Milestones and Challenges of ARCSSTE-E

A presentation by

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African Regional Centre for Space Science and Technology Education-English (ARCSSTE-E)

Affiliated to the UN Office of Outer Space Affairs

Obafemi Awolowo University, Ile-Ife NIGERIA

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Profile

• Professor E.E. Balogun,
• Director,
• African Regional Centre for Space Science and Technology Education-English (ARCSSTE-E)
• Obafemi Awolowo University, Ile-Ife
• http://www.oauife.edu.ng/research/arcsstee/index.htm
ARCSSTE-E Profile

- Affiliated to the UN
- Established 1998
- Staff Strength: 24
- No of past Graduates: 14
- No of Workshops Participants: 225
- Annual Budget: < $200,000/yr
- Divisions
  - Remote Sensing/GIS
  - Satellite Meteorology
  - Satellite Communications
  - Basic Space Science & Atmospheric Sciences
Mission

• To build a high quality capacity and critical mass of indigenous educator in English-speaking African countries for application of Space Science and Technology for sustainable National, Regional and Continental development.
Vision

- Develop skills and Knowledge in four prime areas
  - Remote Sensing and Geographic Information Systems
  - Satellite Meteorology
  - Satellite Communications
  - Basic Space Science and Atmospheric Sciences.

- Ensure that participating African countries are part of the Global Information Society, using leapfrog technologies afforded by Satellite Communication
Support

- OOSA
  - Curriculum Development
  - Relevant UN Publications
  - Funding: Transportation for foreign participants
  - Pledged Support for relevant pieces of equipment
Support cont’d

• **Nigerian Government**
  – Pays local staff salaries and emoluments
  – Pledged counterpart funding for research activities
  – Encourages active participation of Nigeria nationals in ARCSSTEE organized workshops and training programmes
  – Encourages popularization of Space Science and Technology as a national programme
  – Established NASRDA (National Space Research and Development Agency) as a National warehouse and coordinating agency for all space R&D issues
Support cont’d

- **Host Institution**
- **Obafemi Awolowo University, Ile-Ife NIGERIA**
  - Contributes a large pool of top-grade resource persons towards ARCSSTEE’s programmes
  - Provides infrastructure: Accommodation, Energy, and Water supply
  - Provides a large expanse of real estate for the Centre’s permanent site
  - Provides library and Health-Care facilities to staff and students of ARCSSTEE
Support cont’d

• RECTAS
• (Regional Centre for Training in Aerospace Surveys)
  – Provides facilities for Remote Sensing & GIS and GPS
  – Supplies Resource Persons in Remote Sensing & GIS and GPS programmes
Activities - Training

- Year: 2000
- Programme: 1st Post Graduate Course on Remote Sensing/GIS
- Participation:
  - Nigeria: 2
  - Liberia: 2
  - Sierra Leone: 1
### Activities – Training cont’d

<table>
<thead>
<tr>
<th>Year</th>
<th>Programme</th>
<th>Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001 / 2002</td>
<td>2(^{nd}) Post Graduate Course on Remote Sensing/GIS</td>
<td>- Nigeria 2</td>
</tr>
<tr>
<td></td>
<td>1(^{st}) Post Graduate Course on Satellite Meteorology &amp; Global Climate Change</td>
<td>- Gambia 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Ghana 3</td>
</tr>
</tbody>
</table>
Activities – Training cont’d

• Year
• Programme
• Participation

• 2002 / 2003
• 1st Post Graduate Course on Satellite Communications

– Nigeria 4
## Activities – Training cont’d

<table>
<thead>
<tr>
<th>Year</th>
<th>Programme</th>
<th>Participation</th>
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<tbody>
<tr>
<td></td>
<td>2nd PG Course on Satellite Communications,</td>
<td>- Lesotho 1</td>
</tr>
<tr>
<td></td>
<td>3rd PG Course on Remote Sensing/GIS</td>
<td>- Kenya 2</td>
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<tr>
<td></td>
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<td>- Tanzania 1</td>
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<td></td>
<td>- Zimbabwe 1</td>
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<tr>
<td></td>
<td></td>
<td>- Liberia 1</td>
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<td></td>
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<td>- Zambia 1</td>
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</tbody>
</table>
# Activities - Workshop

<table>
<thead>
<tr>
<th>Date</th>
<th>Programme</th>
<th>Target Participants</th>
<th>Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 9-14</td>
<td>1st Regional Workshop on Remote Sensing/Geographic Information Systems Applications</td>
<td>• Research Scientists&lt;br&gt;• Policy Makers&lt;br&gt;• Planners&lt;br&gt;• Engineers&lt;br&gt;• Technicians&lt;br&gt;• Practitioners in Higher Institutions of Learning</td>
<td>45</td>
</tr>
</tbody>
</table>
Activities – Workshop cont’d

Date

- Sept 24-29 2001

Programme

- 2nd Regional Workshop on Remote Sensing/Geographic Information Systems
- 1st Workshop on Satellite Meteorology & Global Climate

Theme

- Application of Satellite Data for Resource and Disaster Management

Target Participants

- Research Scientists
- Policy Makers
- Urban Planners
- Weather and Climate Forecasters
- Water Resources Managers
- Academicians
- Agriculture Offices

Participation

- 35
# Activities – Workshop cont’d

<table>
<thead>
<tr>
<th>Date</th>
<th>Programme</th>
<th>Target Participants</th>
<th>Participation</th>
</tr>
</thead>
</table>
| September 16 - 20 2002 | • 1st Workshop on Satellite Communications | • Research Scientists  
• Policy Makers  
• Telecommunications Practitioners  
• Planners  
• Telecoms Engineers  
• Public Sector Agencies  
• Technicians  
• Academia | • 43 |
<table>
<thead>
<tr>
<th>Date</th>
<th>Programme</th>
<th>Target Participants</th>
<th>Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 13-17, 2003</td>
<td>• 1st International Workshop on Space Science Applications</td>
<td>• Research Scientists</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>• Progress in the Applications of Space Science and Technology</td>
<td>• Policy Makers</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Theme</strong></td>
<td>• Public &amp; Private Sector Agencies in the Application of Space Science and Technology</td>
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</tbody>
</table>
## Activities – Workshop cont’d

<table>
<thead>
<tr>
<th>Date</th>
<th>Programme</th>
<th>Target Participants</th>
<th>Participation</th>
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<tbody>
<tr>
<td>March 1-5</td>
<td><strong>2nd Regional Workshop on Satellite Communications</strong></td>
<td><strong>Communications and Telecom Operators</strong></td>
<td>57</td>
</tr>
<tr>
<td>2004</td>
<td><strong>Satellite Communications and the Proposed Nigeria Communications Satellite (NIGCOMSAT-1)</strong></td>
<td><strong>Policy Makers</strong></td>
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<tr>
<td></td>
<td><strong>Theme</strong></td>
<td><strong>Military</strong></td>
<td></td>
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<td></td>
<td></td>
<td><strong>Academia</strong></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td><strong>Other Allied Stakeholders</strong></td>
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<td><strong>Government Agencies</strong></td>
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Activities - Others

• Signed Local MOU with:
  – The Department of Electrical and Electronic Engineering
  – The Department of Geography

• To enable high-flying students from the Post Graduate Diploma program earn a Master’s Degree from the University
Budget

• Honorarium to Resource Persons
  – 800 hrs at N5000 per hour = N 4,000,000:00
  – i.e. average of $35 US per hour = ~ $28,000 US for the 9 months

• Supervision of Field Trips
  – N 2,250,000 ~ ($15,000 US)

• Practicals Laboratory
  – N1,500,000 ~ ($10,000 US)

• Running Cost of Field Trips and Experiments
  – N2,000,000 ~ ($13,500 US)

• Personnel Cost
  – N12,000,000 ~ ($80,000 US)

• Equipment Lease
  – N3,000,000 ~ ($20,000 US)

• Total $166,500

N is Nigerian Naira where N 150 ~ $1 US
Sample of Publications

- Computer Networking using Satellite Radio Links
- Satellite Communications and the Internet Generation
- Rainfall and the length of the Growing Season in Nigeria
- Wavelength dependence of Aerosol Optical Depth and the fit of Ångström Law
- Investigation of Rain-bearing Convective Systems over Nigeria and Adjacent Areas Using Conventional and Satellite-Derived Data
Research Projects

• Validation of Data from NigeriaSat-1
  – Studies in Deforestation process in South West Nigeria using data from NigeriaSat-1 and other Satellites

• Micrometeorology / Mesometeorology Research
  – Energy Balance
  – Turbulence, Refractive Index

• Estimation of Rainfall amounts from TRIMM data
  – M.Sc thesis completed
  – On-going PhD projects

• Climate Modeling
  – M.Sc thesis completed
  – On-going PhD projects
Research Projects cont’d

- Effects of Raindrops on Transmission of EM waves in Satellite Communication
  - Polarization & Depolarization of EM waves by raindrops
- Investigations on the existence of Astronomy-related projects in local Secondary Schools
- Deforestation and Biodiversity
Titles of Pilot Projects

- Proposal for the Establishment of RS & GIS Office in Liberia
- Digitization of National Topographic Maps in Liberia
- Use of Satellite Imagery in the Inventory of Land Degradation Areas in Barki Ladi and Bokkos Local Government Areas, Plateau State
- Groundwater Targeting in basement Complex Rocks of Jos-Plateau using RS Techniques
- Land-use / Land cover Change Depletion of Barki Ladi, Bokkos and Shendam using Satellite Data
Titles of Pilot Projects cont’d

- Interaction Between Tropical Mid Latitude Weather Systems
- Radiation Estimates from Satellite
- Land-use in Greater Banjul Area, Gambia, West Africa
- Rainfall Estimates from Satellites-new Algorithms
- Nowcasting of Tropical Systems with Aid of Satellite in Africa
Outreach Programmes

- To Elementary and High Schools
  - Locally in the Ile-Ife (ARCSSSTE-E’s catchment Area)
  - National (in other parts of Nigeria)
International Collaboration

- Uppsala University, Sweden
- Bayreuth University, Germany
- ICTP, Italy
- WMO
- IRI, Columbia University USA
Needs

- Funds, Funds, Funds
- Equipment
- Academic Linkages and Exchange programs
- Collaborations with world-class National and Regional Laboratories
- Partnering with other national and international Centres of Excellence
- Research Collaborations with sister UN Centres
Limitations and Lamentations

- Wide Digital Divide
- Poor and Inadequate funding
- Limited Knowledge sharing process
- Inadequate Infrastructure (Hardware & Software) and Manware
- Critical Mass of skilled personnel not yet attained in many African countries
- Data access is still a big challenge for many researchers.
Conclusion

• These Milestones are a testament of salutary courage to accomplish much in the face of tremendous opposition, meager resources and so little motivation.

• More resources will result in more dividends
Thank YOU