CAPACITY BUILDING IN SPACE SCIENCE AND TECHNOLOGY: ACHIEVEMENTS OF ARCSSTE-E

By

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GIS DEVELOPMENT IN COLLABORATION WITH RCMRD,

SAFARI PARK HOTEL, NAIROBI, KENYA

Theme: ''Enabling Socio-economic Development Through Geospatial '

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Presentation Outlines

- Introduction
- Postgraduate Diploma (PGD) Programme
- Research and Development (R & D) Activities
- Space Teducation Outreacg Programme
- Benefits And Spin Offs Of Space Technology
- Conclusions

Introduction

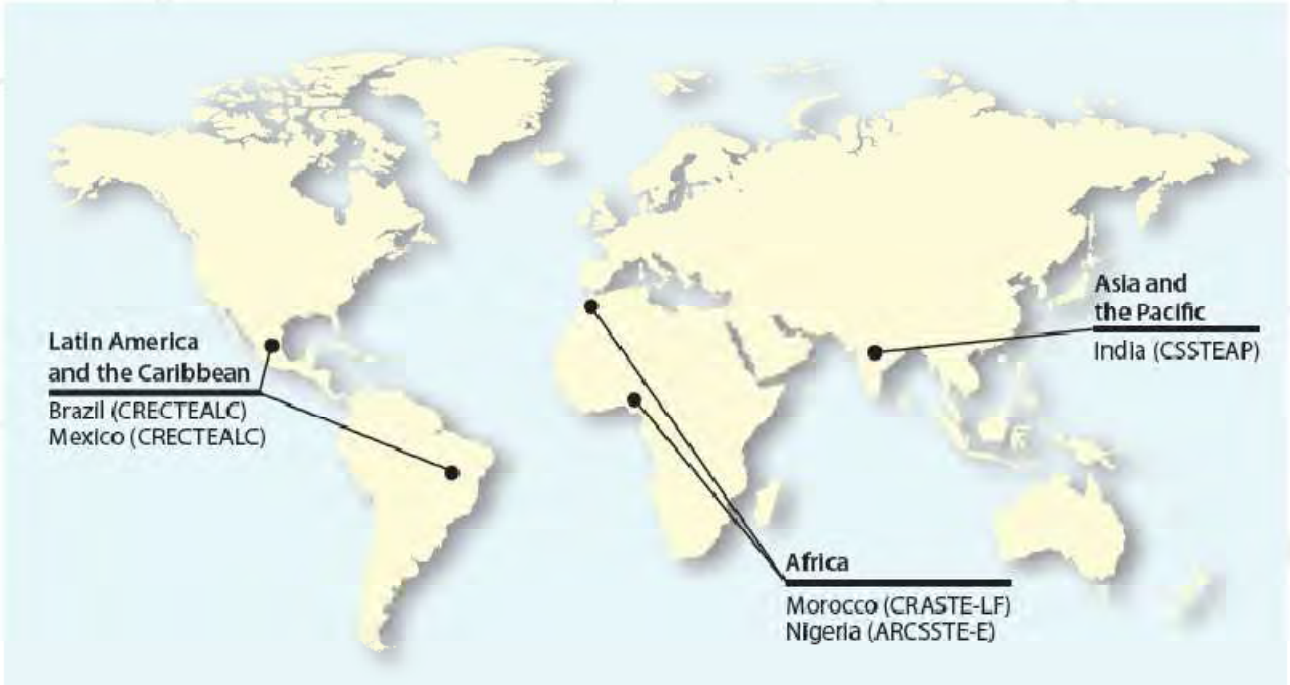
The United Nations General Assembly, in its resolution 45/72 of 11 December 1990 endorsed the recommendation of the Committee on the Peaceful Uses of Outer Space that

"... the United Nations should lead, with the active support of its specialized agencies and other international organizations, an international effort to establish regional centres for space science and technology education in existing national/regional educational institutions in the developing countries."

In 1995, the United Nations General Assembly further endorsed the regional centres initiative and in its resolution 50/27 of 6 December 1995, and recommended that

"... these centres be established on the basis of affiliation to the United Nations as early as possible and that such affiliation would provide the centres with the necessary recognition and would strengthen the possibilities of attracting donors and of establishing academic relationships with national and international space-related institutions."

Locations of the Regional Centres, affiliated to the United Nations

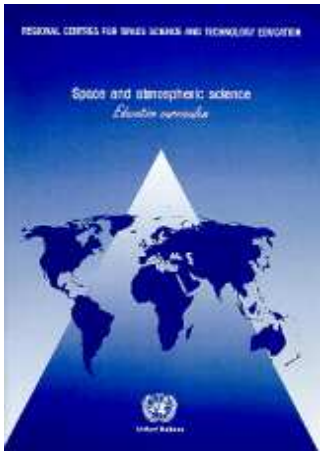


The goal of the Centres is to develop, through in-depth education, an indigenous capability for research and applications in the core disciplines:

- **Remote Sensing and Geographical Information Systems,**
- **Satellite Communications,**
- **Satellite Meteorology and Global Climate, and**
- **Basic Space and Atmospheric Sciences**
- **(Global navigation satellite systems**
- **Space law)**

Postgraduate courses provided by the Centres are based on education curricula developed through UN expert meetings, with the support of prominent educators, in 1989, 1995, and 2001 for each topic of the core disciplines.

UN-OOSA is carrying out preparatory work to hold the fourth United Nations expert meeting on the regional centres for space science and technology education, in 2011 or 2012. At that meeting, efforts will be made to revise, update and expand existing education curricula; this may include GNSS and Space law.



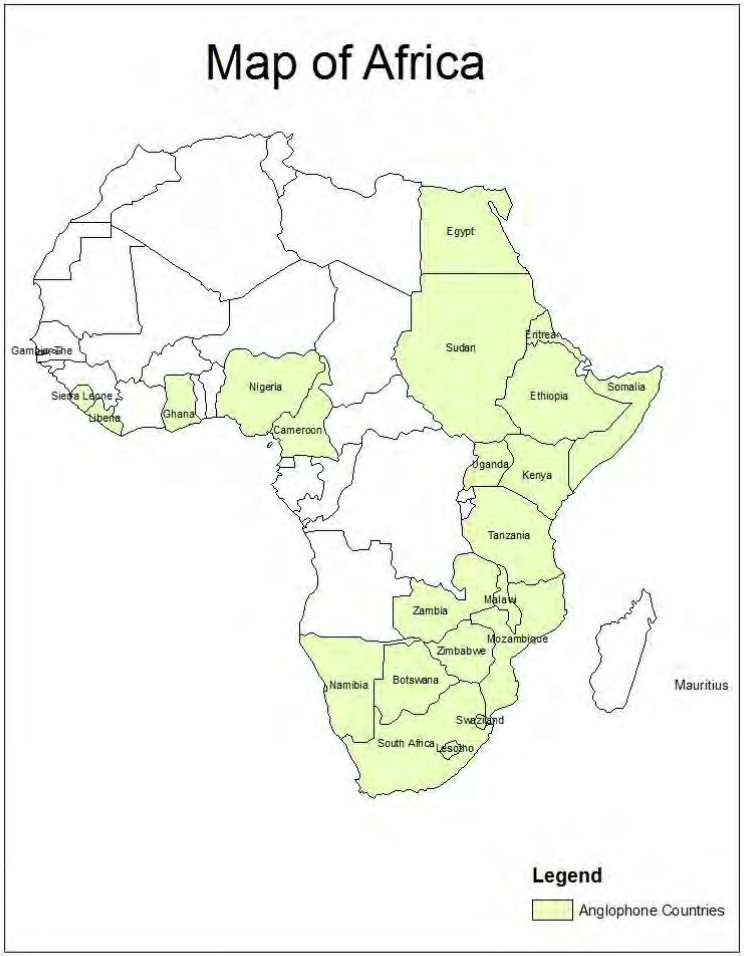
The African Regional Centre for Space Science and Technology Education - in English (ARCESSTE-E) was inaugurated in Lagos, Nigeria in 24 November 1998. In 26 November 2003 the Centre became affiliated to the UN.

24 member countries.

ARCESSTE-E at the Obafemi Awolowo University in Ile-Ife, Nigeria

Anglophone African Member Countries

- Botswana
- Cameroon
- Egypt
- Ethiopia
- Eritrea
- Ghana
- Kenya
- Lesotho
- Liberia
- Mauritius
- Malawi
- Mozambique
- Nigeria
- Namibia
- Somalia
- Swaziland
- Sudan
- South Africa
- Sierra Leone
- Tnazania
- The Gambia
- Uganda
- Zambia
- Zimbabwe



ARCSST-E's Anglophone member countries

Overall Objectives of Centre's Mandate:

(a) Develop, through in-depth education, an indigenous capacity in the applications and development of space science and technology (SST), especially in all principal areas (RS & GIS, Sat Com., Sat Met, BaS & AtSc, GNSS & (Slaw)).

(b) Develop basic and atmospheric sciences curricula from elementary to tertiary institutions (in collaboration with relevant institutions).

(c) Develop skills for satellite communications applications including those associated with rural development and health services, long distance education, disaster mitigation, navigation and regional networking/linkages with industries.

(d) Promote/Develop capacity for regional and international cooperation in SST

(e) Organise Space education outreach programmes for students and teachers of primary and secondary schools, tertiary institutions and the general public.

The technical aspects of ARCSSTE–E's mandates are executed under three major activities:

- **Post Graduate Diploma Programme**
- **Research and Development**
- **Space Education Outreach Programme**

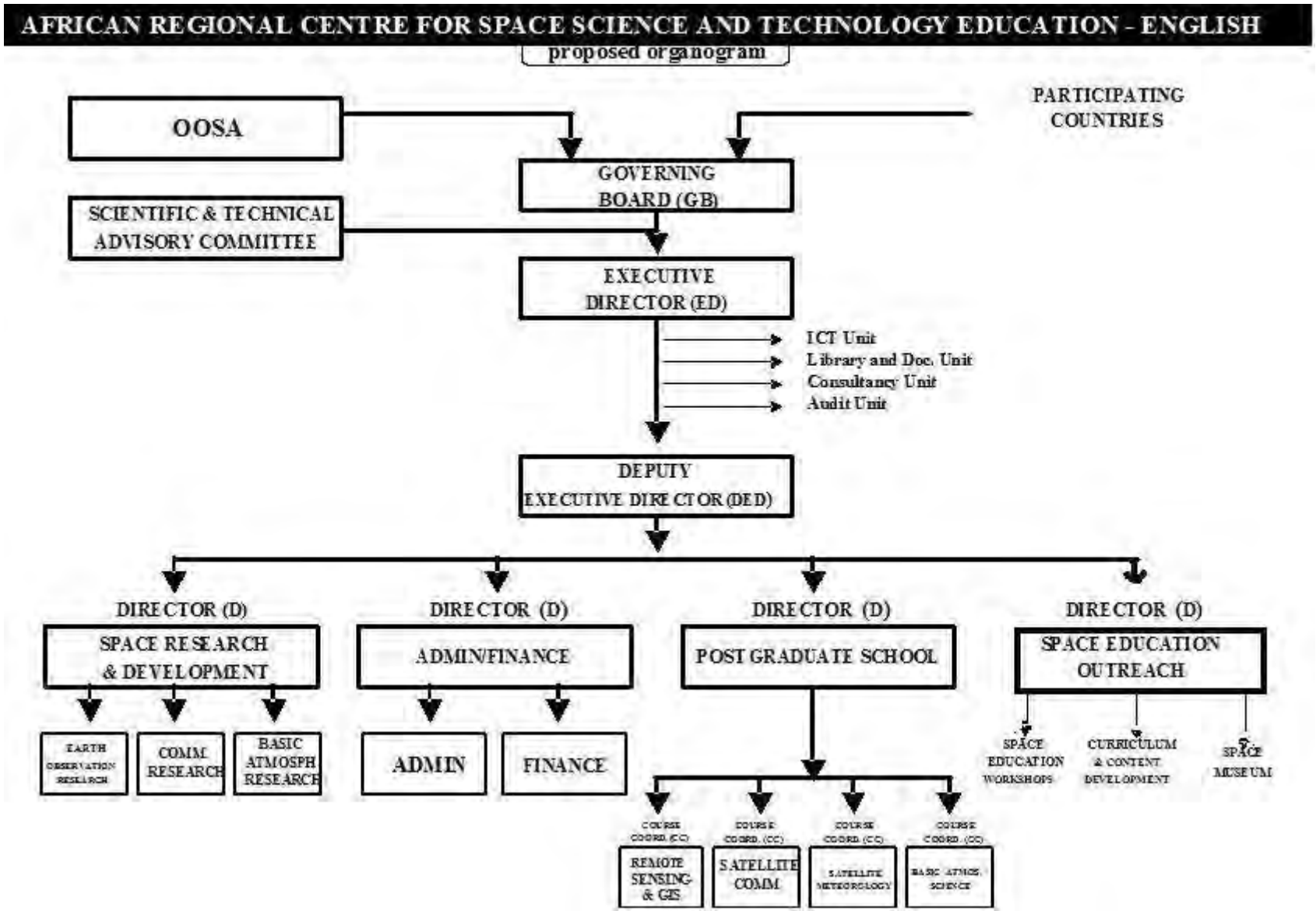
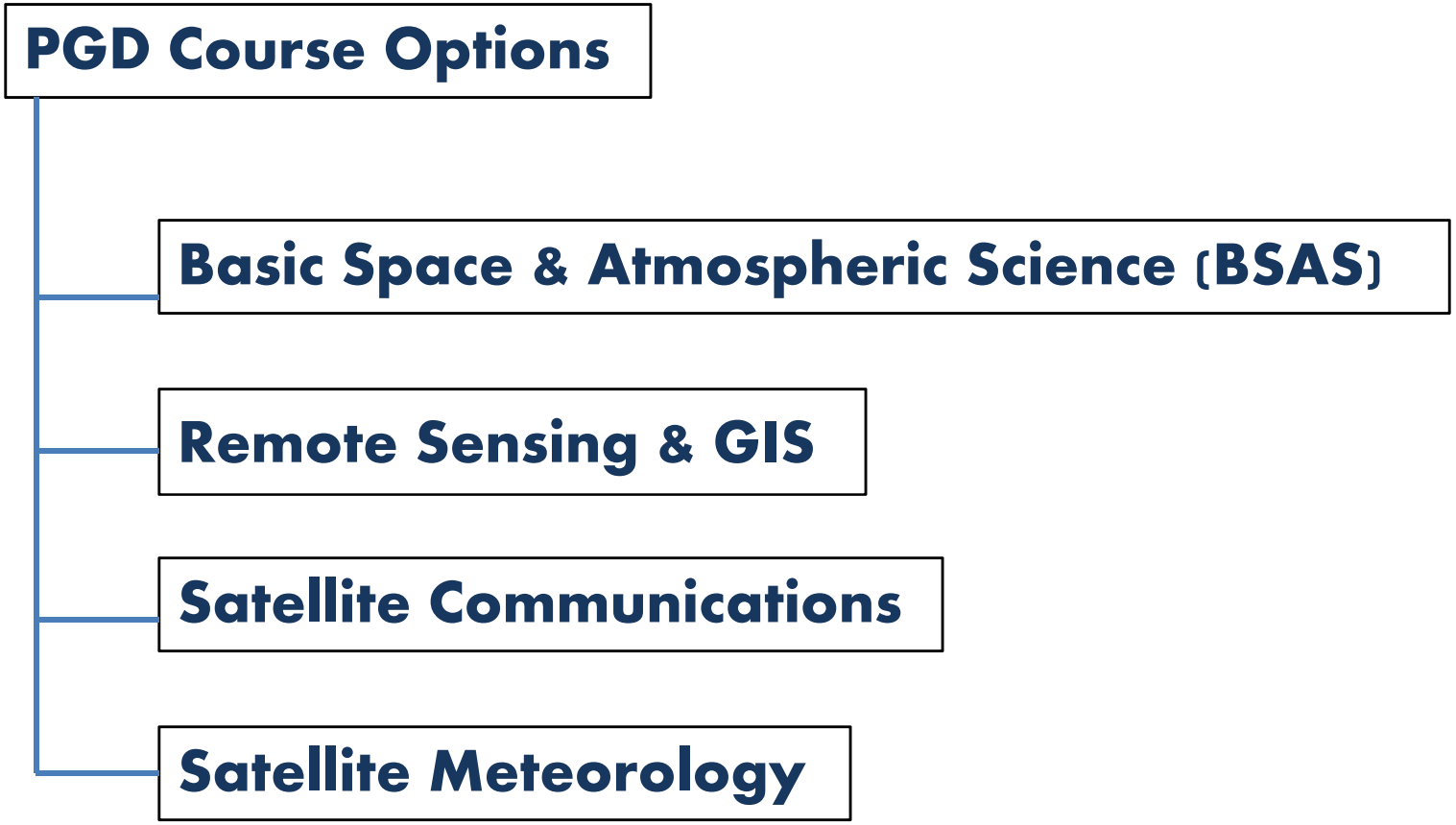
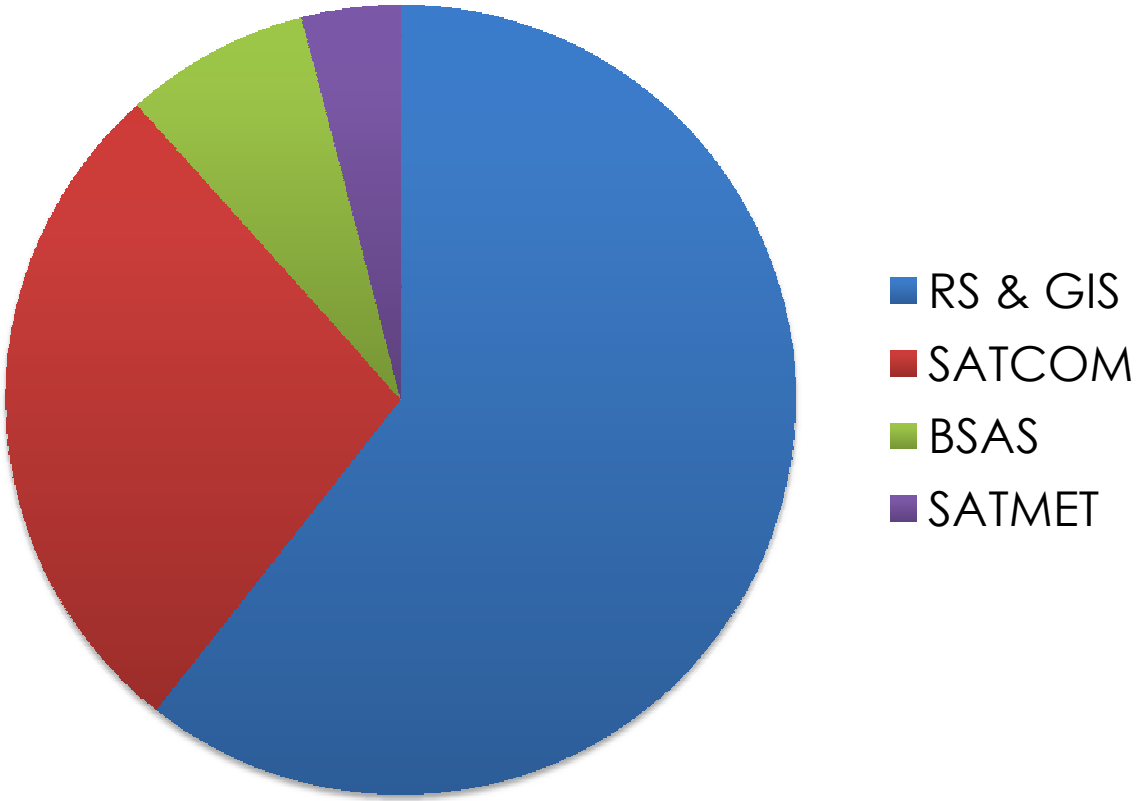


Fig.: Organogramme of ARCSSTE-E illustrating general structure of the Regional Centres.

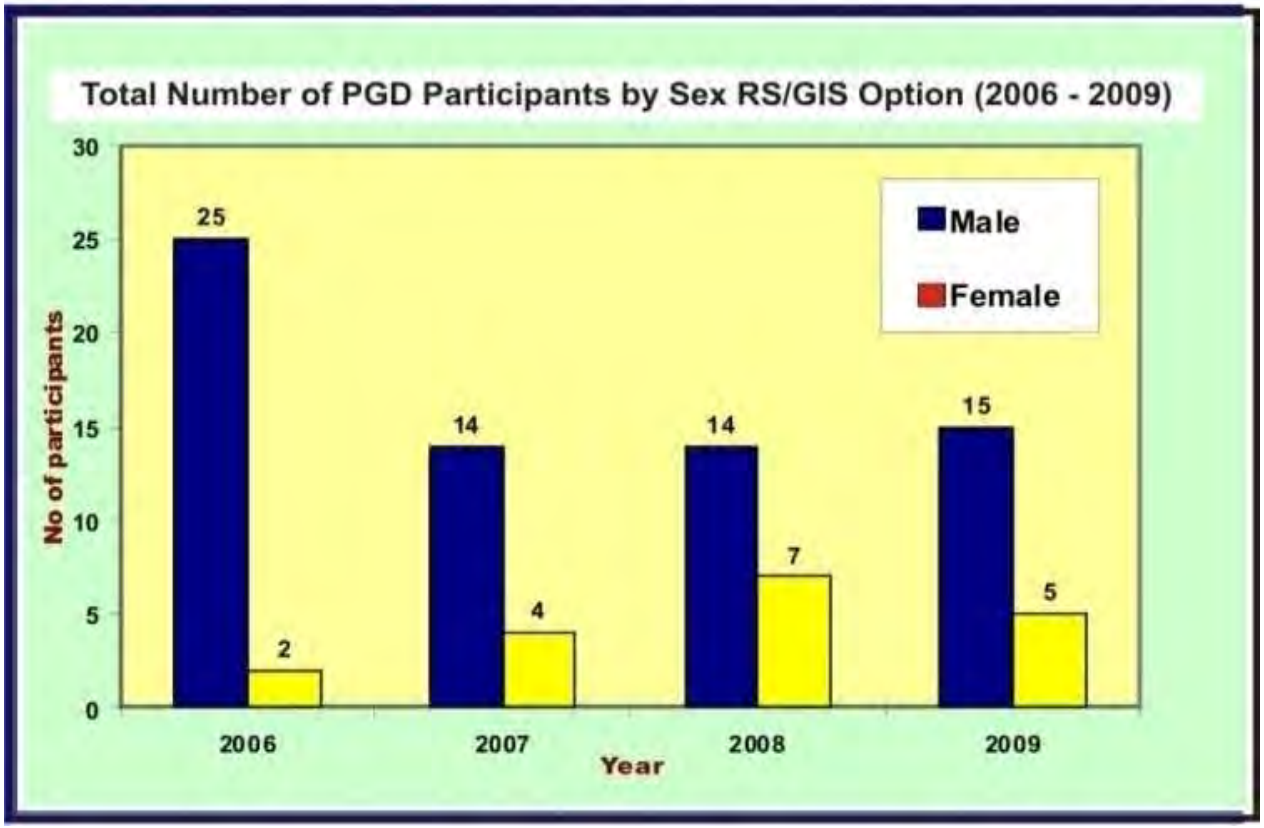
2. Post Graduate Diploma (PGD) Program



Distribution of PGD Participants by Course Options

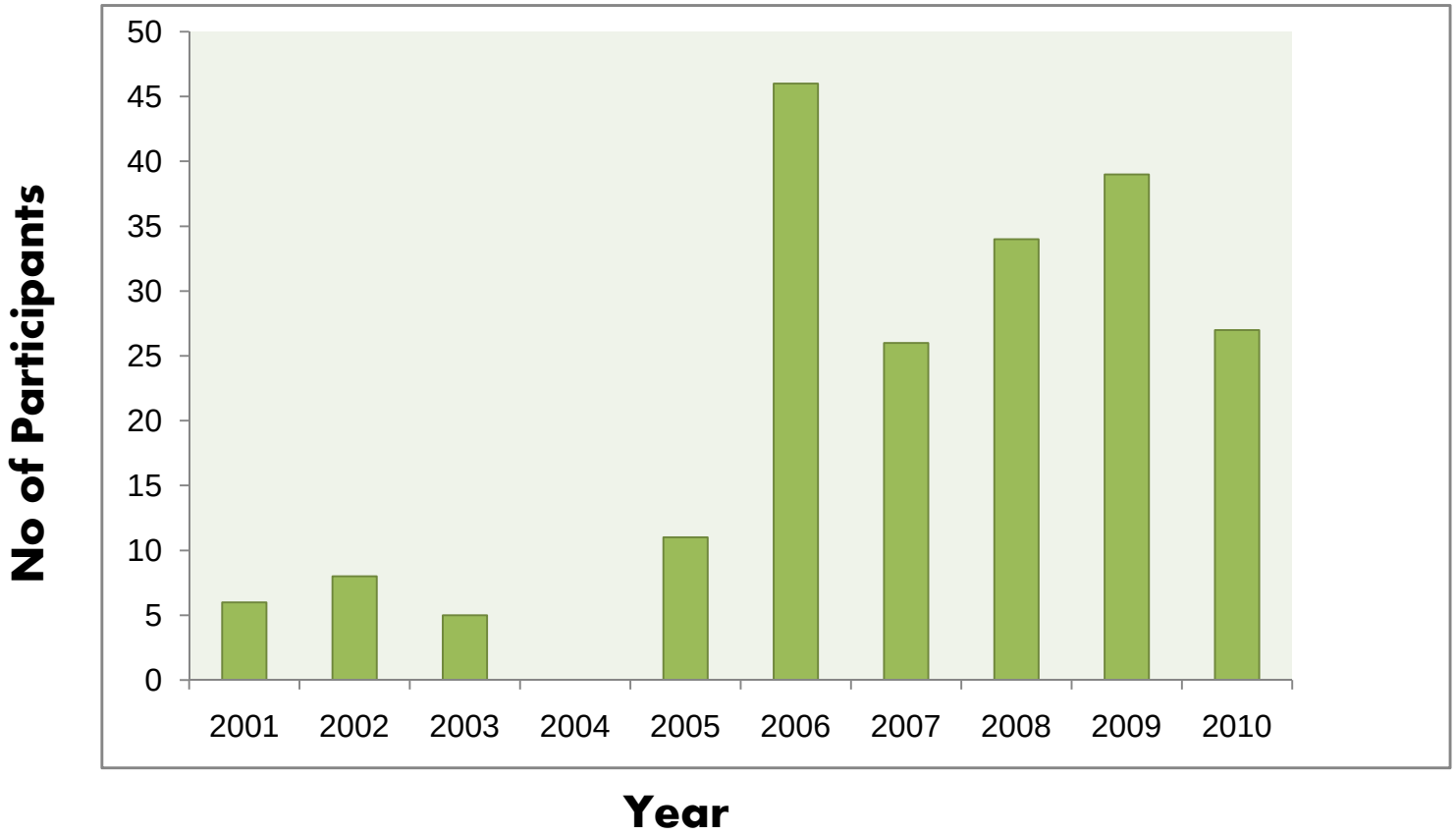


From 2000 to 2010
Total number of PGD Participants = 202



Total number of participants by sex 2006 – 2009.

Annual Distribution of PGD Participants



Distribution of PGD Participants by Country

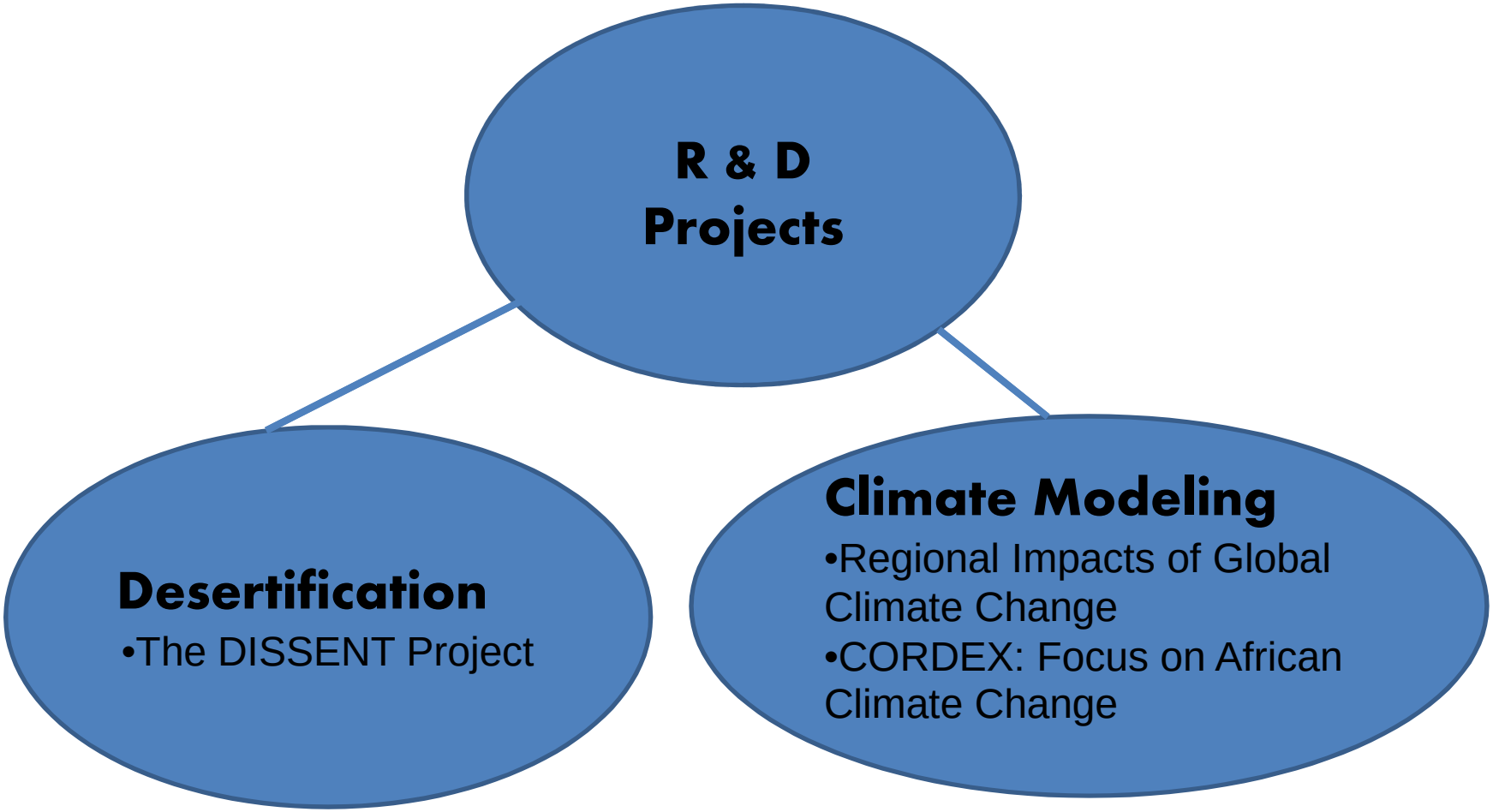
Session											
Country	**2000 to 2001**	**2001 to 2002**	**2002 to 2003**	**2003 to 2004**	**2004 to 2005**	**2005 to 2006**	**2007**	**2008**	**2009**	**2010**	**Total**
Botswana	-	-	-	-	-	-	-	-	-	2	2
Cameroon	-	-	-	-	-	4	7	3	3	2	19
Congo DRC	-	-	-	-	-	-	1	-	-	-	1
Ethiopia	-	-	-	-	-	3	-	-	--	-	3
Gambia	-	-	-	-	-	1	-	-	-	-	1
Ghana	-	-	-	-	-	-	-	-	1	-	1
Kenya	-	-	-	-	-	3	-	-	2	3	8
Liberia	2	-	-	-	-	1	-	-	-	-	3
Malawi	-	-	-	-	-	1	2	2	2	-	7
Nigeria	3	8	5	-	11	28	13	22	26	13	129
Sierra Leone	1	-	-	-	-	-	-	-	-	-	1
Sudan	-	-	-	-	-	2	3	1		1	7
South Africa	-	-	-	-	-	1	-	-	-	-	1
Tanzania	-	-	-	-	-	-	-	2	2	1	5
Uganda	-	-	-	-	-	1	-	3	1	4	9
Zambia	-	-	-	-	-	1	-	-	1	1	3
Zimbabwe	-	-	-	-	-	-	-	1	1	-	2
Total	**6**	**8**	**5**	**-**	**11**	**46**	**26**	**34**	**39**	**27**	**202**

International Committee on GNSS

- Global Navigation Satellite Systems (GNSS) and their applications are overarching, enabling space technologi
- ICG Membership is open to GNSS providers or users of GNSS services
  - 9 nations and the European Community
  - 15 organizations (UN system entities, IGOs, NGOs)
- To date 5 Meetings of the ICG have bee held
  - Adopted the ICG Work Plan and Terms of Reference
  - Established a Providers Forum
- UNOOSA acts as the ICG Secretariat and the Regional Centres as information dissemination and capacity building Centres

ICG International Committee on Global Navigation Satellite Systems

3. Research & Development (R & D) Activities

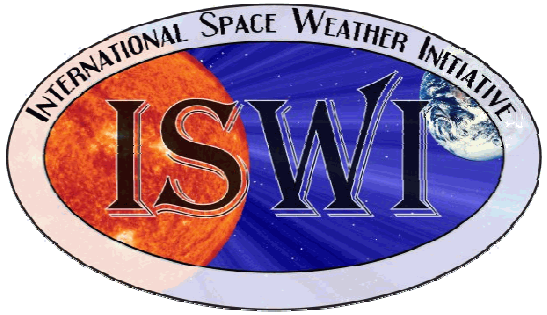


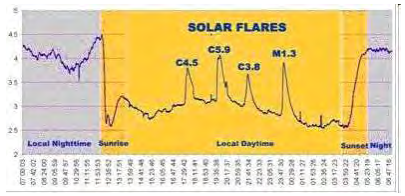
R & D

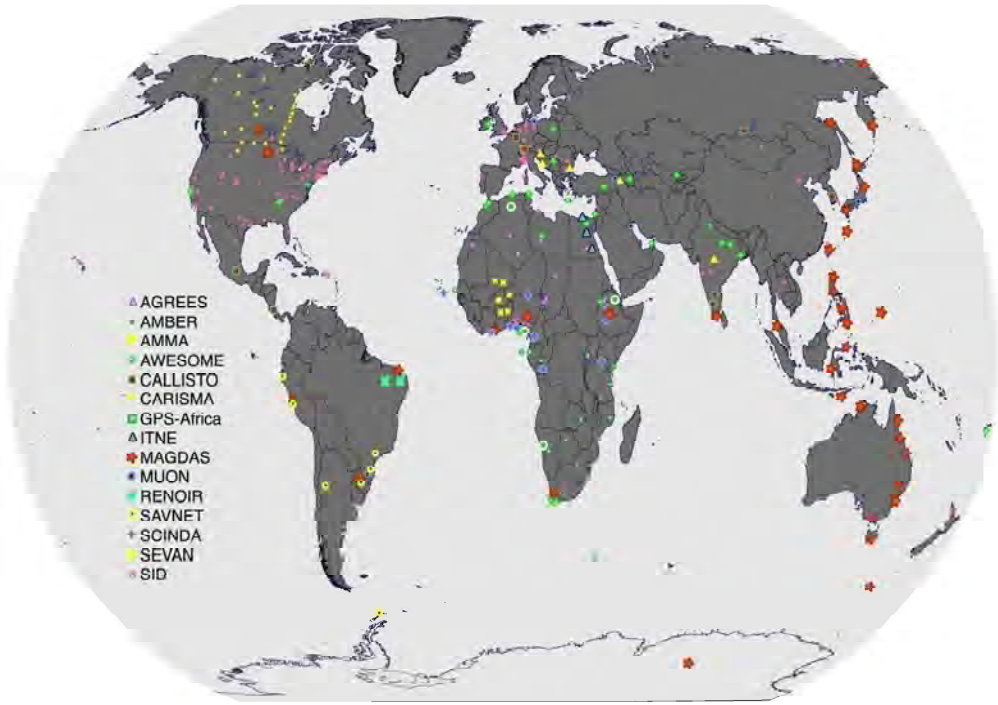
- Development of payloads for Humanitarian Satellite (HumSat) Network System using a Distributed Sensor Network (DISENT) strategy

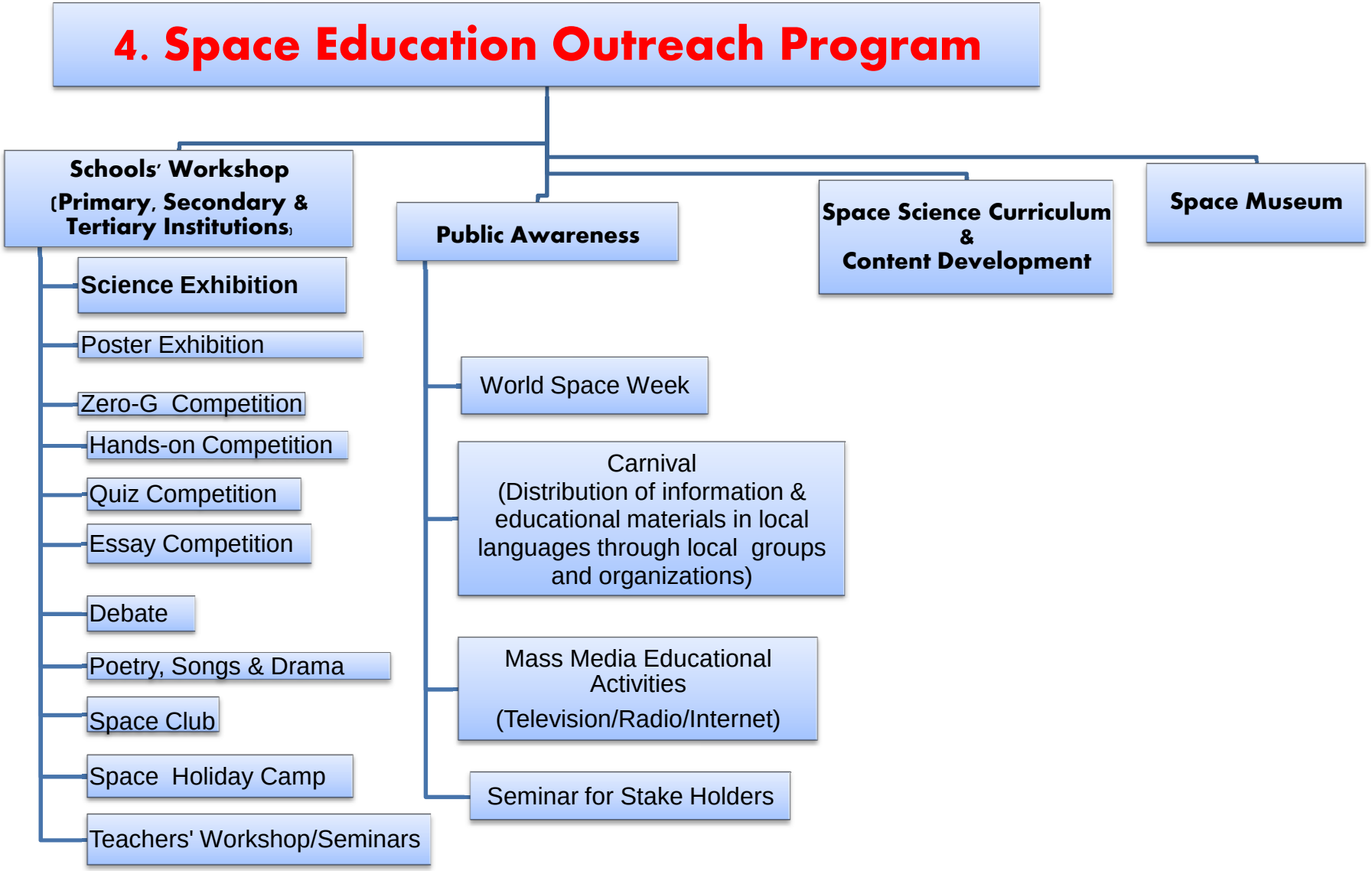
United Nations Programme on Space Applications

Through Basic Space Science Initiative (BSSI) and ISWI (2010 - 2012) almost one thousand instruments were deployed in 14 ground-based networks all over the world to observe solar phenomena.








4. Space Education Outreach Program
Schools' Workshop (Primary, Secondary & Tertiary Institutions)
Science Exhibition
Poster Exhibition
Zero-G Competition
Hands-on Competition
Quiz Competition
Essay Competition
Debate
Poetry, Songs & Drama
Space Club
Space Holiday Camp
Teachers' Workshop/Seminars
Public Awareness
World Space Week
Carnival (Distribution of information & educational materials in local languages through local groups and organizations)
Mass Media Educational Activities (Television/Radio/Internet)
Seminar for Stake Holders
Space Science Curriculum & Content Development
Space Museum

Some photographs of events at the Annual Schools' Workshop at Ile Ife

2009 WORLD SPACE WEEK ACTIVITIES AT EAGLE SQUARE, ABUJA, Nigeria

Pupils/Students at Training Workshop, Eagle Square, Abuja

Pupils dressed as Astronauts in space presenting a song/drama

Students explaining the techniques of making a model of a space rocket

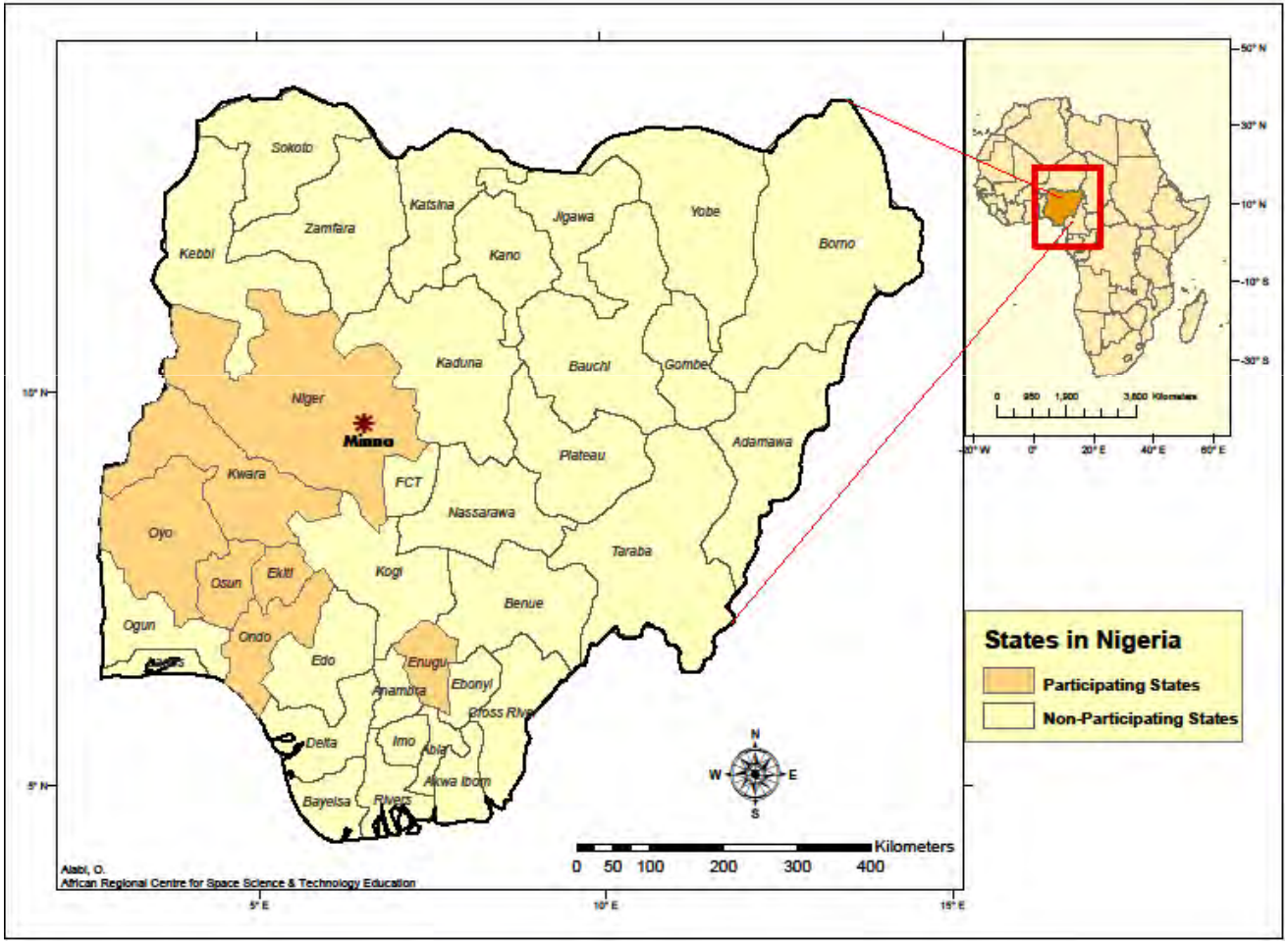
Demonstration of the launch of a water rocket by ARCSSTEE staff

Model of the space station exhibited by students

Participants at Seminar on space Education curriculum development

World Space Week 2010
Theme: Mystries of the cosmos

- The 2010 World Space Week in Nigeria was celebrated in Niger State, with about 1,400 participants, drawn from the host state and 6 other states of the country



2010 World Space Week Celebration in Nigeria

During the instructional period, the students and their teachers paid rapt attention, and took notes on what they learned.

2010 World Space Week Celebration in Nigeria

Introducing Robotic Education:

Exploration Robots

using the LEGO MINDSTORMS: space organized where students had the opportunity to build and programme robots, and learn more

about robotics education.

Figure 32: Model of the Universe depicting the mysteries of the Cosmos. This project was presented by Adesina College, winner of the Science Fair during the 2010 World Space Week Celebration in Nigeria. With

Members of Space Education Outreach Team of ARCSSTEE representatives from Adesina College.

ARCSSTEE'S ZERONAUTS PROGRAMME AS PART OF THE WORLD SPACE WEEK ACTIVITIES

- **Zeronaut programme is established to inspire the young ones. It takes place annually at Kenedy Space Centre, Florida, USA in collaboration with Space Week International Association (SIA).**

Stella Felix
ARCSSTE-E's 1st Zeronaut 2006

Adeolu Akano
ARCSSTE-E's 2nd Zeronaut 2007

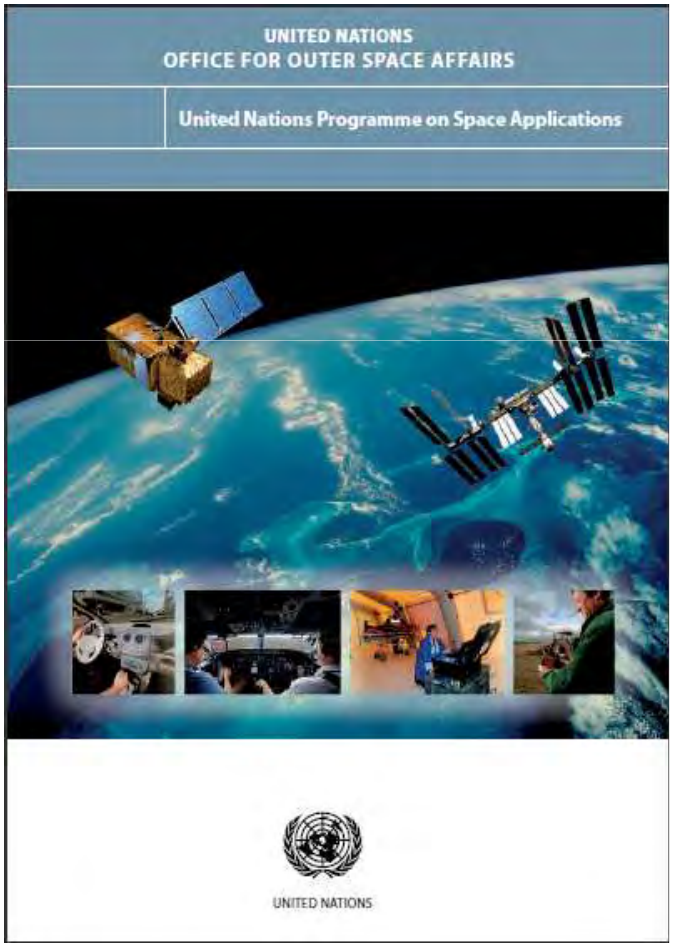
Omolola Ibrahim
ARCSSTE-E's 3rd Zeronaut 2008

5. BENEFITS AND SPIN OFFS OF SPACE TECHNOLOGY

Through The United Nations Programme on Space Applications

Priority thematic areas:

- Education and capacity-building, including research areas in basic space sciences
- Natural resources management and environmental monitoring
- Satellite communications for tele-education and telemedicine applications
- Global navigation satellite systems
- Disaster management
- Climate change



Application of capacity building in ARCSSTE-E on socio-economic development :

Categories of RS and GIS projects carried out by course participants

GIS Applications	2006	2007	2008	2009	2010	Total
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
Defense/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

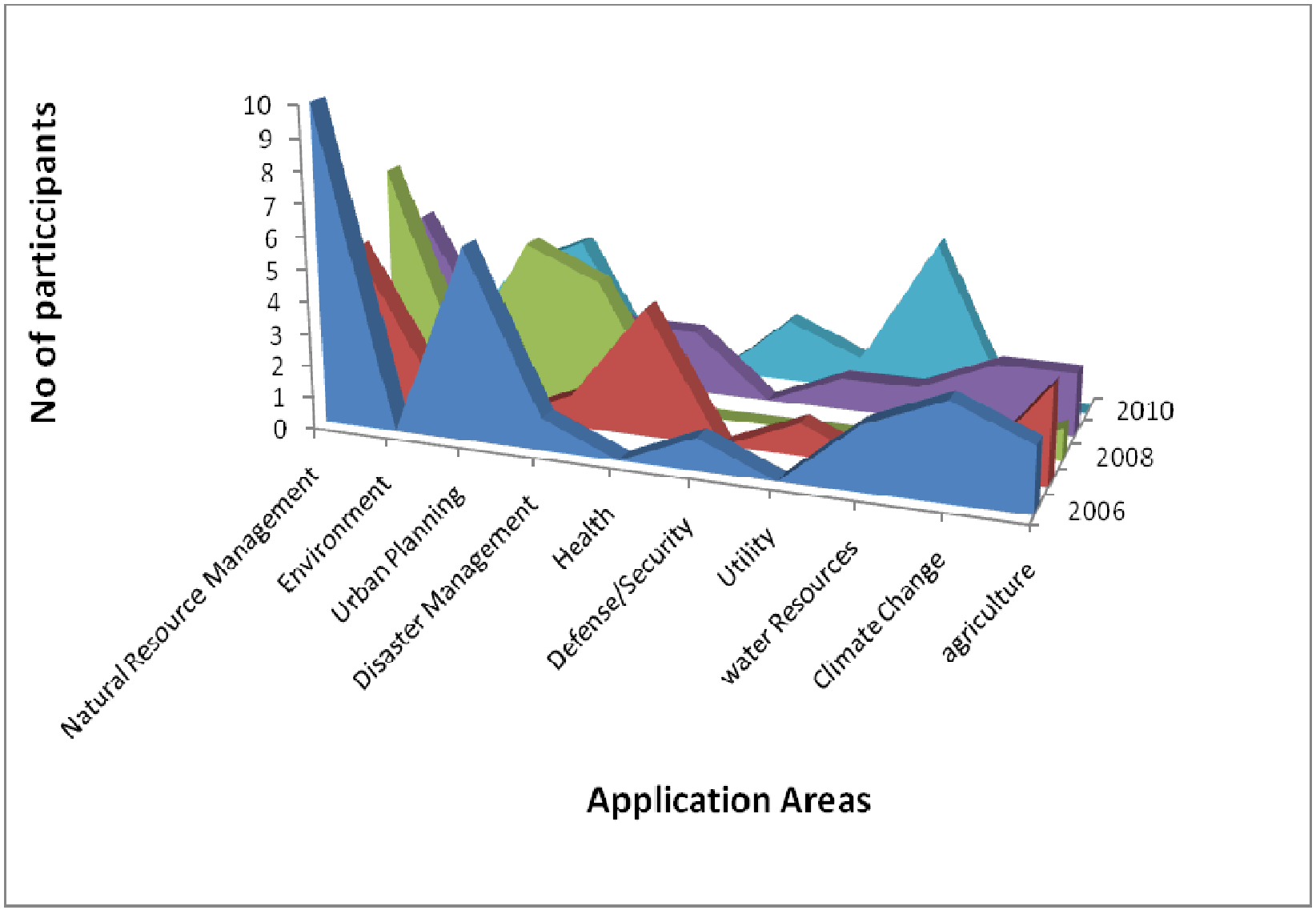


Figure : Number of student projects in various application areas 2006 – 2010.

6. CONCLUSION

- **The advent of operational remote sensing from Earth observation satellites in the 70's and 80's coupled with the ICT innovations, has revolutionized the development and use of Space Technology in virtually all areas of socio-economic development in many developed countries.**

- **Applications/use of SST is critical to the economic reforms in the areas of oil and gas exploration and exploitation, defense and security, food security, tourism, population census, monitoring and control of education, healthcare delivery, communications, water resources development/management, environmental and disaster monitoring/management, commerce and industry and wealth creation.**

- **As with many new technologies, early acceptability and use was slow in many developing countries such as Nigeria for various obvious reasons which include high cost of infrastructural development and inadequate man-power to use and transfer the knowledge.**

- **The intervention of the UN became very important, in assisting the developing countries build their indigenous capacity in SST applications, through the establishment of the Regional Centres for SST education inorder to maximize the vast and unlimited benefits of SST.**

Conclusion contd.

- It also became necessary to integrate space education outreach and awareness programmes , especially ‘’the catch them young programme’’ into the overall strategy for capacity building and the development of indigenous capability in all aspects of SST.

- These include the development of curricula for space education in Nigeria and promotion of gender equality and women empowerment, noting that the first Zeronaut participant in Nigeria and Africa, selected through a keenly contested essay competition, was a female student of Moremi High School, Ile-Ife

- The role of the Organisation of Women in Science for the Developing World cannot be overemphasized which include the promotion of the female child education in science,technical, engineering and mathematical (STEM) subjects.

- With the on-going efforts to sustain the national space programmes, following the launch of NigeriaSat-1, NigcomSat-1 (to be replaced by NigcomSat-1R soon) and the proposed launch of NigeriaSat-2 and NigeriaSat-X in July, 2011, Nigeria will emerge as a space fairing nation, maximising the benefits of SST for the improvement of its economy and the quality of life of all Nigerians.

Stella Felix

ARCSSTE-E's Zeronaut 2006

Adeolu Akano

ARCSSTE-E's Zeronaut 2007

Thank You

Omolola Ibrahim

ARCSSTE-E's Zeronaut 2008

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