite-based GPS for tracking the transportation of mined materials, so that I can optimize routes and reduce delays.
As a mining operations manager, I want to use satellite data to monitor weather conditions, so that I can plan operations and minimize disruptions.
As a reclamation specialist, I want to use satellite imagery to assess the progress of land rehabilitation efforts, so that I can ensure compliance with environmental regulations.
As a financial analyst, I want to use satellite data to evaluate the viability of mining projects, so that I can make informed investment decisions.
As a community relations officer, I want to use satellite data to monitor the impact of mining on local communities, so that I can address concerns and improve relations.
As a regulatory compliance officer, I want to use satellite imagery to ensure that mining operations adhere to legal boundaries and regulations, so that I can avoid fines and legal issues.
As a technology developer, I want to integrate satellite data into mining software solutions, so that I can enhance the efficiency and accuracy of mining operations.

6.7 Tourism & Wildlife

The following user stories are identified as relevant to Ministry of Tourism & Wildlife priorities as described previously:

As a wildlife conservationist, I want to use satellite tracking to monitor animal migration patterns, so that I can protect endangered species and their habitats.
As a tourist, I want to access satellite-based maps of national parks, so that I can navigate trails and explore safely.
As a tour operator, I want to use satellite data to provide real-time weather updates, so that I can ensure the safety and comfort of my clients.
As a park ranger, I want to use satellite imagery to detect illegal poaching activities, so that I can protect wildlife and enforce regulations.
As a travel blogger, I want to use satellite images to showcase remote and beautiful destinations, so that I can inspire my audience to visit these places.
As a wildlife photographer, I want to use satellite data to locate animal hotspots, so that I can capture stunning images of wildlife in their natural habitats.
As a government official, I want to use satellite data to monitor the impact of tourism on natural reserves, so that I can develop sustainable tourism policies.
As an ecotourism operator, I want to use satellite technology to offer virtual tours of protected areas, so that I can promote conservation and attract eco-conscious travellers.
As a researcher, I want to analyse satellite data to study the effects of climate change on wildlife populations, so that I can contribute to conservation efforts.
As a travel agency manager, I want to use satellite-based communication systems to stay connected with tour groups in remote areas, so that I can ensure their safety and provide assistance if needed.

6.8 Water & Sanitation

The following user stories are identified as relevant to Ministry of Water and Sanitation priorities as described previously:

As a water resource manager, I want to use satellite data to monitor water quality in rivers and lakes, so that I can ensure safe drinking water for communities.
As a public health official, I want to track the spread of waterborne diseases using satellite imagery, so that I can implement timely interventions and prevent outbreaks.
As a city planner, I want to use satellite data to identify areas with inadequate sanitation infrastructure, so that I can prioritize improvements and reduce health risks.
As an environmental scientist, I want to analyse satellite data to study the impact of pollution on water bodies, so that I can develop strategies to mitigate contamination.
As a disaster response coordinator, I want to use satellite imagery to assess the impact of floods on water supply systems, so that I can coordinate effective relief efforts.
As a rural development officer, I want to use satellite technology to locate potential groundwater sources, so that I can provide clean water to remote communities.
As a non-profit organisation leader, I want to use satellite data to monitor the effectiveness of water and sanitation projects, so that I can ensure sustainable outcomes.
As a government official, I want to use satellite imagery to enforce regulations on industrial discharge into water bodies, so that I can protect public health and the environment.
As a researcher, I want to use satellite data to study the effects of climate change on water availability, so that I can contribute to policy recommendations for water management.
As a community leader, I want to use satellite-based early warning systems for floods, so that I can prepare and protect my community from water-related disasters.

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