



KENYA SPACE AGENCY

THE KENYA SPACE AGENCY RESEARCH AGENDA

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Vikram Sarabhai – Considered as the father of space activities in India.

There are some who question the relevance of space activities in a developing nation. To us, there is no ambiguity of purpose. We do not have the fantasy of competing with the economically advanced nations in the exploration of the moon or the planets or manned space-flight. But we are convinced that if we are to play a meaningful role nationally, and in the community of nations, we must be second to none in the application of advanced technologies to the real problems of man and society.

1919-1963





The Space Revolution

- ❑ It is projected that over *1,200 satellites* will be launched cumulatively between 2015 and 2025.
- ❑ This indicates a growth of about *25 percent* over the next *10 years* compared to a similar period.
- ❑ Areas on huge interest and research include:
 - a) Augmented Satellite Based Navigation Systems;
 - b) High-throughput Satellite Communication Services;
 - c) Space Tourism/Commercial Spaceflight;
 - d) Satellite Manufacturing;
 - e) Satellite Communication in Commercial Aviation; and
 - f) Commercial Satellite Imagery Based Services.

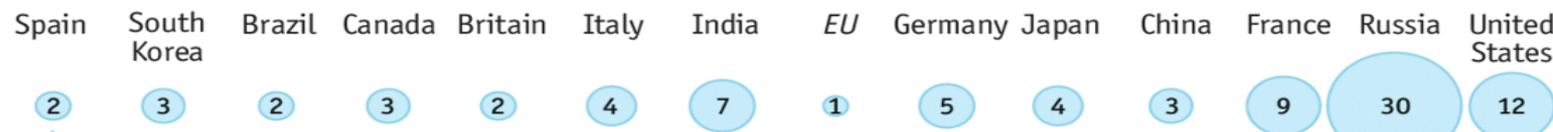
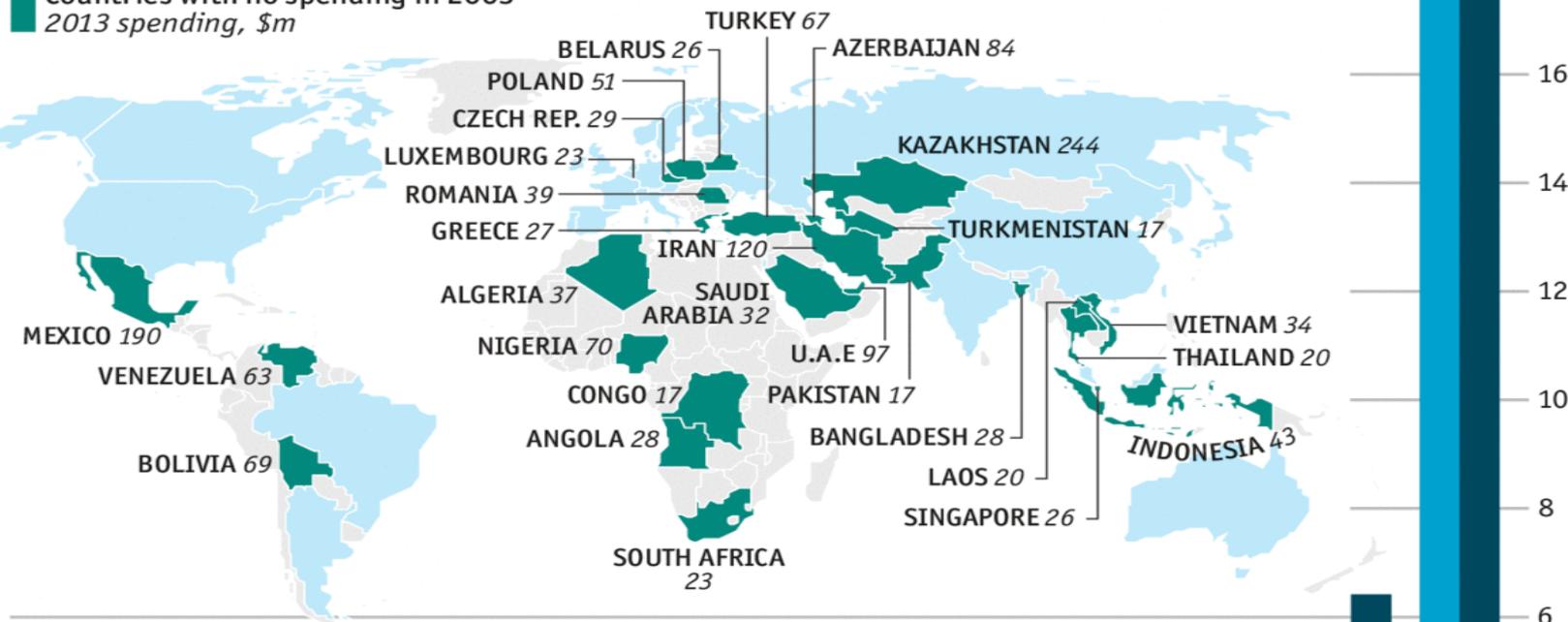


Government space programmes

Non-military spending, 2013 prices, \$bn

2003 2013

Countries with no spending in 2003
2013 spending, \$m



2013 spending per \$10,000 of GDP, \$

Sources: Euroconsult; IMF; The Economist

Economist.com/graphicdetail



U.S. Government Agency Space Budgets 2009

Agency	Budget	Stimulus
Department of Defense (DoD)	\$26.53 B	-
National Reconnaissance Office (NRO)	\$15.00 B	-
National Geospatial-Intelligence Agency (NGA)	\$2.00 B	-
National Aeronautics and Space Administration (NASA)	\$17.78 B	\$1.00 B
National Oceanic and Atmospheric Administration (NOAA)	\$1.18 B	\$0.07 B
Department of Energy (DOE)	\$0.04 B	-
Federal Aviation Administration (FAA)	\$0.01 B	-
National Science Foundation (NSF)	\$0.65 B	\$0.15 B
Total	\$63.19 B	\$1.23 B
Combined Total		\$64.42 B

For more information about U.S. Government Space Budgets, please refer to The Space Report 2010: The Authoritative Guide to Global Space Activity.



Satellite System



Receiving (Ground) station



Satellite



Archiving & Distribution



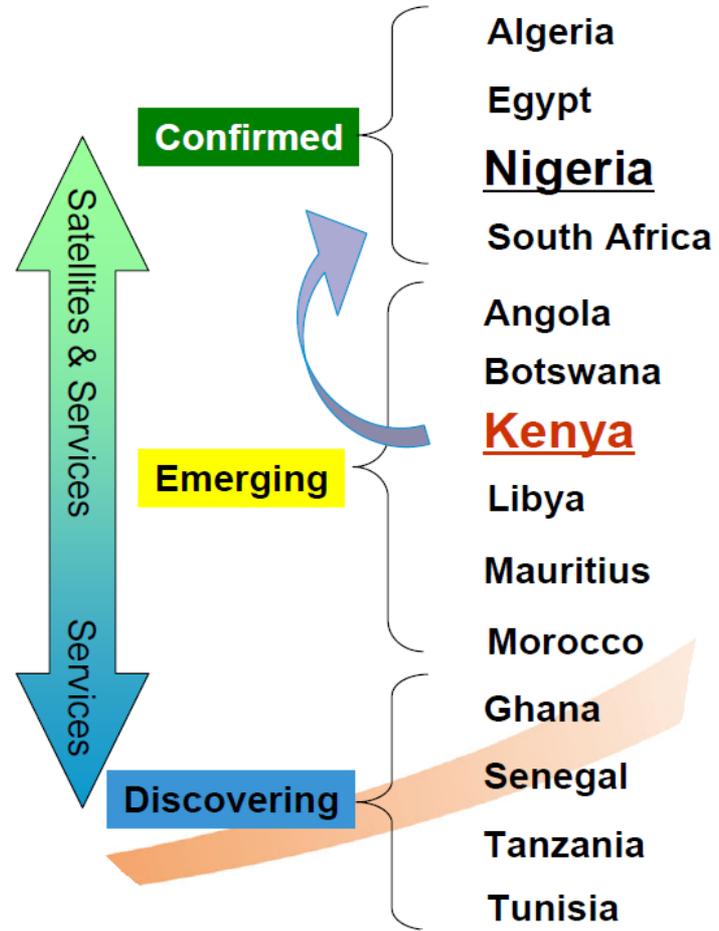
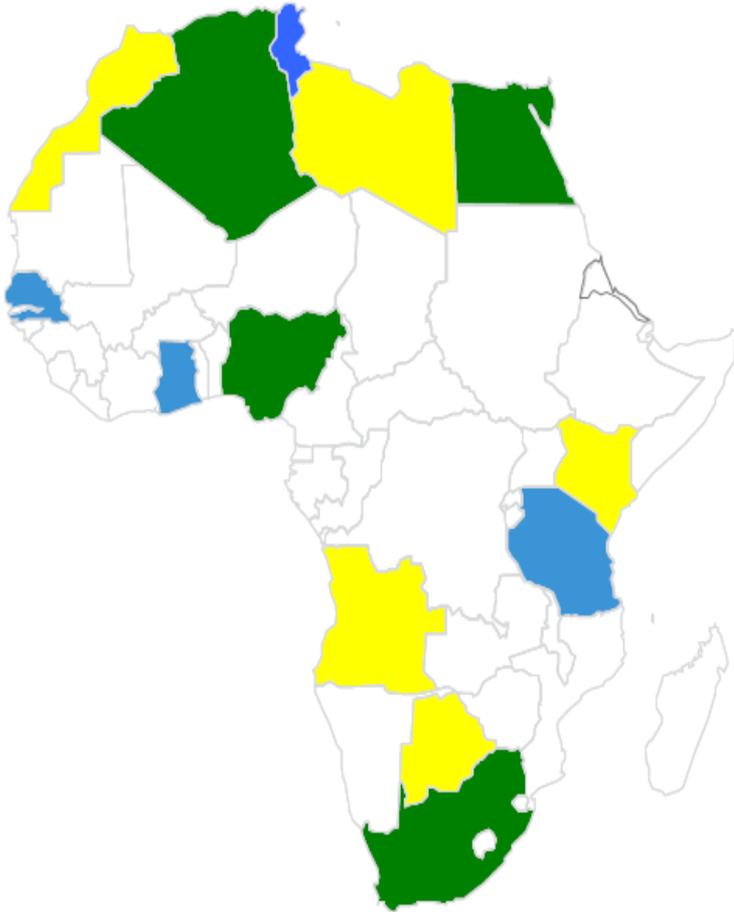


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- ❑ It is now well documented that countries that embrace Space Science and Technology leapfrog their social economic development.
- ❑ Good examples are India, China and Brazil to name but a few
- ❑ Kenya has established the Kenya Space Agency, Gazette notice of 7th March, 2017



Africa's space programs





LEAPFROG

- ❑ To leapfrog the benefits, Kenya must pursue all domains of space technology simultaneously
- ❑ Launching, Ground stations, Design, Testing, Integration, Payloads, Communication, Navigation, Propulsion





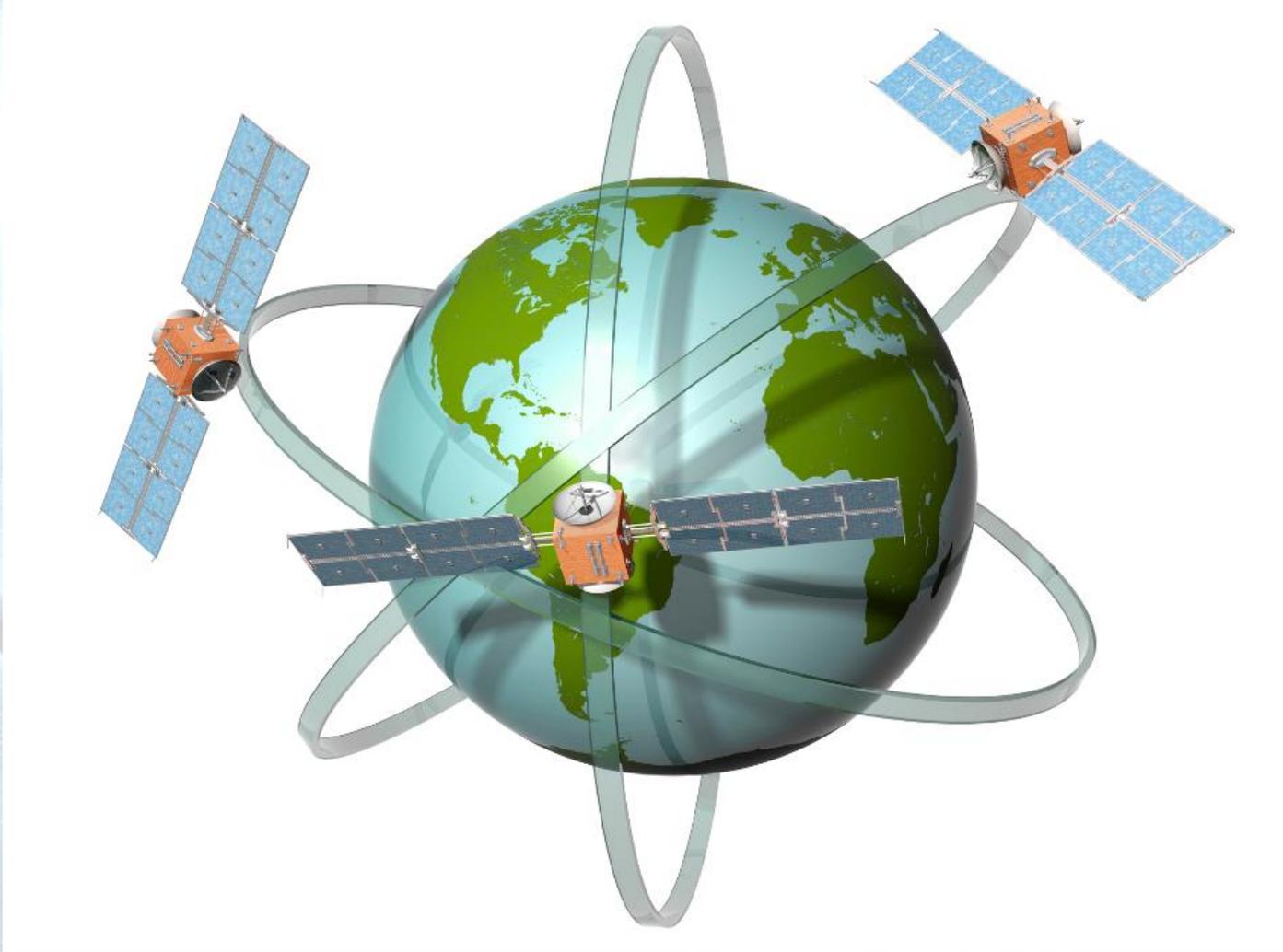
Technology Transfer

- This is technology commercialization. It is the innovation after invention
- It is NOT transfer from developed to developing nations
- The Kenya Space Agency will work with our universities to achieve this.





Satellites in Orbit

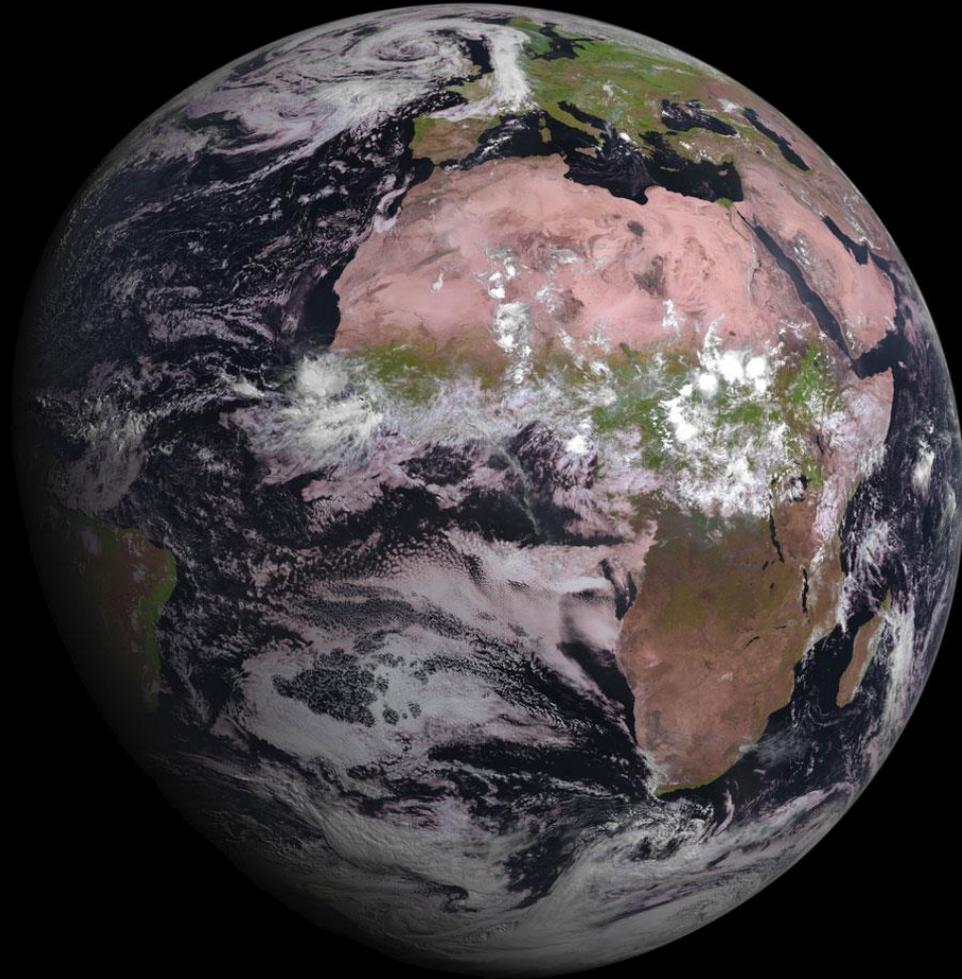


Orbiting Satellites









**MSG-4 SEVIRI First Image
4 August 2015 10:00 UTC**

Full Disk Image - RGB (1.6 μm - 0.8 μm - 0.6 μm)





Space elements



Receiving (Ground) station



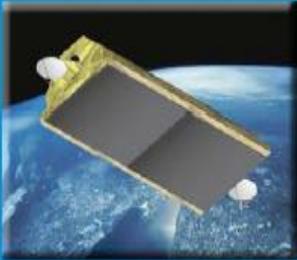
Satellite



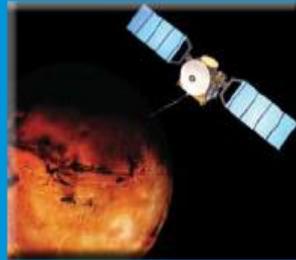
Data storage & Processing



Satellite technology



**Earth observation
optical & radar
satellites**



**Space science
programmes**



**Telecommunications
satellites**



**Navigation
systems**



**Military satellite
systems**



**Subsystems,
equipment &
operations**



Satellite data & Applications



COMMUNICATION
TERRESTRIAL COMMUNICATION NETWORK
COMMUNICATION ON THE MOVE
TELEPORT



E-Agriculture

E-Health

E-Government

E-Education



POSITION & TIMING
HIGH PRECISION POSITIONING
ACCURATE TIMING INDUSTRIAL APPLICATIONS FOR POSITIONING



Transportation

Navigation

Deformation Monitoring

GNSS Metrology



REMOTE SENSING
DATA RECEIVING GROUND STATION
INTENSIVE DATA PROCESSING
DATA APPLICATIONS



Mapping

GIS

Disaster Monitoring

Environment Protection



APPLICATIONS for decisions



Agriculture



Pollution



Climate Change



**Disaster
Management**



**Ecosystem
Management**



Public Health



**Water
Resources**



**Weather
Forecasting**



Applications of Satellite data

Agricultural Management

- Precision agriculture
- Ground water mapping
- Arable land monitoring
- Meteorology and Climate Change
- Crop yield estimation



Applications of Satellite data

Urbanization & Transportation

- Land Use Planning
- Environmental Impact
- Public Works
- Emergency Response
- Routable road maps
- Facilities management



Applications of Satellite data

- ❑ Natural Resource Management
 - ❑ Forest monitoring
 - ❑ Minerals exploration
 - ❑ Marine ecosystem monitoring
 - ❑ Impervious surface mapping
 - ❑ Hydrology
 - ❑ Land cover monitoring
 - ❑ Natural heritage conservation



Applications of Satellite data

- ❑ Disaster Management & Security
 - ❑ Flood mapping and monitoring
 - ❑ Damage assessment
 - ❑ Oil spill monitoring
 - ❑ Forest fire monitoring
 - ❑ Satellite communication
 - ❑ Search and Rescue



Applications of Satellite data

Satellite Communication & Navigation

- Tele-medicine
- Tele-education
- Mobile and internet connectivity
- Satellite TV and Radio
- Air transport
- Ship navigation
- Road and Rail transport



Applications of Satellite Technology

- ❑ National Security
 - ❑ Heavy Weaponry monitoring
 - ❑ Border surveillance
 - ❑ Monitoring rocket launches
 - ❑ Planning attack/defence using real-time satellite imagery
 - ❑ Navigation and communication during war and disaster
 - ❑ Search and rescue



The Malindi Satellite Station

- ❑ Kenya has been involved in space activities since 1962, when Italy Identified Malindi, along the Kenyan coast, which has the combination of being on an *east coast of a continent* and also lies on the *Equator*.
- ❑ The location in Malindi has **great advantages** for *equatorial rocket launches* and for *tracking and controlling* the launched *rockets and satellites*.
- ❑ In addition, the location at **Ungwana bay** in Ngomeni Village, Magarini District in Kilifi County, has unique **magnetic anomalies**, making it best suited for carrying out certain tests that would otherwise be affected by the *Earth's Magnetic Fields*.

San Marco Launch platform



Location of San Marco Base in Malindi

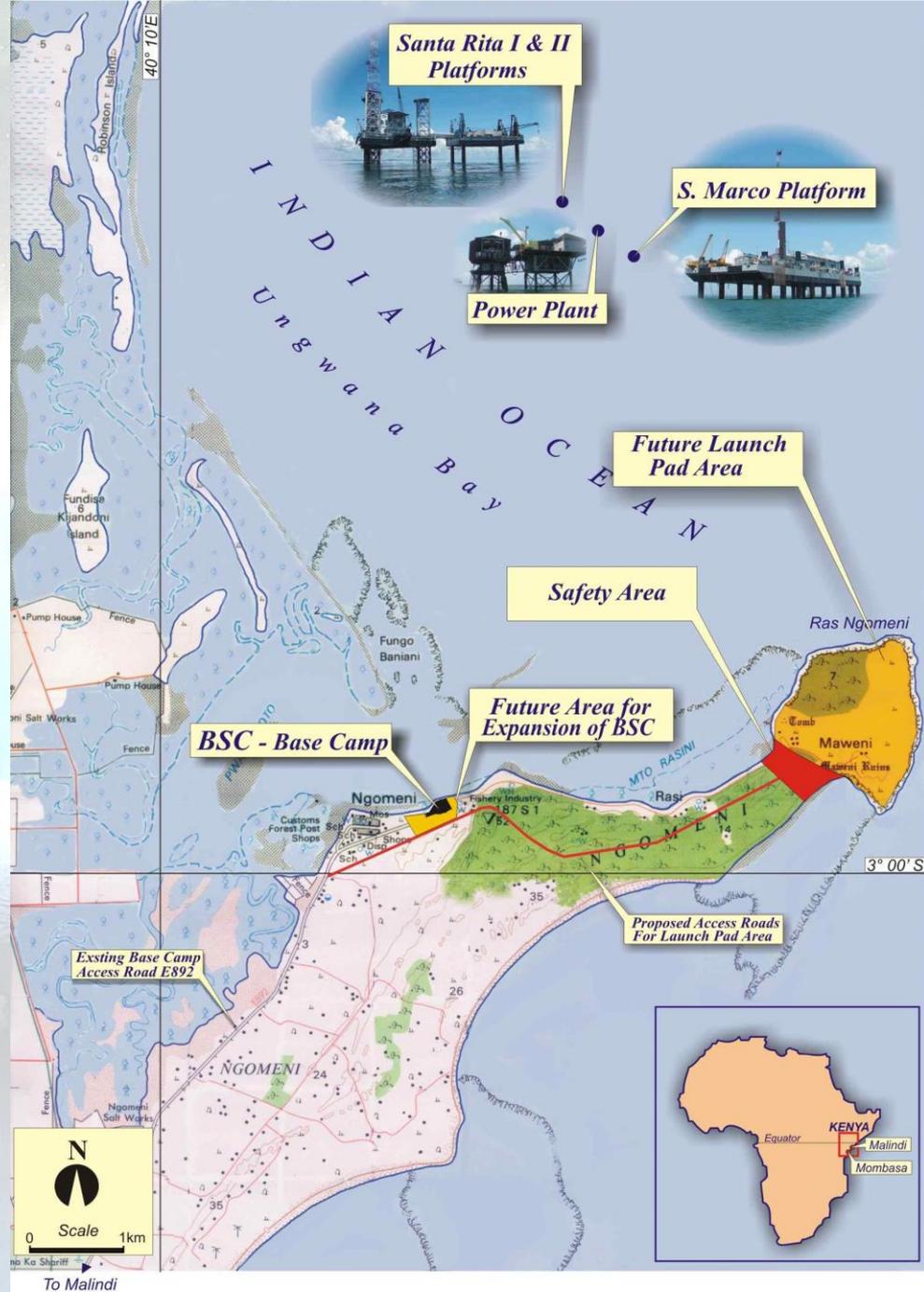


Fig. 1

Current Activities at the Facility

- ❑ The main activities at the San Marco Base in Malindi include:
 - a) **National Programs:** Telemetry Tracking and Control of Satellites (AGILE, SWIFT, NuSTAR)
 - b) **Tripartite:** Support for European Space Agency in Launching of Rockets from Kourou, French Guyana.
 - c) **Third Party:** Support for Chinese Missions (Shenzou and Tiangong) and Kongsberg Satellite Services ASNARO Launch and Early Orbit Phase (LEOP)
- ❑ Remote sensing data acquisition: ASI – COSMOS SkyMed, NASA, NOAA, ESA, CBERS



Concluding Remarks

- The Kenyan Government is keen to establish a vibrant indigenous Space program.
- The program is ready to partner with Universities and research institutions.
- The Space program is one of the flagship projects for job creation.



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THANK YOU