

ARCSSTE-E Education Programme: Best Practices, Challenges, and Future Projections

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www.arcsstee.org.ng



United Nations/United Arab Emirates High Level Forum
“Space as a driver for Socio-Economic Sustainable Development”
20 - 24 November 2016 Dubai, United Arab Emirates

- ❖ Introduction
- ❖ UN-OOSA Regional Centres – Establishment of
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 - Establishment of
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 - Postgraduate Diploma
 - MTech (Space Science & Technology Applications)
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 - National & International Collaborations
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Introduction

- The ability of a society to gain control over her environment will bring about increased realization of the values of the society leading to socio-economic advancement, security, and improved wellbeing of the people.
- Capacity building in Space Science and Technology as well as enhancement and retention of existing capacity, are critical for developing competencies to efficiently respond to societal challenges and addressing sustainable development.
- To ensure Sustainable Development, the 2002 World Summit on Sustainable Development (WSSD) recognized the urgent need for coordinated observations of the state of the Earth in other **'to create a world where decisions and actions are informed by coordinated, comprehensive and sustained Earth observations'** .
- The UN General Assembly has recognised the need to build indigenous capacities in Space Science and Technology about 34 years ago especially in the developing countries in an effort to haul the World's poorest people out of misery and restore/nurture the damaged environmental web that sustains life.

UN-Regional Centres – Establishment of

United Nations General Assembly Resolutions

- **37/90 of 10th December 1982 – UNISPACE '82**

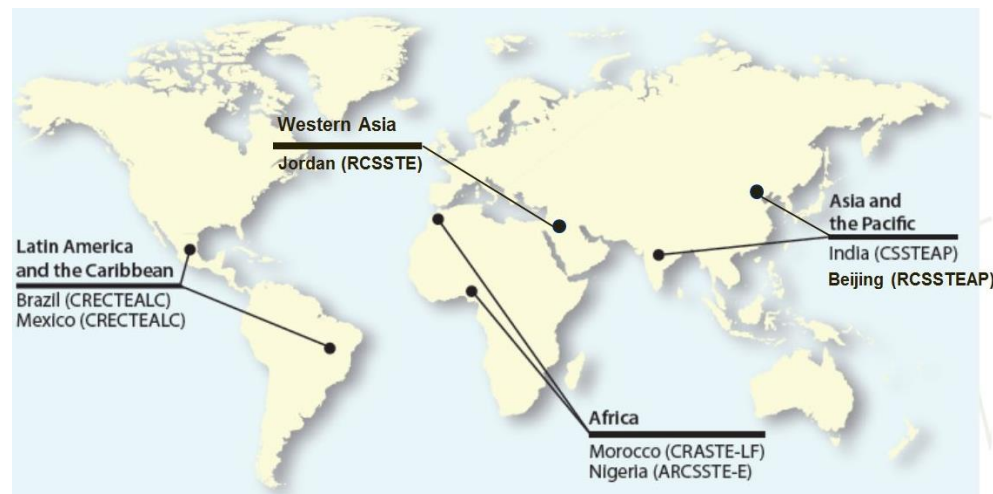
'That the United Nations Office for Outer Space Affairs (UNOOSA), through its Programme on Space Applications should focus its attention, inter alia, on building of indigenous capacities for the development and utilization of Space Science and Technology, particularly at the local level'

- **45/72 of 11 December, 1990 – UN-COPUOS**

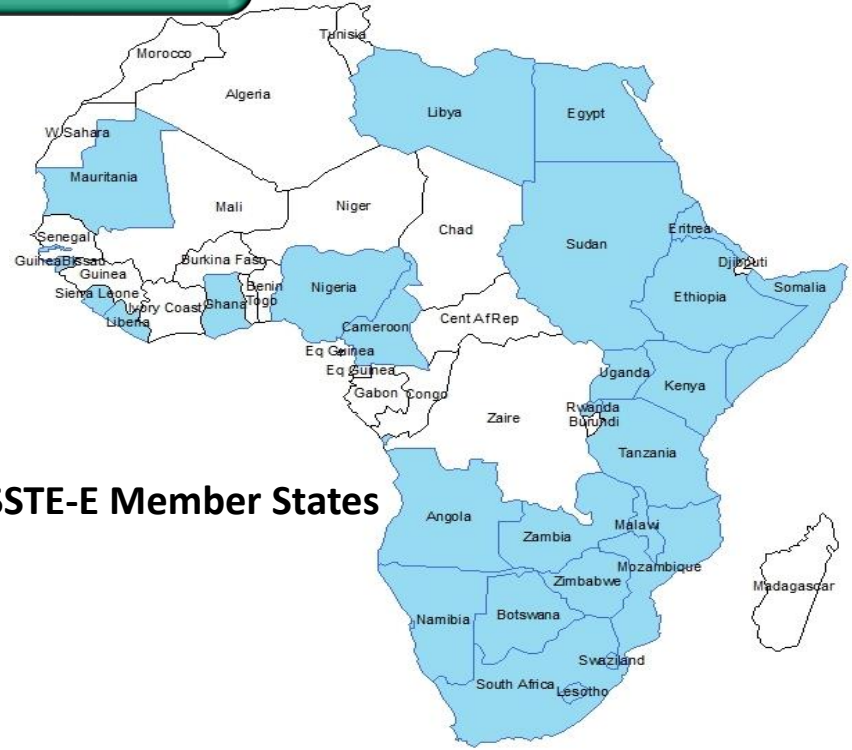
'That the UN should lead, with the active support of its specialized agencies and other international organisations, an international effort to establish Centres for Space Science and Technology Education at the regional level in existing national/regional educational institutions in the developing countries'

African Centres: ARCSSTE-E (Anglophone - NIGERIA) ; CRASTE-LF – (Francophone – MOROCCO)

- **India (inaugurated in 1995)**
- **Morocco (inaugurated in 1998)**
- **Nigeria (inaugurated in 1998)**
- **Mexico and Brazil (inaugurated in 2003)**
- **Jordan (inaugurated on 29 May 2012)**
- **China (inaugurated 2014)**



ARCSSTE-E - Established 15 September 1998



ARCSSTE-E Member States

Legend
English Speaking Nations



➤ **ARCSSTE-E** has operated under the administration of **NASRDA** since the inception of **NASRDA** on May 5, 1999.

➤ **ARCSSTE-E** serves as **NASRDA's Centre for Space Science and Technology Education (CSSTE)**

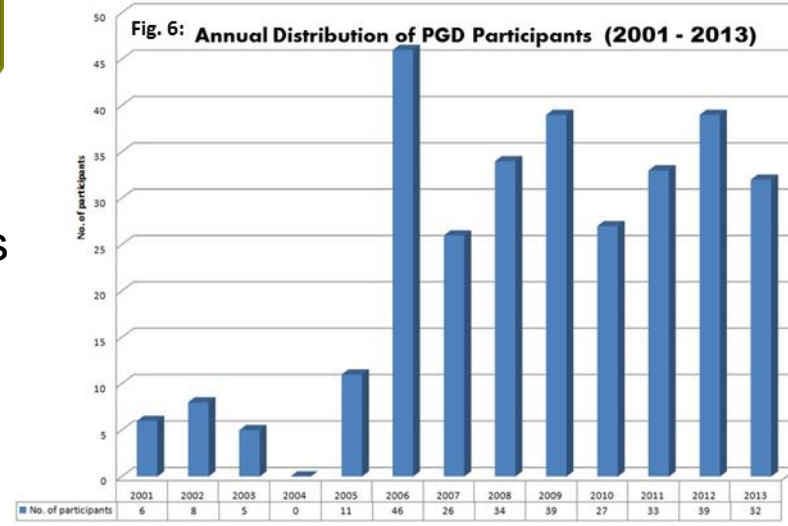
Goals and Objectives of ARCSSTE-E Capacity Building Programme

- ❖ Development of Skills and Knowledge of university educators, research application scientists through rigorous theory and research works, applications, field exercises, and Pilot-Projects in aspects of Space Science and Technology, especially in five principal areas:
 - *Remote Sensing & GIS*
 - *Basic Space & Atmospheric Science (BSAS)*
 - *Satellite Communications*
 - *Satellite Meteorology*
 - *Global Navigation Satellite Systems (GNSS)*
- ❖ To Establish Academic relationships with space-related institutions, as well as Regional and International Co-operation in Space Science and Technology programmes e.g. participation in FP7 (Horizon 2020 programme of the EU and similar ones in USA & Canada, etc.
- ❖ To establish Space Education Outreach Programmes for the dissemination of the value of space science & technology to pupils/students and teachers at primary, secondary, and tertiary institutions, policy and decision makers and the general public.

ARCSSTE-E Core Activities

Post Graduate Diploma Programme

- **Duration:** 9-month Post-graduate Diploma Programme in five key areas of Space Science and Technology (SST) Education
- **International Participants** are offered full scholarship covering: - Tuition Fee, Accommodation, Medical Services, Travel Ticket, etc.

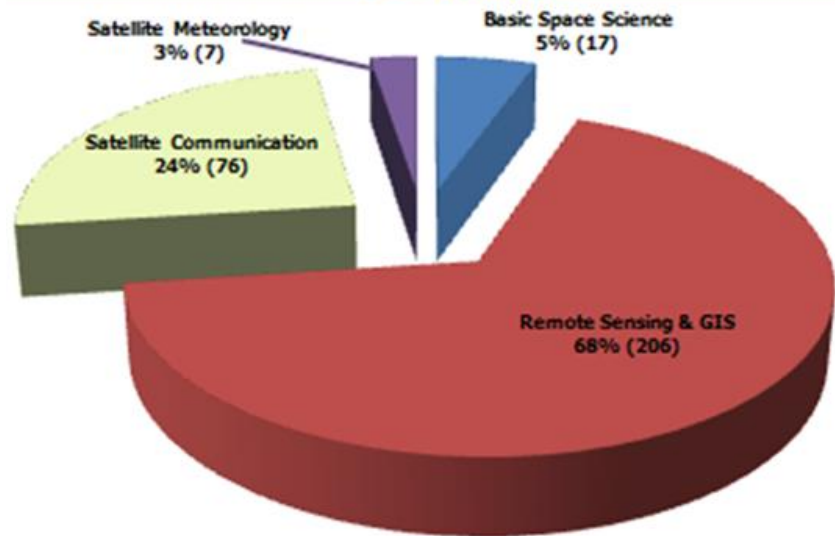


*** 17 of the 24 Countries have participated in the PGD Programme to date**

Botswana	2
Cameroon	30
Congo DRC	1
Ethiopia	4
Gambia	1
Ghana	6
Kenya	13
Liberia	10
Malawi	7
Nigeria	250
Sierra Leone	1
Sudan	13
South Africa	1
Tanzania	5
Uganda	11
Zambia	3
Zimbabwe	6
Total	376



Distribution of PGD Participants by Course Options (2001 - 2013)



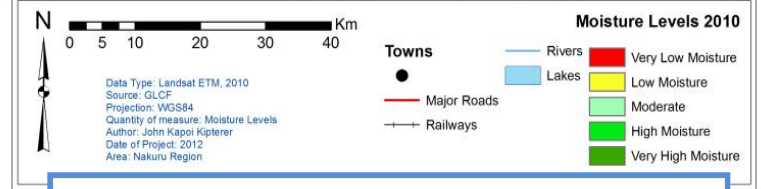
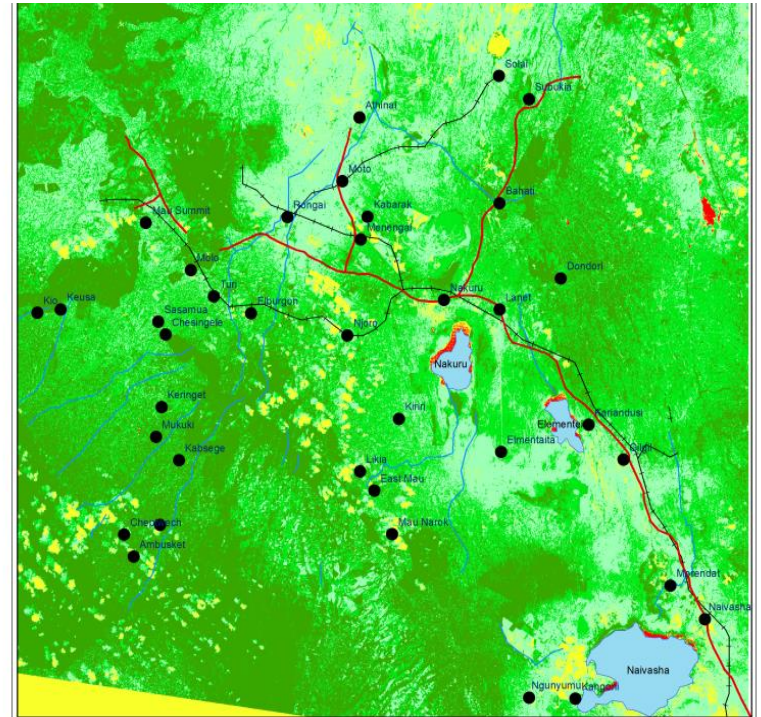
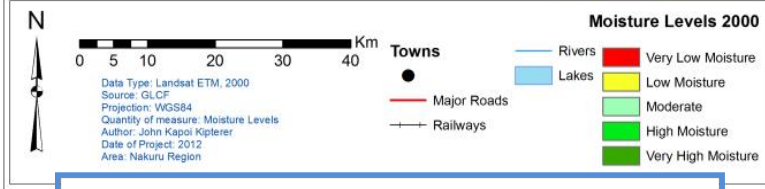
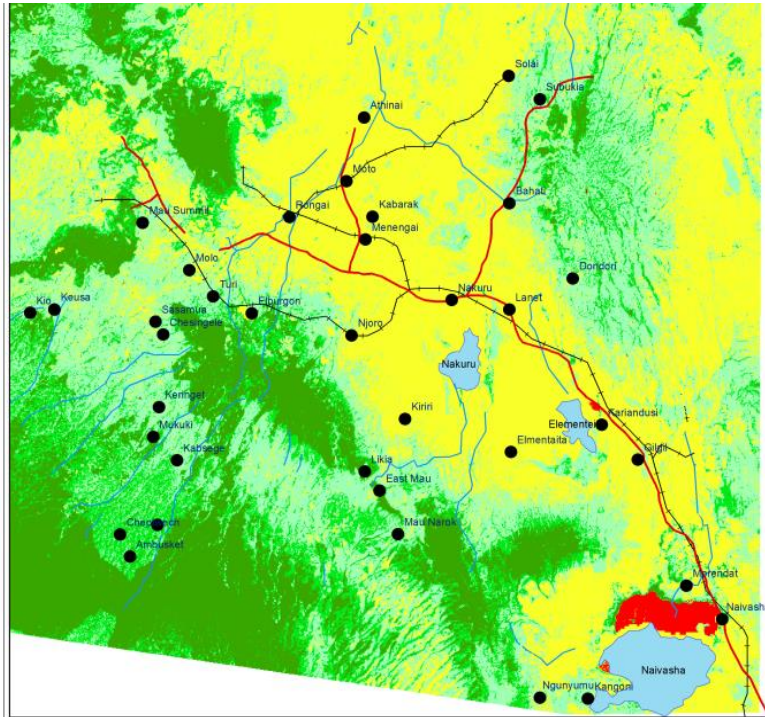
Impact of PGD 'Projects' on Development

	2006	2007	2008	2009	2010	Total
RS&GIS Applications		7				
Natural Resource Management	10	5	7	5		27
Environment		1	1	1	3	6
Urban Planning	6		5	4	4	19
Disaster Management	1	1	4	2		8
Health		4		2		6
Defence/Security	1				2	3
Utility		1		1	1	3
Water Resources	2			1	5	8
Climate Change	3			2		5
Agriculture	2	3	1	2		8
Total	25	15	18	20	15	93

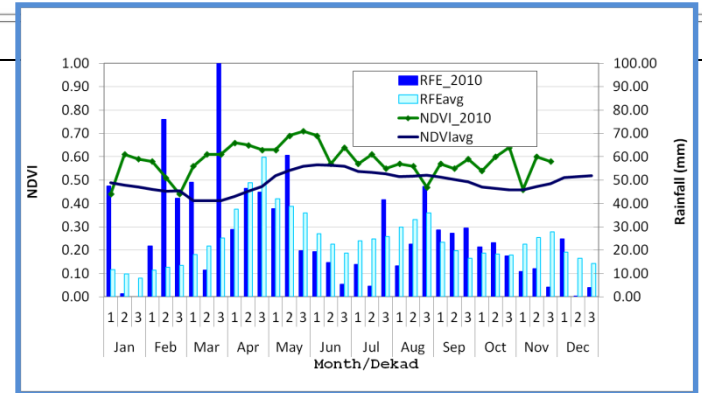
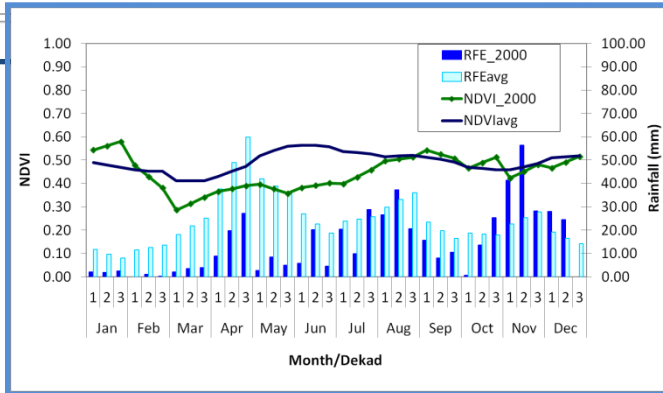


2016 Graduation Ceremony

Agricultural Drought Severity Assessment Using Land Surface Temperature and NDVI in Nakuru, Kenya



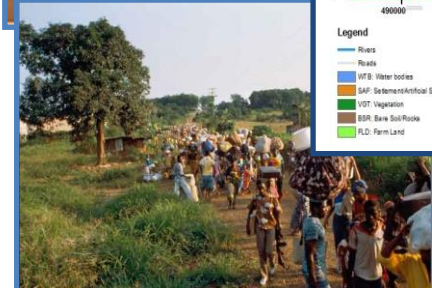
Typical Example of Participant's Research Projects



(2) Geospatial Analysis of Land Use Dynamics in Ganta City, Northeast, Liberia

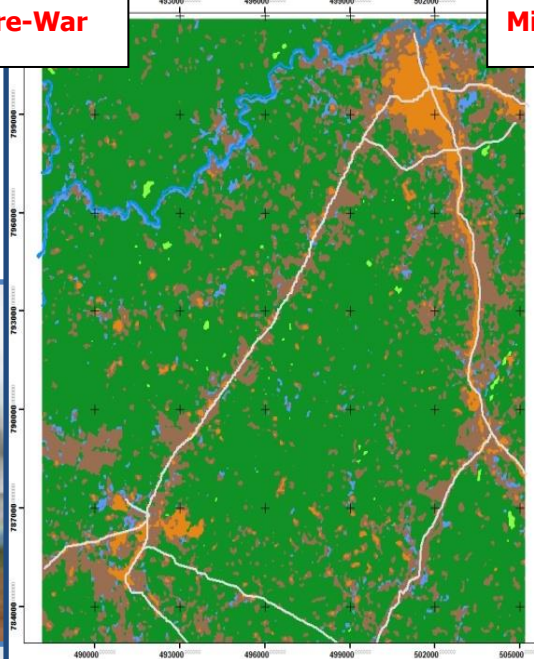


**Civil War
1989-2003**



**1986:
Pre-War**

Land Use Classes: 1986



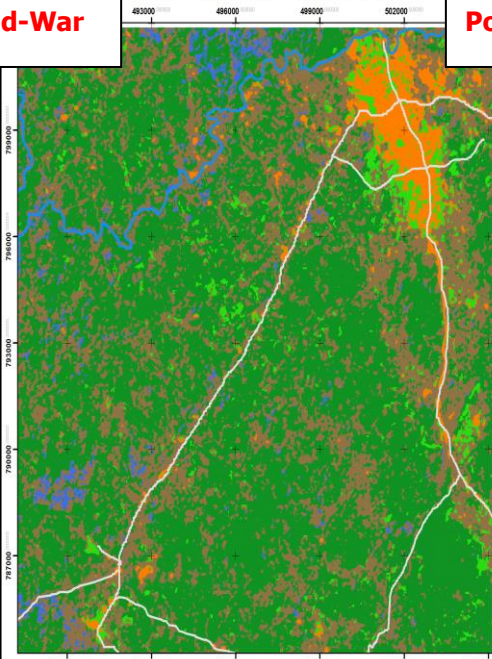
- Rivers
- Roads
- WTB: Water Bodies
- SAS: Settlement/Artificial Surfa
- VGT: Vegetation
- BSR: Bare Soil/Rocks
- FLD: Farm Land

Scale: 1 cm = 1 km



**2002:
Mid-War**

Land Use Classes: 2002



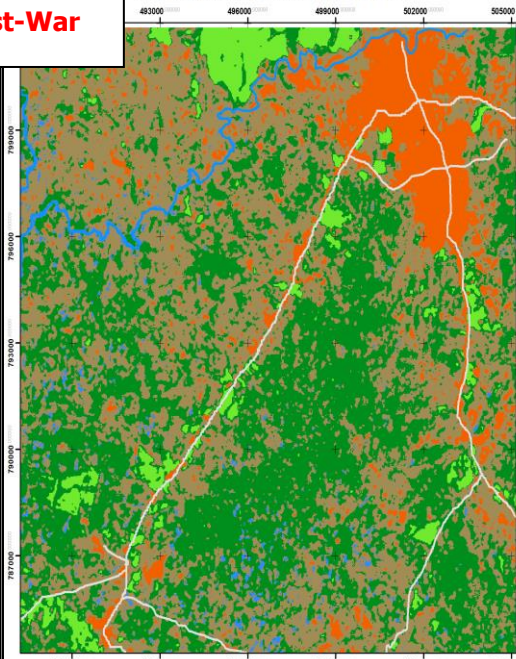
- Rivers
- Roads
- WTB: Water Bodies
- SAP: Settlement/Artificial Surfa
- VGT: Vegetation
- FLC: Farm/Cultivated Land
- BSR: Bare Soil/Rocks

Scale: 1 cm = 1 km



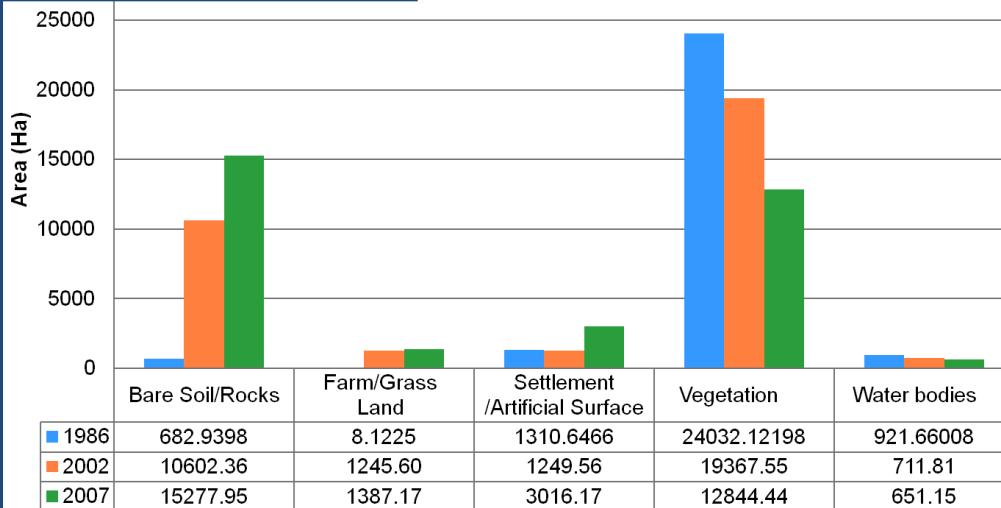
**2007:
Post-War**

Land Use Classes: 2007



- Rivers
- Roads
- WTB: Water Bodies
- BSR: Bare Soil/Rocks
- SAC: Settlement/Artificial Surfa
- VGT: Vegetation
- FLD: Farm Land

Scale: 1 cm = 1 km



Legend

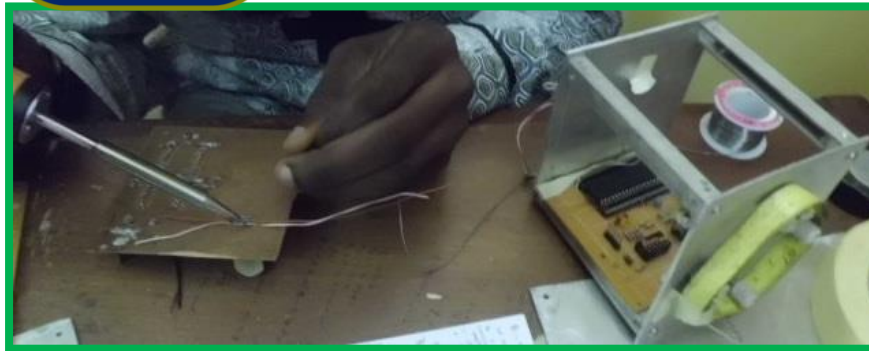
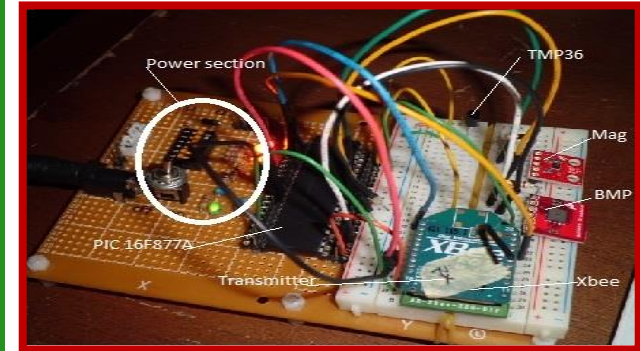
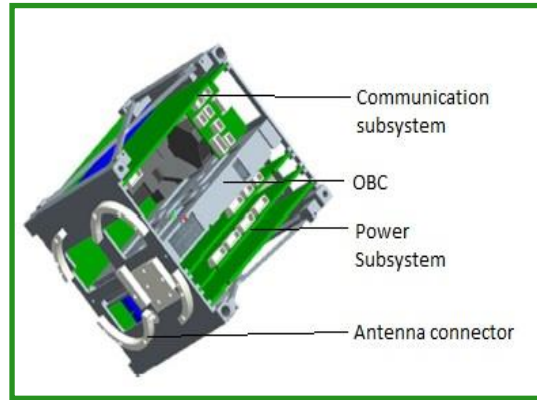
- Rivers
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- WTB: Water Bodies
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- SAS: Setement/Artificial Surfa
- VGT: Vegetation
- FLD: Farm Land

Typical Example of Participant's Research Projects

(3) Design and Construction of a Prototype CubeSat (EregbuSAT-1)



Typical
Example of
Participant's
Research
Projects



- A 10x10x10 prototype Cubesat (EregbuSAT) was developed by a student in Satellite Communication option of the PGD program.
- EregbuSAT is designed to simulate communication (send and receive data) between a satellite and its Ground Station (GS)
- When completed, this device will provide an opportunity for future students in the Satellite communication option of ARCSSTE-E PGD program to develop the capacity to build and operate a prototype Satellite.
- The development of EregbuSAT has being well reported in the website (<http://www.uk.amsat.org/?p=12387>) of AMSAT-UK, a voluntary organization that supports the design and building of equipment for Amateur Radio Satellite.



MTech. (Space Science & Technology Applications)

- **Duration:** 18-month MTech. (SSTA) in five key areas of Space Science and Technology (SST) Education
- **Collaborating University:** Federal University of Technology, Akure (FUTA)



Commenced: 2013 with 18 Students
2014: 15 Students
2015: 20 Students



ARCSSTE-E Core Activities III

- Space Education Outreach Programme





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UAE SPACE AGENCY

ARCSSTE-E Core Activities III



مركز محمد بن راشد
للفضاء
MOHAMMED BIN RASHID SPACE CENTRE

- Space Education Outreach Programme



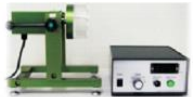
The Founder/CEO of SLOOH addressing the participants during the 'Twinkle Twinkle Little Star' Workshop - 2015

UNITED NATIONS
Office for Outer Space Affairs
**Human Space Technology
Initiative (HSTI)**

Zero-Gravity Instrument Project (ZGIP) promotes space education and research in microgravity.

<http://www.unoosa.org/oosa/en/sapidx.html>

The United Nations Office for Outer Space Affairs launched the ZGIP on 1 February 2013, and distributed the microgravity simulation instruments to qualified schools, universities, research centres and institutes



CLINOSTAT: A one-axis clinostat was selected for distribution because of the ease of use and potential scientific benefits.



ARCSSTE-E has developed Curricula for space science education in primary and secondary schools in Nigeria

During this project, the students learn:

- How to collect scientific data in a laboratory environment
- Analyze the data with specialized software
- Obtain results
- Interpret and present the result of their study in a standard format to the scientific community.



ARCSSTE-E received, on a competitive basis, one of the 20 Clinostats distributed in 2013

Alumni Conferences & International Workshops

International Training Workshop on GNSS
in collaboration with **RCSSTEAP** and **Beihang University, Beijing, China** (August, 2016)



Biennial Alumni Conference
- An avenue to foster Regional Collaboration



International Collaborations

1. GEO, Geneva, Switzerland



- Participating Organisation (PO) status

2. International Committee on GNSS, UN-OOSA, Vienna



3. RCSSTEAP, China



Planned Collaborations

- EUMETSAT on GEONetCast
- establishment of



- China-Brazil Earth Resources Satellite (CBERS)
- Ground Receiving Station (educational)



- ESRI Educational licensed products e.g. ArcGIS

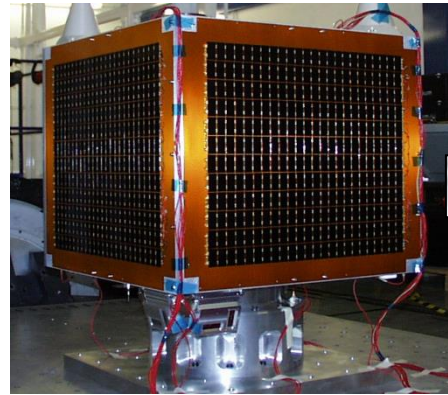


- Samara State Aerospace University , Russia



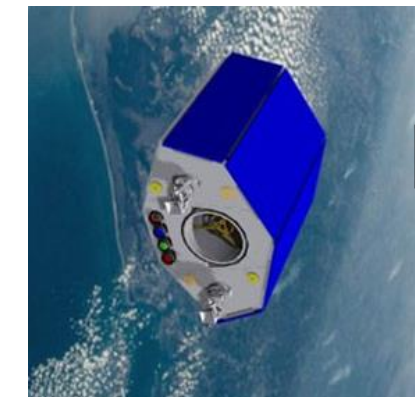
- Others welcome!

NIGERIA's EO Space Infrastructure Supporting ARCSSTEE Activities



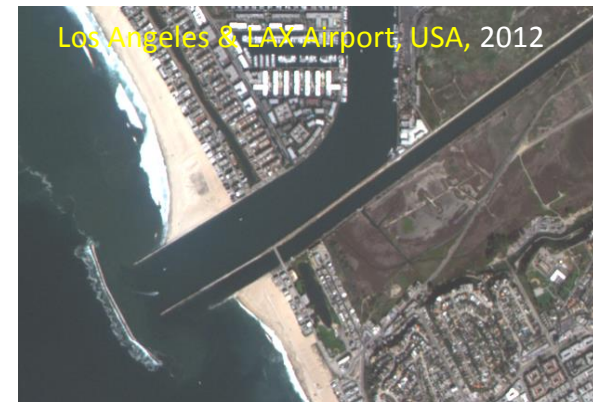
32m

NIGERIASAT-1



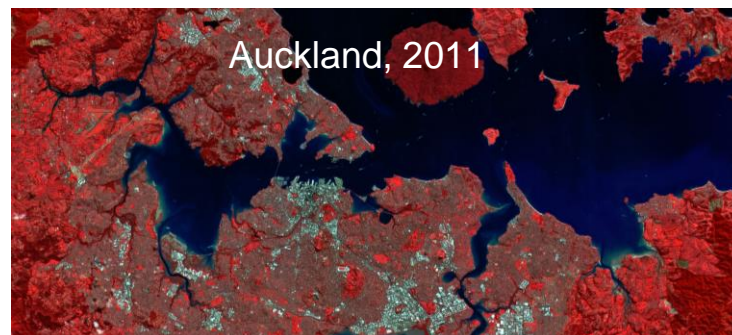
2.5m; 5m

NIGERIASAT-2



22m

NIGERIASAT-X



- ⊕ Trained over 376 participants at the Postgraduate Diploma level
- ⊕ Trained over 33 participants in the MTech. (SSTA) programme
- ⊕ Over 1000 Participants in short training Programmes/Workshops.
- ⊕ ARCSSTE-E's capacity building program also includes:
 - Integrated space-based research and development
 - Space Education Outreach/Awareness for schools at all levels and
 - Reaching over 10,000 School Children, Students and Teachers and the general public.
- ❑ Developed Curricula for Space Science Education in primary and secondary schools in Nigeria
- ❑ National & International Collaborations – **FUTA, Nigeria, RCSSTEAP, China**

Challenges

- ⊕ Inadequate funding for improved ICT infrastructure for learning
- ⊕ Funding from Member States has been nil since inception
- ⊕ Establishment of Ground Receiving Station facilities for teaching and research



Recommendations for UNISPACE+50

- ⊕ Establishment of E-learning facilities in collaboration with other Regional Centres and International Institutions, Webinar by Director, UN-OOSA
- ⊕ Staff Internship and Secondment/Exchange in collaboration with other Regional Centres/International Institutions and Network with UN University
- ⊕ Financial commitment of Member States to the Regional Centres must be rekindled; Permanent Reps in Vienna, & Ambassadors engaged.
- ⊕ Regional Centre's Directors meeting, on the edges of COPOUS meeting
- ⊕ A module of UN-OOSA Capacity Building: History-Current-Future
- ⊕ Collaboration in research and support for teaching facilities
- ⊕ Incubation at the Centres best practice from industries and other major space fairing nations through UN_OOSA
- ⊕ Linkages with Regional Organisations e.g. AARSE, UNECA, etc. for effective utilisation of the Centre for Capacity Building opportunities for the region

Conclusions

- The applications of SS&T to socio-economic development within the African region are gaining wide acceptance with the emergence of more countries pursuing the development of one form of SS&T programme or the other, depending on the individual country's level of investments.
- There is a clear evidence of the impact of the UN-assisted capacity building programme which has already produced appreciable number of trained personnels as revealed in ARCSSTE-E's programme implementation and its achievements since its inception in November, 1998.
- New strategies for capacity building at the formal and informal levels of education to train a sizeable number of experts to ensure meeting up the SDGs 2030 are evolving in line with advances in technologies.
- Indigenous Skill Acquisition in Space Science & Technology especially is key to the Socio-Economic Sustainable Development of any nation.



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Thank
you



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