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Report of the Scientific and Technical Subcommittee on its forty-third session

REPORT OF THE CENTRE FOR SPACE SCIENCE AND TECHNOLOGY EDUCATION IN ASIA AND THE PACIFIC (CSSTEAP)

(Affiliated to the United Nations)

In paragraph 19 of its resolution 60/99, the General Assembly agreed that the regional centres for space science and technology education, affiliated to the United Nations, should continue to report to the Committee on the Peaceful Uses of Outer Space on an annual basis.

The present document contains the report of the Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP), as submitted by the Centre to the Office for Outer Space Affairs.

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1. Introduction

1. Sharing the benefits of space science and technology and capacity building for all Member States has been an area of considerable importance for the United Nations and its relevant space-related bodies. Thus, the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE 82) recommended the need for establishing space science and technology education centres in developing countries. This was also endorsed by the United Nations General Assembly in 1990 and adopted as a resolution to establish regional centres (A/Res/45/72). As a follow up, the Office for Outer Space Affairs of the Secretariat has played an active role in establishing these regional centres for space science and technology education.

2. The first of these Centres, the Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP), was established in India on 1 November 1995. The Centre's headquarters are located in Dehradun, India, and its programmes are executed by staff of the Department of Space (DOS) at campuses in Dehradun and Ahmedabad. The DOS institutions involved include the Indian Institute of Remote Sensing (IIRS) in Dehradun and the Space Applications Centre (SAC) and the Physical Research Laboratory (PRL), both in Ahmedabad. An agreement between CSSTEAP and the Office for Outer Space Affairs was signed in May 1996 to formalize the affiliation of the Centre to the United Nations.

3. While CSSTEAP is one of the first regional centres established under the aegis of theUnited Nations, similar United Nations-affiliated regional centres for space science and technology education have been set up in Morocco for Francophone Africa, in Nigeria for Anglophone Africa (1998) and in Brazil and Mexico for Latin America and the Caribbean (1997).

CSSTEAP and host institutions

4. Each regional centre is conceived as an institution that should offer the best possible education, research and applications programmes, opportunities and experience to the participants in all its programmes. The principal goal of each Centre is the development of the skills and knowledge of university educators, research and applications scientists through rigorous theory, research, applications, field exercises and pilot projects in specific aspects of space science and technology that can contribute to sustainable development in many countries of the regions. The mission of the regional centres is to establish national capabilities in developing countries to design and implement education, research and application programmes in space science and technology, in particular, in the areas of: (1) remote sensing and geographic information systems (GIS); (2) satellite communications and global navigation satellite systems; (3) satellite meteorology and global climate; and (4) space and atmospheric sciences.

2. Objectives of the Centre

5. More than half the world population lives in the Asia-Pacific region. As a result, there is a large pressure on the natural resources of the region. There are widespread concerns about the quality of the environment, ranging from the consequences of climate change, on food security and sea-level rise,

loss of biodiversity in marine and terrestrial ecosystems and the degradation of land and water resources. Other areas of concern in the Asia-Pacific region relate to the management and mitigation of natural disasters, the occurrence of widespread and persistent poverty, poor education and health care facilities in rural areas, poor physical and communication infrastructure, etc.

6. Against this background, a major objective of the Centre is to create awareness regarding the potential of space science and technology for contributing to the solution of these environmental and related problems, and to establish and strengthen national capabilities in space science and technology, through education, training, application programmes and regional cooperation. To this end, the Centre organizes post-graduate level courses of 9-month duration in the major disciplines of space science and technology, workshops and short-term courses, and promotes cooperation in the field of space science and technology among institutions in countries in the Asia-Pacific region.

3. Organization and management of the Centre

7. Ten countries signed the Agreement for the Establishment of CSSTEAP during a meeting held on 1 November 1995 in New Delhi. To date, 15 countries have signed the Agreement. In addition to providing a formal affiliation of the Centre to the United Nations, the Office for Outer Space Affairs extends support in terms of expert advise, technical assistance and relevant documentation.

8. The Government of India has concluded a Host Country Agreement with the Centre (March 1998), by which it has accorded specific privileges and international status to the Centre, similar to the privileges enjoyed by Specialized Agencies of the United Nations. Under the Host Country Agreement, the Centre also has access to facilities, infrastructure and expertise of DOS institutions, including IIRS, SAC and PRL. The Government of India has brought out an official gazette notification in pursuance of the Host Country Agreement.

9. The activities of CSSTEAP are administered by an international Governing Board, consisting of 15 signatory members from countries in the Asia-Pacific region and two observers: namely the United Nations (Office for Outer Space Affairs) and the International Institute of Geo-information Science and Earth Observation (ITC) in Enschede, The Netherlands.

10. While the Governing Board formulates policies, reviews progress, approves the budget and administration of the Centre, its scientific and technical arm is the Advisory Committee. The Advisory Committee is an independent body of experts for guiding the technical programmes of the Centre, evaluating the course, advising CSSTEAP on technical facilities and addressing all issues of coordination with other institutions. The Advisory Committee is chaired by a representative of the Office for Outer Space Affairs, the Directors of host institutes, the Course Directors of the four courses, observers and two international experts in each subject area. At present there are 19 members in the Advisory Committee.

11. The host country provides support to the host institutes for all necessary infrastructure and the operational budget for running the educational programmes. The success and achievements of CSSTEAP are largely due to the guidance and vision provided by the Chairman of the Governing Board, Shri. G. Madhavan Nair (since September 2003) and Dr. K. Kasturirangan (in the period November 1995 – August 2003). In the formative years the Directors of CSSTEAP, Prof. B.L Deekshatulu (1995-2002) and Prof. Karl Harmsen (2002-2005) provided leadership to shape its policies, programmes and helped CSSTEAP reach its status of excellence. Since 2005, Dr. V.K. Dadhwal is the Director-in-charge of the Centre.

12. CSSTEAP conducts all of its educational programmes in close collaboration with one of the DOS institutions and thus has direct access to their physical facilities and intellectual capabilities. In addition to providing facilities, infrastructure and skilled manpower, the Government of India, through DOS, also provides most of the funding for the Centre. In the past decade a grant of approximately Rs 185 million has been provided by the Government of India, while grants for travel support for few participants amounting to Rs 6.0 million has been provided mainly by the Office for

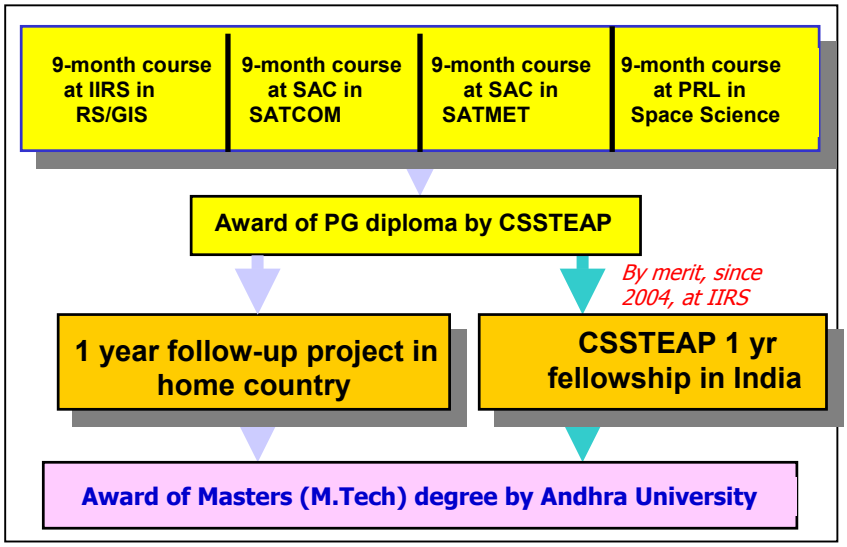
Outer Space Affairs with some contribution from the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) and the United Nations Development Programme (UNDP).

4. Educational programmes

13. The Centre offers post-graduate level courses in the fields of:

(a) Remote Sensing and GIS,
(b) Satellite Communication and Global Positioning Systems (SATCOM),
(c) Satellite Meteorology and Global Climate (SATMET), and
(d) Space and Atmospheric Sciences.

14. On each of the campuses, most of the teaching staff are drawn from the host institution (about 80% of the teaching time). Where desirable or needed, staff is drawn from other DOS institutions, or professional, scientific or academic institutions in India (around 15%) or from institutions or organizations outside India, that is, from the Asia-Pacific region as well as from Europe, North America or the Pacific Rim (around 5% of the teaching time).



Structure of the educational programme

15. Successful completion of the 9-month post graduate-phase of the programme leads to the award of a post-graduate diploma by the Centre. The post-graduate course is organized in such a way to emphasize the development and enhancement of knowledge on the subject and orienting towards planning and executing a project. Nine months of the course includes 30% of time on the project research work, which is important for skill development. The students normally undertake their pilot work in the post-graduate courses in consultation with their home institution, which could be of relevance when they return home.

16. As part of the technical tour, the trainees are provided an opportunity to visit different centres of ISRO/DOS, Government of India, Andhra University, India and organizations in India concerned with the technology. The Centre publishes lecture notes in the form of a book as well as in a digital version covering the syllabus of post-graduate courses and distributes them to the students.

17. All educational programmes are conducted in English. In principle, students are expected to be sufficiently fluent in English, but facilities for improving their English language skills are made available to those students who want to avail of this facility, upon their arrival on campus. The courses are taught in classroom environments with the use of modern teaching methods and tools, and also include multimedia tutorials for self-study. Practicals are given in the laboratories and skill development environments of the DOS institutions.

18. In the RS & GIS post-graduate courses, the students work on pilot project research broadly covering a wide variety of themes such as crop inventories, biodiversity, forest cover, natural resource

management, forest fires, wildlife habitats, land use planning, watershed management, soil erosion, ground water resources and hydrology, salt water intrusion, coastal zone management, water quality assessment, geomorphology, earthquake risk assessment, landslide risk assessment, urban planning, traffic flows and infrastructure, etc.

19. In the SATCOM post-graduate courses, the broad themes chosen for project work are on design for communications DAMA system and satellite, antenna tacking system, digital cyclone warning system, meteorological data reception system, very small aperture terminal (VSAT) network of satellite communication, communication payload for low Earth orbit satellite system, design of TV broadcasting system, Earth station etc.

20. In the SATMET post-graduate courses the topics investigated include satellite-based rainfall estimation, cloud analysis, snow cover monitoring, temperature and moisture profile, storm surge prediction and inundation, vegetation and land surface temperature, sea surface temperature monitoring, numerical weather prediction modeling, aerosol measurement, etc.

21. In the Space and Atmospheric Sciences post-graduate courses the project topics have been on ionospheric tomography, ionospheric plasma depletions, ozone content and modeling, study of spectral imaging of asteroids, binary stars, precession magnetometer, solar furnance gamma ray telescope, astronomical grade array detectors, tropospheric chemistry models, etc.

22. The Centre has played a major role in the development of the curricula of various courses that are currently being followed by the United Nations for all regional centres for space science and technology education, affiliated to the United Nations. There is an internal Board of Studies (BOS) in every discipline, which meets annually. The members include subject matter experts in the relevant field from universities and organizations and course directors of the course. The BOS committee provides technical guidance in fine tuning the course syllabus, keeping in view the recent developments in technology and applications in the relevant fields of space science.

5. Short-term training and workshops

23. In addition to long-term post-graduate courses, the Centre also conducts theme specific short-term courses, workshops and awareness seminars for scientists, technologists, teachers, policy-makers, decision-makers, planners, etc. In the last 10 years, CSSTEAP organized seven theme specific short courses (4-week duration) and two workshops on RS & GIS (few days). The courses/workshops benefited 149 scientific/technical personnel from 26 countries in the Asia-Pacific region and also benefited 16 participants from 10 countries outside the Asia-Pacific region. The various themes that were covered were: Digital Image Processing for Environmental Management (1999), Technology and Applications in Natural Resources and Environmental Management (2000 and 2001), Geoinformatics for Disaster Management (2002 and 2004), Geoinformatics for Biodiversity Assessment (2003), Satellite Remote Sensing and GIS Applications in Agricultural Meteorology (WMO sponsored this international workshop) (2003), Geoinformatics for Sustainable Agriculture (2005).

24. In the SATCOM stream, the Centre organized three theme specific short-term courses and one workshop ranging from a few days to weeks. These have benefited 53 scientific/technical personnel from 12 countries in the Asia-Pacific region and seven participants from seven countries in other regions. The various themes that were covered were: workshop on distance education and training via satellite (1997); digital signal processing (1999); application of satellite communications for development (2000); application of space science and technology for social scientists (2001).

25. In the SATMET stream, the Centre organized two theme specific workshops lasting a few days. These benefited 25 scientific/technical personnel from 10 countries in the Asia-Pacific region. The themes covered were: workshop on emerging trends in satellite meteorology: technology and applications (ETSAMTA) (1998); emerging trends in satellite meteorological applications with special emphasis on microwave remote sensing (2002).

26. Under Space and Atmospheric Sciences, one theme specific workshop on data processing from the Chandra and XMM-Newton space missions (2003) was organized and benefited 26 personnel from four countries in the Asia-Pacific region and two participants from two countries in other regions.

6. Trainees output

27. To date, the Centre has conducted 23 post-graduate courses: 10 on Remote Sensing and GIS, five on Satellite Communications and four each on Satellite Meteorology and Global Climate and Space and Atmospheric Sciences. The Centre has further conducted 16 short-term courses and workshops in the past 10 years. These programmes have benefited approximately 643 participants from a total of 30 countries in the Asia-Pacific region. In addition to this, about 26 participants from 16 countries in other regions have also benefited from the educational programmes. 30 June 2006 marks the successful completion of the 10th RS & GIS post-graduate programme (19 participants from 13 countries). In the post-graduate courses, countries benefiting the most (more than 10 students) are: India, Mongolia, Nepal, Bangladesh, Sri Lanka, Uzbekistan, Democratic People's Republic of Korea, Indonesia, Viet Nam, Philippines, Kyrghyzstan, Myanmar and Kazakhstan.

	RS &GIS	SATCOM	SATMET	SPACE SC
1996	25 Students 14 Countries			
1997-98	23 Students 14 Countries	13 Students 9 Countries		
1998-99	21 Students 11 Countries		17 Students 10 Countries	10 Students 7 Countries
1999-00	17 Students 11 Countries	18 Students 8 Countries		
2000-01	19 Students 13 Countries		21 Students 13 Countries	9 Students 5 Countries
2001-02	20 Students 13 Countries	14 Students 8 Countries		
2002-03	23 Students 13 Countries		19 Students 13 Countries	11 Students 3 Countries
2003-04	21 Students 16 Countries	15 Students 7 Countries		
2004-05	20 Students 11 Countries		15 Students 10 Countries	9 Students 5 Countries
2005-06	19 Students 13 Countries	12 Students 6 Countries		

Afghanistan
Azerbaijan
Bangladesh
Bhutan
Cambodia
China
DPR Korea
Fiji
India
Indonesia
Iran
Japan
Korea
Kazakhstan
Kyrghyzstan
Lao PDR
Malaysia
Maldives
Mongolia
Myanmar
Nepal
Pakistan
Papua N.G
Philippines
Sri Lanka
Thailand
Tajikistan
Taiwan
Uzbekistan
Vietnam

Post-graduate course students output

7. Opportunity for a Master of Technology degree

28. The students who successfully finish their post-graduate course and are interested in continuing with a Master of Technology (M.Tech) degree, the Centre offers the opportunity to do so, in collaboration with Andhra University (AU) in Visakhapatnam, India. To this end, the student has to complete a one-year research project (phase-II) in an application of space science or technology. This project has to be approved by CSSTEAP and AU, and the research is supervised by designated academic staff of CSSTEAP, AU and the institution where the research is carried out. In most cases the one-year project is carried out at the home institution of the student concerned. Since 2004, few meritorious post-graduate students are given fellowships to complete their M.Tech thesis work at CSTEAP or host institutions. To date, 75 post-graduate students (40 in RS & GIS; 13 in SATCOM; 12 in SATMET, and 10 in Space Science) have been awarded M. Tech degrees from 15 different countries.

8. Publications, outreach, and linkages

29. All course materials are published by the Centre in the form of hard-copy lecture volumes and CD-ROMs. The Centre further publishes conference proceedings and other documents, such as general information brochures, course announcement brochures and memoirs marking the end of every post-graduate course. A quarterly newsletter is published regularly and sent to all alumni and to persons and institutions associated with the Centre. Pilot research case studies in the form of student project works showing the potential application of space science and technology in natural resources management, improved meteorological and communications studies etc. in Asia-Pacific region have been accomplished by the Centre.

30. The Centre recently initiated research activities in the form of phase–II post-graduate courses for M.Tech thesis work by selected meritorious students with all the financial support. The Centre maintains a website (www.cssteap.org) showing information on the educational activities of the Centre. The Centre has established international linkages with various organizations, namely the Office for Outer Space Affairs, the International Centre for Integrated Mountain Development (ICIMOD), Committee on Science and Technology in Developing Countries (COSTED), ESCAP, Start Southern Asia Regional Committee (START-SASCOM), Centre for Science and Technology of the Non-Aligned and Other Developing Countries (NAM S&T), Japan Overseas Forestry Consultancy Association (JOFCA), International Tropical Timber Organisation (IITO), World Meteorological Organization (WMO), Third World Academy of Sciences (TWAS) etc.

31. A commemoration function was organized on 8 November 2005 at the National Agricultural Science Centre (NASC), New Delhi, to celebrate the successful ten years of operation of CSSTEAP. A compendium listing achievements and abstracts of all student project work was published. Around 200 participants and guests attended the function. Shri Prithviraj Chavan, MOS, Prime Minister Office, Government of India, representatives from the Governing Board countries, past Directors, Deputy Directors of CSSTEAP, selected past students from each course, current CSSTEAP students, Government of India associated institutes and guests were invited.

9. Future strategy

32. The Centre has completed a decade of its existence and in the coming years has plans to achieve the status of an international centre of excellence in training, education and research. It has embarked on this journey by establishing a vision and long term strategy. This has led to the identification of specific steps to increase visibility of training and education in space science and technology areas, develop an advanced research programme, maintain core staff, requisite facilities and infrastructure, linkages with international programmes, multilateral agencies etc., for Asia-Pacific region-wide research and applications.