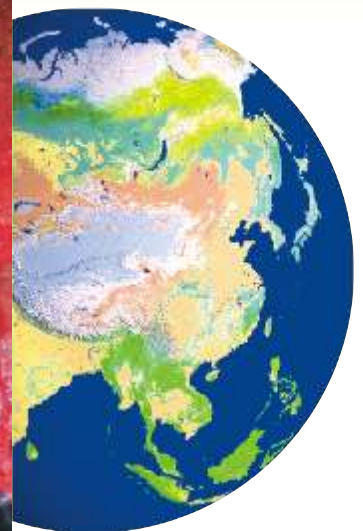
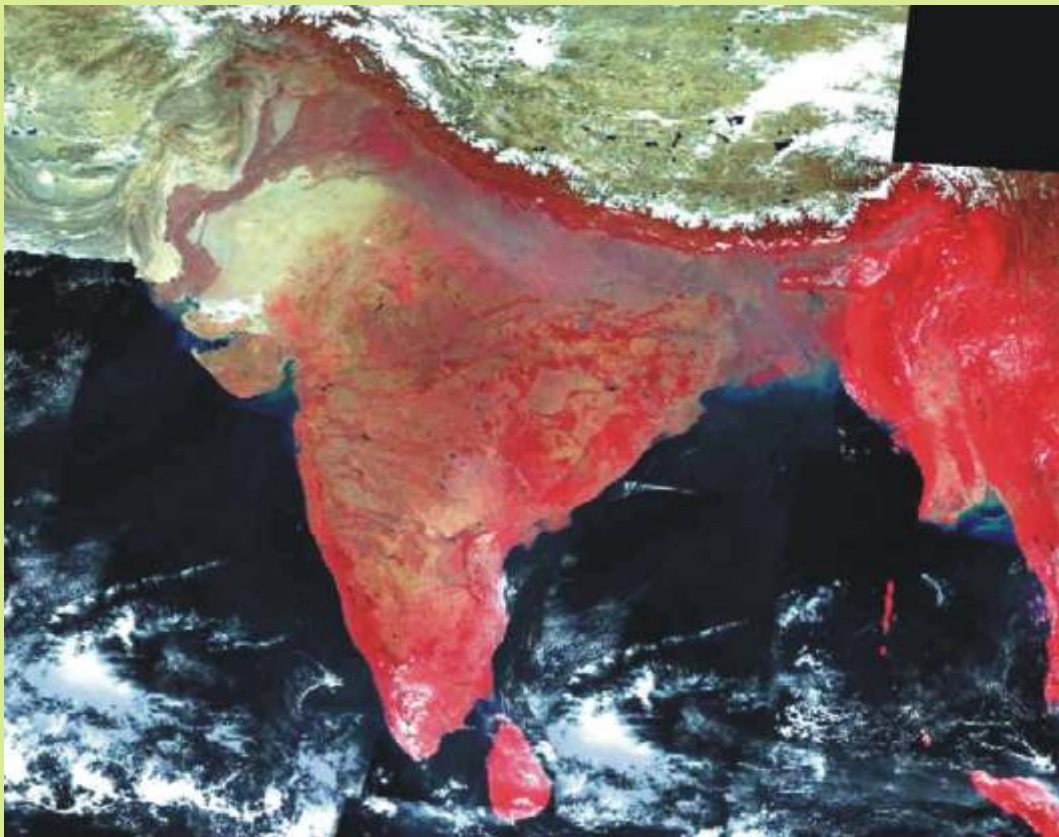




## CSSTEAP - 10 years of capacity building in Asia-Pacific Region



# Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP), Affiliated to the United Nations

*10 years of capacity building in Asia-Pacific Region*

Dr. V. K. Dadhwal  
Director In-charge

## INTRODUCTION

The United Nations General Assembly in its resolution 45/72 of 11 December 1990 and 50/27 of 6 December, 1995, endorsed the recommendation of the Committee on the Peaceful uses of Outer Space (COPUS) that regional centres for space science and technology education should be established on the basis of affiliation to the United Nations in developing countries. A consensus emerged within the international community that if effective assimilation and appropriate application of space technology are to succeed in the developing countries, efforts must be devoted at the regional level for the development of necessary knowledge and expertise in various domains of space technology fields and its applications.

## REGIONAL CENTRES FOR SPACE SCIENCE AND TECHNOLOGY EDUCATION

Under the auspices of the United Nations and through UN-OOSA, four regional centres have been established on the basis of regions that correspond to the UN Economic Commissions : one for Asia and Pacific in India; one for Latin America and the Caribbean (a collaborative enterprise between Brazil and Mexico) and two in Africa (one in Morocco and one in Nigeria)(see table 1). All of these centres are officially affiliated to the United Nations through UN-OOSA. A fifth centre in Western Asia (Jordan) will be established in the future. In addition, a network of collaborating institutions and countries is being

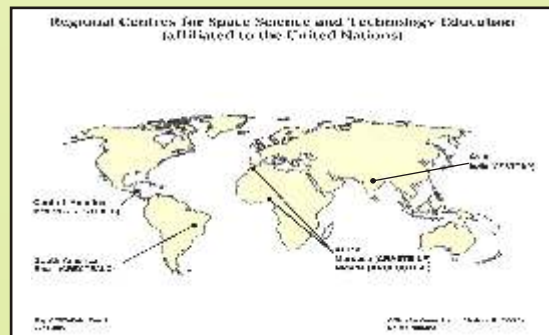


Table 1 : Summary of the Regional centres around world

S.No	Centres	Region	Location	Established
1.	Centre for Space Science & Technology Education in Asia and the Pacific (CSSTEAP)	Asia and Pacific	India	1995
2.	Regional Centre for Space Science and Technology Education for Latin America and the Caribbean (CRECTEALC)	Latin America	Brazil and Mexico	1997
3.	African Centre for Space Science and Technology - in French Language (CRASTE-LF)	Africa (French)	Morocco	1998
4.	African regional Centre for Space Science and Technology Education - in English Language (ARCSSTE-E)	Africa (English)	Nigeria	1998

established in Eastern Europe. These centres use existing facilities and expertise in education and other research institutions that are already extant in their respective regions. Brief description of these centres is provided below while CSSTEAP and its activities and achievements are described in detail in later sections.

### **African Centre for Space Science and Technology in French Language (CRASTE-LE)**

African Centre for Space Science and Technology (CRASTE-LE) in its French language acronym was established on Morocco in 1998. It is based at the Mohammadia school of engineers at the University Mohammed V Agdal in Rabat. Important national institutions such as the Royal centre of Space Remote Sensing (CRTS), Scientific Institute (IS), Agronomic Institute and Veterinary Hassan II (IAV), National Institute of telecommunications (INPT) and Directorate of National Meteorology (DMN) actively support the educational programmes offered by the centre. The governing Board of CRASTE-LF comprises 16 members from 13 countries in the region and one observer from UN-OOSA. The centre has already carried out 6 PG courses and 10 short term programmes. The PG courses were attended by more than 70 scholars from 16 countries in the region.

### **African regional centre for Space Science and Technology Education English (ARCSSTE-E)**

The African regional centre for Space Science and technology Education English (ARCSSTE-E) was inaugurated in Nigeria in 1998. It operates under the auspices of the National Space Research and Development Agency (NSRDA) and is located at Obafemi Awolowo University (OAU) campus, Ile-Ife. The centre's facilities are mainly provided by departments of the OAU and the regional centre for training in Aerospace surveys (RECTAS) which is also located on the OAU campus. ARCSSTE-E has already offered six PG courses and eight short-term programmes. About 30 scholars from nine countries in the region attended the long term courses.

### **Regional Centre for Space Science and Technology for Latin America and the Caribbean- Brazil and Mexico campuses (CRECTEALC)**

The regional centre for space science and Technology education for Latin America and the Caribbean Brazil and Mexico campuses (CRECTEALC) was established in 1997 after Brazil and Mexico signed an agreement recognizing the centre with a campus located in each country. The campus in Brazil benefits from the facilities made available to it by the National Institute for Space research (INPE), a renowned Brazilian research institution in space science and technology. The CRECTEALC (campus Brazil) has already conducted two PG courses and four short-term programmes in RS & GIS. The PG courses have benefited 25 scholars from 10 countries in the region. The Mexican campus is planning to offer its first PG programme during 2005.

### **CENTRE FOR SPACE SCIENCE AND TECHNOLOGY EDUCATION IN ASIA AND THE PACIFIC (CSSTEAP)**

In 1994 a UN team conducted an evaluation mission of six countries in Asia-Pacific region. Based on the report of the evaluation mission, the UN office for Outer Space Affairs (UN-OOSA)

notified India as the host country for establishment of Centre for Space Science & Technology Education in Asia and the Pacific (CSSTEAP). The first of these centres, CSSTEAP was established



CSSTEAP Hqrs, Dehradun

in India for Asia-Pacific region during November 1, 1995 under an agreement signed initially by 10 member countries of the region. The cooperation agreement with the United Nations drawing upon its support was signed during May 1996 and host country agreement was approved by Govt. of India in March 1998.

Under the host country agreement, the Department of Space, Govt. of India has made available facility and expertise to the Centre at the Indian Institute of Remote Sensing (IIRS), Dehradun; Space Applications Centre (SAC), Ahmedabad and Physical Research Laboratory (PRL), Ahmedabad. The Centre's headquarters is located in Dehradun, India, and its programmes are executed by staff of the Department of Space (DOS) at campuses in Dehradun and Ahmedabad. The emphasis of the centre is to concentrate on in-depth education, research and application programmes, execution of pilot projects, continuing education and awareness and appraisal programmes. The centre offers Post Graduate level courses in the fields of (a) Remote Sensing and Geographic Information System (RS & GIS), (b) Satellite Communications (SATCOM), (c) Satellite Meteorology and Global Climate (SATMET) (d) Space and atmospheric science. Towards running these courses, a set of standard curricula has been developed by the United Nations. The centre is affiliated to the United Nations and its education programmes are recognized by Andhra University, India.

Under the host country agreement, the Department of Space, Govt. of India has made available facility and expertise to the Centre at the Indian Institute of Remote Sensing (IIRS),

The mission of the regional centre is to establish national capabilities in developing countries to design and implement education, research and application programmes in space science and technology particularly in the four areas of disciplines.

## CRITICAL ISSUES OF THE ASIA-PACIFIC REGION

There are basically three types of the critical issues in the region (a) on the man and nature interface, (b) on the social horizon, (c) within the individual realm

(a) On the man and nature interface

The centre has identified four critical issues that govern interface between man and nature. They are :

- Sustainable development of the environmental resources
- Protection and conservation of the environment
- Mitigation of natural and man made hazard
- Judicious control of urbanization and industrialization

Asia-Pacific region has been slipping into a complex situation dogged by environmental practices many of which could be unwise and unsustainable. At the same time, it is the region endowed with enormous resources that need to be managed judiciously for posterity. In all respect the region is a mini-world that has every geographic unit bestowed to this planet. Due to this it is fact that the region faces a multitude of hazards that eventually turn into disasters, damaging property and life. Hazards result not only from environmental vagaries, they also result from decision making on development plans from the society. The situation is more compounded by the fallout of rapid urbanization and industrialization. Therefore on the man and nature interface, the Asia-Pacific region experiences the problems of food security and the environmental security.



#### (b) On the social horizon

There are two critical issues on the social horizon as well in the region. These issues are borne out of the need to tackle the problems that exists on the man and nature interface as stated earlier. The two issues are :

- Creation of educated, aware and skilled capacity for effective self reliance
- Need for rapid multiplication of capacity in tune with expanding requirement

The human resource needs to be prepared in view of the multi disciplinary and cross-sectoral nature of global information. The population pressure and the speed of environmental change makes it necessary to multiply the capacity at various levels in tune with the requirement.

#### (c) Within the individual realm

The centre identifies three basic issues within the realm of 'individual'. They are as follows :

- Understanding of contemporary knowledge using the state- of- the-art facility
- Becoming able to define and design experiments and analyse information
- Procure knowledge on sources, interactivity and application of information in the society.

It is clear that individual and intellectual enrichment, clarity on information and good access to facilities are very important critical issues that are closely connected to sustainable development and management of environment and societies.

## OBJECTIVES OF CSSTEAP

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, to 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.

Against this background, the major objectives of the Centre are

- (a) develop the skills and knowledge of university educators, environmental research scientists and project personnel in the design, development and application of space science and technology for subsequent application in national and regional development and environment management.
- (b) Assist educators to develop environmental and atmospheric sciences curricula that they can use to advance the knowledge of their students in their respective institutions/countries.
- (c) Develop skills for satellite communications including those associated with rural development, long distance education, delivery of health services, disaster mitigation, air and maritime navigation and network/linkage of the region's professionals and scientists.
- (d) Assist research and application scientists in preparing space-derived information for presentation to the policy and decision makers in charge of national and regional development programmes.
- (e) Enhance regional and international cooperation in space science technology and applications programmes as envisaged in the strategy and action plan adopted under the Beijing declaration on Space Technology applications for environmentally sound and sustainable development in Asia and the Pacific.
- (f) Assist in disseminating to the general public the value of space science and technology in improving their everyday quality of life



To this end, the Centre organizes :

- (a) post-graduate level courses of 9-month duration in the major disciplines of space science and technology,
- (b) workshops and short-term courses, and

- (c) promotes cooperation in the field of space science and technology among institutions in countries in the Asia-Pacific Region, and with institutions in high-income countries.

## ORGANIZATION AND MANAGEMENT OF THE CENTRE

Ten countries signed the agreement for the establishment of CSSTEAP during a signing ceremony held on November 1, 1995 in New Delhi. As of today, fifteen countries have signed the agreement (Table 2). In addition to providing a formal UN affiliation to the Centre, UN-OOSA extends support in terms of expert advice, technical assistance and relevant documentation. A cooperation agreement was signed between UN-OOSA and CSSTEAP on May 7, 1996.

**Table 2 : Signatory countries**

S.No	Signatory Countries	Members of Governing Board
1.	Democratic People's Republic of Korea (1996)*	Democratic People's Republic of Korea
2.	India	India
3.	Indonesia	Indonesia
4.	Kazakhstan	Kazakhstan
5.	Kyrgyzstan	Kyrgyzstan
6.	Malaysia (1996)*	Malaysia
7.	Myanmar (1999)*	Myanmar
8.	Mongolia	Mongolia
9.	Nepal	Nepal
10.	Philippines (1998)*	Philippines
11.	Republic of Korea	Republic of Korea
12.	Republic of Nauru	Republic of Nauru
13.	Sri Lanka	Sri Lanka
14.	Thailand (2005)*	Thailand
15.	Uzbekistan	Uzbekistan
16.		UN-OOSA (Observer)
17.		ITC, The Netherlands (Observer)

\* year of joining if not November 1, 1995

The Government of India has concluded a Host country agreement with the Centre (The Gazette of India, Regd. No. D.L 33004/99 dated 10 March 2000) by which it has accorded specific privileges and international status to the Centre, similar to the privileges enjoyed by UN specialized agencies. 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.

CSSTEAP is administered by an international Governing Board consisting of representatives of the member countries in the Asia-Pacific Region and representative of the United Nations (UN-OOSA) and the International Institute of Geo-information Science and Earth Observation (ITC) in Enschede, The Netherlands. The technical activities of the centre are guided by an advisory

committee consisting of prominent individuals in the field of space science technology and applications. The Advisory committee consist of experts in the field of RS & GIS, Satellite communications, Satellite Meteorology and Space & atmospheric science, UN-OOSA, CSSTEAP, Centre Directors of DOS, representative from Andhra University. These committees meets once a year in India.

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 the Department of Space, also provides most of the funding for the Centre. Funding for travel grants, tuition fees and scholarships of students of CSSTEAP is mainly provided by the Department of Space, UN-OOSA, the Ministries of Finance and External Affairs of India, UNESCO, the UN Economic and Social Commission for Asia and the Pacific (ESCAP) in Bangkok, Thailand.

Since the inception of CSSTEAP, the Government of India through Department of Space has provided around Rs. 165 million towards the educational programmes and infrastructural development of CSSTEAP. Over the years UN-OOSA has been kind enough to grant around Rs. 5.1 million for CSSTEAP.

The details of the funding agencies over the years for different courses of CSSTEAP are given in table 3.

**Table 3 : Details of the funding agencies for different courses**

**(A) Scholarships/travel grants for all PG courses (not including UN-OOSA)**

Source	RS & GIS	SATCOM	SATMET	SP. SCIENCE
<u>GOI</u>				
DOS	114	47	60	37
MOF (TCS) (T, F <sub>p</sub> )	25	02	03	01
<u>UN</u>				
UNESCAP (T)	42	13	07	-
<u>Intl. Org</u>				
ICIMOD (T)	26	01	-	-
<u>Others</u>	01	09	02	-
<b>Total</b>	<b>208</b>	<b>72</b>	<b>72</b>	<b>38</b>

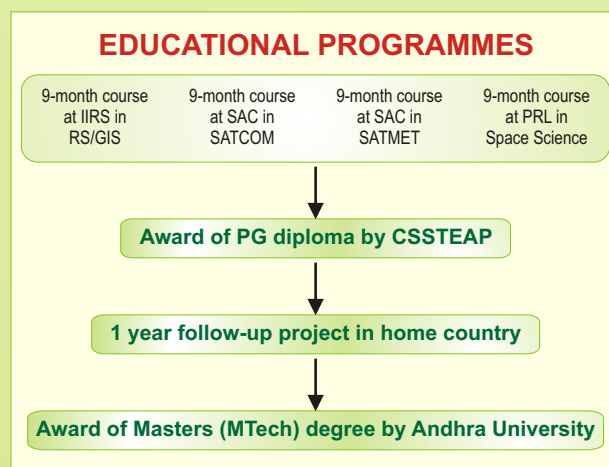
## (B) Scholarships/travel grants for all Short courses (not including UN-00SA)

Source	RS & GIS	SATCOM	SATMET	SP. SCIENCE
<b>GOI</b>				
DOS	33	43	12	28
MEA (ITEC)	26	-	-	-
MOF (TCS) (T, F <sub>p</sub> )	37	09	02	-
<b>UN</b>				
UNESCAP (T)	20	-	05	-
UNESCO	05	-	-	-
WMO	16	-	-	-
<b>Intl. Org</b>				
ICIMOD (T)	-	-	-	-
<b>Others</b>	28	08	06	-
<b>Total</b>	165	60	25	28

Note : T = travel; F<sub>p</sub> = partial fellowship

## EDUCATIONAL PROGRAMMES

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. For each course there are Course Directors who overall guides and frame the programme. There are course coordinators who assists for day to day educational program. At each campus, most of the teaching staff are drawn from the host institution (about 70% of the teaching time). Where desirable or needed, staff is drawn from other DOS institutions, or professional, scientific or academic institutions in India (some 20%) or from institutions or organizations outside India, that is, from the AP Region as well as from Europe, North America or the Pacific (some 10% of the teaching time).



Successful completion of the 9-month PG-phase of the programme leads to the award of a post-graduate diploma by the Centre. The Centre also conducts short-term courses, workshops and awareness seminars for scientists, technologists, teachers, policy-makers, decision-makers, planners, etc. List of the PG courses conducted till date is given in table 4. The centre has conducted 9 short term courses in RS & GIS of different themes with

emphasis on Technology and Applications in Natural Resources and Environmental management, disaster management, biodiversity assessment, agricultural meteorology and sustainable agricultural. Under Satellite communications the centre has conducted 4 short term courses on different themes. In Satellite meteorology two theme based workshop/short term and one in space science has been conducted.

**Table 4 : Total Post Graduate courses conducted by CSSTEAP**

Year	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		

\* Courses are in progress

## Phase-II of the course

For those eligible students who successfully finish their PG course and who are interested in continuing for a Master of Technology (M.Tech) degree, the Centre offers the opportunity to do so, in collaboration with Andhra University (AU) in Visakhapatnam, India. The eligibility criteria and norms are decided by Andhra University. After completing the 9 months PG course the student has to complete a 1-year research project on application of space science or technology. This project has to be approved by CSSTEAP, AU and the home country guide and the research is supervised by designated academic staff of CSSTEAP and the home institution guide. In most cases the 1-year project is carried out at the home institution of the student concerned. Till May 2005 fifty seven of the PG participants have obtained their M.Tech degree.

Considering the fact of lack of infrastructure in terms of expertise and hardware, software, satellite data in continuing the project in phase II in their home country. The GB in its eight meeting recommended to enhance research skills to enhance research skills by introducing additional

fellowships for PG students to complete their one year research project at CSSTEAP for obtaining M.Tech from Andhra University. For the batch of PG course in RS & GIS 2003-04 four meritorious students one each from Azerbaijan, Bangladesh, Kyrgyzstan and Nepal were given fellowships for full one year to carry out their phase-II project at CSSTEAP. As of date they all have submitted thesis for award of M.Tech degree. For the batch of PG course in RS & GIS 2004-05 three scholars one each from Bangladesh, Nepal and Mongolia have been offered fellowships for full one year to complete their M.Tech project. Another six scholars one each from Kyrgyzstan, Myanmar, Nepal, and Uzbekistan and two from Sri Lanka have been offered fellowships in Phase II for 3-6 months period at CSSTEAP-IIRS.

## ACHIEVEMENTS

The centre has played a major role in the development of curricula of various courses which are currently being followed by all the CSSTE's. All course materials are published by the Centre in the form of hard-copy lecture volumes and CD-ROM's. The Centre further publishes conference proceedings and other documents, such as general information brochures, announcement brochures and 'memoirs' for educational courses. 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 students 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. The centre established international linkages with various organizations viz., UN-OOSA, ICIMOD, COSTED, UN-ESCAP, START-SASCOM, NAM S&T, JOFCA, IITO, WMO, TWAS etc.

Till date the Centre has so far conducted twenty one 9-months PG courses: 9 in RS & GIS, 4 each in SATCOM, SATMET and Space Science. The Centre has further conducted 16 short courses and workshops in the past 10 years. These programmes have benefitted some 643 participants from a total of 30 countries of the Asia-Pacific region (including current batch of 12 participants from 6 countries of fifth SATCOM PG Course; 19 participants from 13 countries of tenth RS & GIS PG Course). In addition to this about 26 participants from 16 countries from outside the Asia-Pacific region have also been benefitted.



Mr. Bambang Sudarto, Indonesia, fifth RS&GIS course participant receiving PG diploma certificate from Dr. A.P.J Abdul Kalam (currently President of India)

Recently a survey of past participants with the objective to assess the impact of the knowledge transmitted to the participants and how they are utilizing the knowledge gained at CSSTEAP. Also an impact assessment of the organizations/institutes feedback of the performance of their employees who have done the CSSTEAP courses. The questionnaires were designed separately for participants and organizations and were sent to all till the year 2003 in July/August 2004 and reminders in Feb/March 2005.

While limited feedback has been received from participants and organization combined (5.2% responses in RS & GIS PG, 15.3% in SATMET PG, 4.45% in SATCOM PG courses and in short courses about 5.8% responses). Process for getting responses are continuing. An analysis of the responses indicate that participants feel the knowledge gained is immensely useful and are using in their ongoing professional carrier, day-to-day activities, research projects, etc. Most of them felt that these courses give them wide exposure to all related subjects, update their existing knowledge, development of skills and aptitude. The responses from organizations indicate that the staff who have undergone training are imparting their knowledge to other fellow staff in their institute/university, introducing new syllabus in education curricula and strengthening research application projects.

## THE FUTURE

CSSTEAP plans to establish collaborative projects in education and research in space science and technology with national and regional institutions in the Asia-Pacific region and to stimulate mutual collaboration. These activities may also include the establishment of formal CSSTEAP campuses in the AP Region. In general, CSSTEAP will try to increase its educational and training capacities, increase the number of students from the region, establish collaborative ventures outside India, strengthen its regional and International networks, diversify the funding base of the Centre and encourage more countries to become signatories to the CSSTEAP Agreement, thus increasing the prominence and effectiveness of the Centre and its contribution to sustainable development in the Asia-Pacific Region. It would also try to establish linkages between CSSTE's through exchange of students, facility, educational material, etc. The centre intends to initiate research programme with the aim to position a higher level of image. Expanding the network with various institutions/organizations in the Asia-Pacific countries through web-based education, etc.,

The centre has been serving tirelessly towards the capacity building in the Asia-Pacific region and has significant achievements in the last one decade and with sustained efforts still more is to be achieved. This is only a beginning and I am sure given the rapid pace of space technology advancements there are challenging tasks ahead for us to accomplish in the future. The spirit of learning shown by the international students in these courses have given us strength and a sense of responsibility to march ahead and meet the challenges.

## NURTURING HANDS

The success and achievements of CSSTEAP are largely due to the guidance and vision provided by Chairman GB, Mr. G. Madhavan Nair (from Sep 2003 till date) & Dr. K. Kasturirangan (Nov 1995-Aug 2003). In the formative years CSSTEAP Directors Prof. B.L Deekshatulu (1995-2002) and Prof. Karl Harmsen (2002-2005) provided leadership to shape its policies, programmes and realize CSSTEAP the current heights. CSSTEAP has been fortunate to have received constant encouragement and advise by UN-OOSA. The credit for this achievement must also go to members of Governing Board, Advisory Committee, Director's of host institutions, members of ISRO coordination committee, ISRO headquarters liaising with CSSTEAP and tireless efforts by Course Coordinators, programme coordinators, course coordinators, teaching and research

and support staff of host institutions belonging to DOS/ISRO family (see Annexure-I). In this endeavor the CSSTEAP has also been aided immensely by Andhra University and visiting faculties from many countries.

## Acknowledgment

I am indebted to CSSTEAP headquarters staff and Dr. Yogesh Kant for help in compiling this article.

## Annexure- I

### Chairman GB

1. Dr. Kasturirangan (November 1995 - August 2003)
2. Shri G Madhavan Nair (September 2003 till date)

### Director, CSSTEAP

1. Prof. B. L. Deekshatulu (November 1995 - April 2002)
2. Prof. Karl Harmsen (April 2002 - September 2005)
3. Dr. V. K. Dadhwal (September 2005 till date)

### Deputy Director, CSSTEAP

1. Dr. P. S. Roy (May 2003 - July 2005)
2. Dr. V. K. Dadhwal (July 2005 till date)

### Course Directors

#### RS & GIS

1. Dr. P. S. Roy (March 1996-March 1999)
2. Dr. S. K. Saha (April 1999 till date)

#### SATCOM

1. Dr. (Mrs.) Dipti Rastogi (1997, 1999-2000)
2. Dr. C. Lal (2001-2002)
3. Mr. Rakesh Gupta (2003- till date)

#### SATMET

1. Dr. M. S. Narayan (1998)
2. Dr. P. C. Joshi (2000-2001, 2002-2003)
3. Dr. B. M. Rao (2004- till date)

#### SPACE SCIENCE

1. Prof. H.S.S. Sinha (1998, 2000-2001, 2002-2003)
2. Dr. R.N. Misra & Dr. R. Sekhar (2004- till date)

### Programme Coordinators

1. Mr. S.K. Sharma, at SAC (1997 till date)
2. Dr. R. Sudarsana, at IIRS (1995-2001)
3. Dr. S.K. Saha, at IIRS (2001 till date)