CSSTEAP
PERFORMANCE ASSESSMENT
AND
OUTLOOK FOR THE FUTURE

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

Indian Institute of Remote Sensing Campus,
4, Kalidas Road, Dehradun 248001, India
E-mail: cssteap@iirs.gov.in
Website : www.cssteap.org
CSSTEAP
PERFORMANCE ASSESSMENT
AND
OUTLOOK FOR THE FUTURE

Dr. George Joseph
Director

CENTRE FOR SPACE SCIENCE AND TECHNOLOGY EDUCATION
IN ASIA AND THE PACIFIC (CSSTEAP)
(Affiliated to the United Nations)

September 2009
OUR VISION

Human resource development in the Asia-Pacific region in applying space science and technology for sustainable development of the region, achieved through academic excellence thereby enabling all learners to reach their individual potential.

This Endeavour should result in the development and growth of technically and managerially competent human network, who can use those aspects of space science and technology that could have greater impact on the country’s economic and social development including the preservation of its environment.

The Centre to emerge as a nodal institution in the region which will focus, in addition to education, on specific regional issues of development through close cooperation between the countries, leading to integrated programme of space applications for regional development.

It is our hope that in the years to come, no country in the region will have to look abroad for expertise in Space Science & Technology application, but will find them ready at home.

Dr. George Joseph
Director, CSSTEAP
FOREWORD

The ability of space technology to create wealth and improve the quality of life over broad geographic and economic areas makes it a powerful tool for socio-economic development. Recognizing the fundamental role of space technologies for capacity building in the Asia Pacific Region, the Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP), affiliated to the United Nations, came into existence consequent to the UN General Assembly's endorsement of the recommendations of the UNISPACE 82, on an initiative and with active support of UN-OOSA.

As on date, the CSSTEAP has become an important educational institute to impart training in the applications of space science and technology, which could support national development in various critical areas. CSSTEAP has evolved as a Centre of Excellence. As of now the centre has 862 alumni from 48 countries.

Any growing organization should introspect its past performance, and if found necessary carry out 'mid course' corrections. The centre must look ahead and renew its strategy to cater to the whole Asia-Pacific region to address many of the societal problems. With this in view the 12th Governing Board asked the Director to come out with a vision document highlighting, what is achieved and gap areas. I am happy to note that Dr. George Joseph, Director, CSSTEAP has made a critical analysis, of what the centre has achieved and what needs to be done to improve its performance to meet the goals intended by UN, while conceptualizing to set up the regional centres. As per the decision of 14th Governing Board meeting, this document is brought out as a booklet for wider circulation. I hope this document will help other CSSTEAPs for their future activities.

The Government of India through Dept. of Space is committed to continue to provide technical, infrastructural and financial support to the Centre to ensure the nations of Asia-Pacific region would benefit from the space technology. I solicit all the nations in the region to extend support to the centre and make best use of the opportunities provided.

Dr. G. Madhavan Nair
Chairman, CSSTEAP GB/ISRO
India
PREFACE

During the 12th Governing Board Meeting, Director was asked to prepare a document highlighting the performance of CSSTEAP, gap areas and future directions. A document was prepared, as per the directive. The document “CSSTEAP Assessment of Performance and Outlook for the Future” was circulated during the 13th GB meeting. The document critically analysed the achievements of the centre since its inception, what are the short comings with respect to the goals envisaged by UN-OOSA and future directions/mid course correction. During the 14th GB Meeting held on 9th September 2009 at New Delhi, representative from UN-OOSA suggested that this document should have wider circulation among the member states, to understand how the regional centre is performing. This document is an updated version of the earlier document.

The document first gives in nutshell how the courses are conducted and what the Centre has achieved in terms of throughput. Further it brings out, how much the Centre’s performance meets the UN’s aspirations, while recommending the setting up of the regional centres, as envisaged in various UN-OOSA documents. We have tried also to get some feed back on the selection process of the students, and how the knowledge acquired at CSSTEAP is used back in the home country. It is unfortunate that the facilities offered by the Centre are not fully utilized by all the member countries, as evidenced by the poor response in attending various courses. This should be viewed seriously and remedial measures need to be found out. To make full advantage of the educational and training opportunities provided by the Centre, through the generous support of the host country – India, there should be a concerted effort by each country, to have a national coordinated action in selection of the scholars and also to utilize their newly acquired knowledge when they are back home.

Any growing organization needs to adapt its management structure and its way of functioning taking into account its past experience, present challenges and future expectations. In any organization certain management structure is created based on the need at that time. It is high time to review CSSTEAP management structure keeping in view, what more the Centre should achieve in the future. Some suggestions in this direction are given in this document. I sincerely hope all concerned will give a serious consideration, how all the countries in the Asia-Pacific region can best benefit from the efforts put by the Centre.

George Joseph
Director
## CONTENTS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Introduction</td>
</tr>
<tr>
<td>2.</td>
<td>Educational Programmes at CSSTEAP</td>
</tr>
<tr>
<td>3.</td>
<td>Management of the Centre</td>
</tr>
<tr>
<td>4.</td>
<td>Objectives and Goals of Regional Centres</td>
</tr>
<tr>
<td>5.</td>
<td>Assessment of CSSTEAP Performance with respect to UN guidelines</td>
</tr>
<tr>
<td>6.</td>
<td>Increasing the Outreach</td>
</tr>
<tr>
<td>7.</td>
<td>Awareness Programme for Policy Makers</td>
</tr>
<tr>
<td>8.</td>
<td>Research Programme leading to PhD</td>
</tr>
<tr>
<td>9.</td>
<td>CSSTEAP Satellite</td>
</tr>
<tr>
<td>10.</td>
<td>Selection of Students</td>
</tr>
<tr>
<td>11.</td>
<td>National Advisory Council</td>
</tr>
<tr>
<td>12.</td>
<td>Core Faculty</td>
</tr>
<tr>
<td>13.</td>
<td>How effective is CSSTEAP educational programme in meeting the objectives of UN</td>
</tr>
<tr>
<td>14.</td>
<td>Summary</td>
</tr>
<tr>
<td></td>
<td>Annexure-1 Analysis of CSSTEAP MTech Programme</td>
</tr>
<tr>
<td></td>
<td>Annexure-2 Current Status of Phase II Programme</td>
</tr>
<tr>
<td></td>
<td>Annexure-3 CSSTEAP Distance Education Configuration</td>
</tr>
<tr>
<td></td>
<td>Annexure-4 Analysis of Feedback received from scholars</td>
</tr>
<tr>
<td></td>
<td>Annexure-5 Alumni Back at Home</td>
</tr>
<tr>
<td></td>
<td>Annexure-6 Proposal to have a CSSTEAP Programme Advisory Committee (PAC)</td>
</tr>
<tr>
<td></td>
<td>Annexure-7 Alumni Shares their Experience</td>
</tr>
</tbody>
</table>
Introduction

The benefits of space technology, both direct and indirect, have introduced new dimensions into the study and understanding of Earth’s processes and in improving the quality of life for the people living on it. All countries should have access to space technology and must share the benefits. An essential pre-requisite to fruitfully use these opportunities, is to develop human skills to adopt and adapt the space technology for the societal benefit. In recognition of this, a consensus has emerged within the international community that if effective assimilation and appropriate application of space technology are to succeed in the developing countries, devoted efforts must be made at the local level, for the development of necessary high-level knowledge and expertise in space technology fields. Recognizing this 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. 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 United Nations Economic Commissions: one for Asia and the Pacific in India; one for the Latin America and the Caribbean (a collaborative enterprise between Brazil and Mexico) and two in Africa (one in Morocco and one in Nigeria). All of these Centres are affiliated to the United Nations through UN-OOSA. The mission of the regional centres is to establish national capabilities in the developing countries of the respective regions to design and implement education, research and application programmes in space science and technology.

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 of 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). CSSTEAP was established 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. The emphasis of the centre is to concentrate on in-depth education, research and application programmes, execution of pilot project, continuing education and awareness and appraisal programmes.

Apart from fixed assets such as buildings, equipments and other infrastructure more than 95% of the operational cost of the centre is provided by the host country.
Guest faculty Prof. H. Moellering Ohio University USA delivering lecture

Dr. Latizia Lo Presti Italy, Guest Faculty delivering lecture to students
Educational Programmes at CSSTEAP

The major educational programme of the Centre is the 9 months post graduate diploma programme in the following disciplines

1. Remote Sensing and Geographical Information System (RS&GIS)
2. Satellite Communications (SATCOM)
3. Satellite Meteorology and global climate (SATMET)
4. Space and Atmospheric Science (Space Science)

To carry out these educational programme, CSSTEAP has arrangements with IIRS, Dehradun for RS&GIS course, with SAC, Ahmedabad for SATCOM and SATMET and PRL, Ahmedabad for Space Science.

The RS&GIS PG course is conducted every year since 1996. The SATCOM and SATMET & Space Science courses are conducted every alternate year. SATCOM course starts every odd year, while SATMET & Space Science courses start every even year. Towards running these courses, a set of standard curricula has been developed by UN-OOSA. A Board of Studies has been set up for each course, which after the end of each course reviews the performance and suggests modifications, if found necessary, for the future courses taking into account of the faculty and students feedback and the advancement in the subject. From 2008, we have introduced a ‘Common Module’, to be taught for the participants of all courses. The topics covered are

- Space Science and Meteorology
- Satellite Communications
- Remote Sensing and Geographical Information System
- Space Law

The intention is that all scholars, who pass out of CSSTEAP should have basic understanding (appreciation) of space science and technology other than their own field of expertise.

The 9 month course is conducted in 3 modules each of about 3 months duration. The third module is oriented towards executing a pilot project, which will enable the candidate to apply the knowledge the candidate has gained during the two modules to solve a practical problem. Throughout the programme, the emphasis is to increase skills and knowledge of the candidate to carry out specific task (tasks) which will empower the candidate to apply this knowledge to practical problems back in the home country. As an example the break up of time for various activities during the RS&GIS 9 month course is given in Fig. 1. It can be seen that major time is spent on carrying out practical and project work. The pilot project carried out during the course gives practical training how to carry out a technology/application programme back in their home country. The pilot projects are chosen by the students in consultation with their organization. As an example the number of students gained expertise in each discipline of RS&GIS is given in Fig. 2.
2.1 Conduct of the courses

For each course there is a Course Director, who is responsible for the overall academic programme. He is assisted by a course coordinator, who takes care of day to day activities, including the students’ welfare. The teaching methods include classroom lectures, computer based training packages, laboratory experiments, group discussions, and seminars and field work/case studies (as applicable). Each course participant is provided with a computer and has access to all required application softwares.

The core faculty is from various Indian Space Research Organisation (ISRO) Centres. In addition teaching staff is drawn from various reputed educational/research institutions in India. The faculties have a strong scientific background with long teaching/research experience. A few
lectures are given by scientists from reputed institutions outside India. The performance of the participants is assessed through written and overall examination at periodic intervals. On successful completion of the 9 month course, the centre awards post graduate diploma.

Andhra University, one of the oldest Universities in India, has recognized the CSSTEAP 9 month programme for partial fulfillment of MTech degree. A further one year successful research would award MTech degree to those students who satisfy the admission requirements of Andhra University. The research work can be carried out at the candidates’ home country with co-guides from the organization where he/she works and from CSSTEAP. Since 2004 a few meritorious students are given one year fellowship to carry out the MTech thesis work at CSSTEAP.

The participants are provided with hostel facility with all modern amenities including kitchenette. They can also avail of indoor and outdoor sports facility including a gymnasium.

Soon after the establishment of the centre in 1995, CSSTEAP geared itself to start the academic programmes. The first post graduate (9 months) diploma course on RS&GIS started on April 1996 with 25 participants from 14 countries of Asia-Pacific region. Since then the RS&GIS course is conducted every year at Indian Institute of Remote Sensing, Dehradun. The 13th RS&GIS course with participation of 15 students concluded on June 27, 2009. A total of 263 professionals from 24 countries got benefited so far from RS&GIS PG diploma course. As stated earlier SATCOM course starts every odd year, while the SATMET and Space Science courses start every even year. Table-1 gives a summary of the number of participants benefited till date from all the four PG courses. As seen from the table 519 participants (369 male and 150 female) from 27 Asia-Pacific countries got benefited, of which 405 students are from member countries. Of these 519 scholars 96 have submitted MTech thesis based on the research work carried out on one of the problems of their national interest. Based on the evaluation of the thesis they have been awarded MTech degree by Andhra University, Visakhapatnam. In addition, 75 participants are carrying out research work and are in various stages of completion. (For details refer Annexure-1)

Apart from the 9 month PG courses, the Centre also conducted 20 short courses in various specific themes, benefiting 342 professionals. To summarise as of September 2009, 862 professionals have undergone the educational programme of CSSTEAP. 

Thus, since its inception, the Centre on an average, has imparted education/training to more than 70 professionals per year. This is an impressive record and all the concerned – the host institutional heads, course directors and other supporting staff – need to be congratulated for their dedicated efforts.

2.2 International Recognition

An agreement has been signed between International Institute for Geo-Information Science and Earth Observation (ITC), The Netherlands and Centre for space Science and Technology
<table>
<thead>
<tr>
<th>S.N.</th>
<th>COUNTRY</th>
<th>RS &amp; GIS</th>
<th>SATCOM</th>
<th>SATMET</th>
<th>SPACE SCIENCE</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Azerbaijan</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>2.</td>
<td>Bangladesh</td>
<td>17</td>
<td>8</td>
<td>10</td>
<td></td>
<td>35</td>
</tr>
<tr>
<td>3.</td>
<td>Bhutan</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>4.</td>
<td>Cambodia</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>5.</td>
<td>China</td>
<td>7</td>
<td></td>
<td>1</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>6.</td>
<td>Fiji</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>7.</td>
<td>India</td>
<td>27</td>
<td>14</td>
<td>15</td>
<td>21</td>
<td>77</td>
</tr>
<tr>
<td>8.</td>
<td>Indonesia</td>
<td>12</td>
<td>6</td>
<td>7</td>
<td>1</td>
<td>26</td>
</tr>
<tr>
<td>9.</td>
<td>Iran</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>10.</td>
<td>Kazakhstan</td>
<td>5</td>
<td></td>
<td>11</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>11.</td>
<td>Korea DPR</td>
<td>12</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>24</td>
</tr>
<tr>
<td>12.</td>
<td>Korea, Rep.</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>13.</td>
<td>Kyrgyzstan</td>
<td>13</td>
<td>6</td>
<td>4</td>
<td>1</td>
<td>24</td>
</tr>
<tr>
<td>14.</td>
<td>Lao PDR</td>
<td>7</td>
<td></td>
<td></td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>15.</td>
<td>Malaysia</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>16.</td>
<td>Maldives</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>17.</td>
<td>Mongolia</td>
<td>25</td>
<td>16</td>
<td>11</td>
<td>16</td>
<td>68</td>
</tr>
<tr>
<td>18.</td>
<td>Myanmar</td>
<td>19</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>22</td>
</tr>
<tr>
<td>19.</td>
<td>Nepal</td>
<td>22</td>
<td>18</td>
<td>8</td>
<td>1</td>
<td>49</td>
</tr>
<tr>
<td>20.</td>
<td>Papua New Guinea</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>21.</td>
<td>Pakistan</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>22.</td>
<td>Philippines</td>
<td>8</td>
<td>1</td>
<td>6</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>23.</td>
<td>Sri Lanka</td>
<td>23</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>33</td>
</tr>
<tr>
<td>24.</td>
<td>Tajikistan</td>
<td>2</td>
<td></td>
<td>2</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>25.</td>
<td>Thailand</td>
<td>11</td>
<td></td>
<td>4</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>26.</td>
<td>Uzbekistan</td>
<td>16</td>
<td>5</td>
<td>4</td>
<td>6</td>
<td>31</td>
</tr>
<tr>
<td>27.</td>
<td>Vietnam</td>
<td>20</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>Total Participants</td>
<td>263</td>
<td>92</td>
<td>106</td>
<td>58</td>
<td>519+1*</td>
</tr>
<tr>
<td></td>
<td>Total Countries</td>
<td>24</td>
<td>16</td>
<td>22</td>
<td>13</td>
<td>27+1*</td>
</tr>
</tbody>
</table>

* One candidate from Bolivia (country outside Asia Pacific Region)

**Table-1 Summary of the number of participants for all PG courses**
Education in Asia and the Pacific (CSSTEAP) for exemption for PG diploma holders of the CSSTEAP “Post Graduate Course in Remote Sensing and Geographic Information System”. All PG diploma holders of the CSSTEAP RS&GIS course can get exemptions for two or more modules of the ITC Postgraduate Diploma, Master degree or MSc. degree courses. Individual graduates of the CSSTEAP course applying for an ITC course who request for an exemption on the basis of this agreement, have to submit the CSSTEAP Diploma plus the course record. This allows ITC to check whether the curriculum is still the same as at the date the agreement was signed.

2.3 Some Concerns

The course brochure clearly mentions that the courses are conducted in English language, and hence proficiency in written and spoken English is very essential. The candidates who do not have higher education in English medium are required to provide a certificate to establish the applicant’s proficiency in English. While the candidates provide certificate endorsing his/her working knowledge of English, in actual practice most of them find it difficult to comprehend English. In one of the extreme cases one candidate required an interpreter to answer even simple personal queries.

In order to support students with poor proficiency in English, we conduct evening classes in English by professionals for about 12 weeks. Till they achieve reasonably good working knowledge in English, the candidates will not be able to assimilate fully what is presented during the lecture. This is not a very desirable situation.

In order to ensure that the students get adequate working knowledge of English, we are now informing the selection of the candidates at least 3 months in advance and the candidates are advised to take up special English classes and this is also communicated to the head of the organization who has nominated the scholar. Though this effort did not have the effect as envisaged, a few followed the suggestion.

Another effort we have made is to video and audiograph the lectures and put the same in the computer server. The candidates can repeatedly listen (and see) the proceedings of the classes. The students have informed that this has improved their assimilation of the lecture.

**While we continue these efforts for the students, to get the best out of the courses, the organization and the candidate should take some proactive step to ensure that the scholars have adequate working knowledge of English, before they arrive at CSSTEAP.**

Another issue is the subject knowledge amongst the students. The eligibility required for admission is masters degree in science or Bachelors degree in engineering or equivalent qualification. The knowledge base is highly variable from country to country. Therefore we have to start from fundamentals. The first module primarily deals with fundamentals. If all the scholars have adequate knowledge of the basics, atleast part of time spend in first module could have been used for advanced topics.
Dedicated computer facility for participants

Student in the soil analysis lab
Management of the Centre

CSSTEAP is administered by an international Governing Board (GB) consisting of one representative from each country in the Asia-Pacific Region who have signed the agreement with the Centre (member countries) and representatives of the United Nations (UN-OOSA) and the International Institute of Geo-information Science and Earth Observation (ITC) in Enschede, The Netherlands, as observers. Director of the Centre acts as Secretary to the GB. At present we have 15 member countries viz., DPR Korea, India, Indonesia, Kazakhstan, Kyrgyzstan, Malaysia, Mongolia, Myanmar, Nauru, Nepal, Philippines, Republic of Korea, Sri Lanka, Thailand, Uzbekistan. In case an official GB member finds it is not convenient for him to attend the GB meeting, generally the member’s nominee attends the meeting and participates in the deliberations. Till now we had 14 GB meetings. The number of GB members/nominees who attended various GB meetings is given in Fig. 3.

The technical activities of the centre are guided by an advisory committee consisting of prominent individuals in the field of space science and technology and applications. Such international experts’ involvement was very useful in the initial formative stage of the Centre. Since the system is stabilised it has been decided during the 10th meeting of the Advisory Committee that most of the consultations can be done through e-mail and other modern communication medium and formal meetings need to be held only once in every three years. At this stage the advice required should be from the member countries about their expectations from CSSTEAP, in terms of areas of expertise the scholars should have to tackle their national problems. There is an urgent need to redefine the advisory committee as elaborated in section 11.

---

**Fig. 3.** Year wise participation of member countries in the GB meetings
Host country has set up a Co-ordination Committee, with Additional Secretary, Department of Space as Chairman, to have smooth interface with the Centre and host institutions. The overall organisational chart is given in Fig. 4.

In order to outline a vision for the immediate future, it is essential, first to recapitulate the goals set by UN, while conceiving the regional centres and then to have a critical look at the past performance of the Centre and how it meets the aims set forth by the UN while initiating the setting up of the regional centres.

![Groundtruth collection during field work](image)
Objectives and Goals of Regional Centres

The objectives and goals for the Centres as envisaged by UN are clearly spelled out in various documents of UNOOSA (A/AC. 105/535, A/AC. 105/649, A/AC. 105/703 etc.)

The principal goal of each Centre is the development of skills and knowledge of university educators and research and applications scientists through rigorous theory, research, applications, field exercises, and pilot projects in those aspects of space science and technology that can enhance social and economic development in each country.

That is primarily human resource building in each country, to apply space technology for national development.

To achieve this goal each centre is conceived as an institution that should offer the best possible education, research and application programmes, initially focusing on:

i) Remote Sensing and Geographic Information Systems
ii) Satellite Meteorology and Global Climate
iii) Satellite Communications
iv) Space and Atmospheric sciences.

4.1 Long term educational programme

The major educational programme of the regional centres as conceived by UN expert team is the Post Graduate course covering above themes. Various UN OOSA documents (A/AC.105/534 of 1993, A/AC.105/649 of 1996, A/CONF.184/BP/10 of 1998, A/AC.105/703 of 1998) clearly spells out how this programme should be carried out. All these documents are unanimous in stating that the programme has to be undertaken in two major phases.

4.1.1 Phase I

The Phase-I of the post graduate programme will be at each centre for a period of 9 months. During this period through rigorous theory, research, applications and field exercises, the scholars will gain necessary application skills in his or her chosen area of space science and technology. The centres will follow as a guideline the model curricula generated by UN to conduct the Phase-I course.

4.1.2 Phase II

During the second phase the scholars are expected to make use of the skills and expertise gained during the Phase-I, by carrying out a project of relevance to their country- essentially to apply their knowledge to solve a ‘real life’ problem. The UN education curricula document
(A/AC.105/649) is categorical in stressing the importance of phase-II activity as evident in the following statement.

“No Scholar will have completed the Centre’s programme until the research project has been completed and formally presented to and certified by the centre”.

(Please note the intention of UN is not to award a degree. The research work is a further training for the scholar how to solve a ‘real life’ problem using the education and skills he got at regional centres).

4.2 Short term educational programme

Each centre shall also foster

Continuing education programmes for its graduates, and

Awareness programmes for policy and decision-makers and the general public.

4.3 Data management unit

In addition an integral part of each of the Centers is a data management unit, through which the centres will have direct linkages with existing global data centres.

Keeping the above as benchmark, let us review the performance of CSSTEAP.
Assessment of CSSTEAP Performance with respect to UN guidelines

5.1 PG Diploma course

520 scholars have completed the Phase-I programme since the first course started in 1996. That is about 40 participants per year, which is quite encouraging. The scholars are given lectures by highly experienced and renowned skilled professionals from India and abroad. For on the job training the scholars are given “state of the art” laboratory facilities with all required tools. The curricula itself is being fine tuned periodically based on the suggestions from the Boards of Studies, and the Advisory Committee.

While reviewing the UN recommendation of the curricula of the centre, it is noted that the programme of each centre also requires the scholars to complete an obligatory common assignment, which is the same for all participating scholars. The common module will provide all the scholars with an overview of the observation of the Earth and its environment from space and the use of the data collected in such a process in atmospheric and terrestrial analysis. ‘The obligatory programme will also expose the scholars to the physical principles of remote sensing, satellite orbital characteristics, operational sensors, satellite and ground-based communications, the impact of global positioning satellites on the integration and construction of remote sensing and geographical information system databases and the demonstration of selected environmental applications.’ (A/AC.105/649).

It is observed that there is no module specifically designed to be taught for all the four streams, though they are in some sense distributed in the curricula. **I think it is a good idea to have an organized introductory module for all courses**, so that each participant passing out CSSTEAP will have reasonable familiarity in areas other than his own specialty. This has been implemented since 2008.

**In conclusion I feel the Phase I programme was and is being conducted exemplary well.**

However, out of the 520 participants who underwent Phase I programme, only 96 submitted research reports to the Centre and another 75 are carrying out the research work. The centre has an agreement with Andhra University (AU) to award MTech degree, based on the research thesis and satisfying other criteria set by AU. The country wise details of MTech awarded and the number of years taken for submission is given in Annexure-I. These 96 scholars submitted their research work within 1-5 years. Thus only 171 out of 520 have either submitted thesis or in the process of doing project work. Therefore, **around 67% of the scholars have not followed up with Phase-II research work**. Thus from the originally thought of by UN as a two phase programme, currently the programme has effectively become a 9-month programme, with the possibility to undertake MTech programme to those who desire so, and qualified as per AU norms.

This was a conscious decision taken by AC/GB, due to the poor response to pursue project
activity after the course at CSSTEAP. Background information in this regard is given in Annexure-2.

There could be many reasons for this lapse such as

- scholars may not have adequate facility at the home institution
- scholars might have been moved out of the earlier position
- home institutions may not have adequate budgetary provision to support such activities.
- Lack of interest of the scholars to pursue a specific task
- The scholars might have been considering the follow up research only for getting MTech degree and not obligatory as a part to complete the centre’s educational programme.

(see Annexure 4, for actual feedback from alumni)

CSSTEAP AC/GB members need to consider the future course of action.

The following options are possible:

i) maintain status quo (which I personally feel is not ideal (especially for the RS&GIS Course) for the objective for which regional centres are created)

ii) to admit only those students who are sponsored by the organization agreeing to support one year follow up research work, for the candidates.

*The candidates will be given the diploma certificate only after completing the Phase-II. (At the end of Phase-I, they can be given a letter of having completed Phase-I).*

*However this may end up with only fewer numbers applying for the courses, unless the member countries seriously follow up the sponsorship.* Member countries should take a proactive role to ensure the scholars take up Phase II activity seriously.

If we decide not to make phase II project obligatory, this need to be suitably reflected in the announcement brochures.

*In the 10 AC meeting it was decided to maintain status quo, that is, the research work back home is optional.*

5.1.1 MTech Scholarship

Of the 96 scholars, who completed the MTech programme 78 are from the member countries. Since 2004, in order to encourage bright students fellowship has been given to selected scholars...
to carry out the project work at CSSTEAP. Till now 9 fellowships have been given. Seven candidates have already submitted thesis towards MTech degree, of which four are from member countries. Currently at the end of the Phase-I programme the candidates are selected on the basis of their performance during their 9 month PG Course. The selection is conveyed to their parent organization for their concurrence. Once the concurrence of the parent organization is received the candidate is intimated about award of fellowship by CSSTEAP. The fellowship is for one year, within which the candidate has to complete the research work, thesis and other formalities for submission to Andhra University for the award of the MTech degree.

We may modify the procedure for awarding MTech fellowship so that the awardees make best use of this opportunity to apply the skill learnt through the 9 month CSSTEAP programme for their national development. They should not only choose a problem of interest to their country, but also spend some initial period in formulating the problem, field visit, ground truth collection (wherever applicable) etc. in the home country. This will help the scholar to understand the issues in conducting such studies at field level. This may also induce some motivation for his/her colleagues around him to take up similar activities. This preparatory period will be for a period not less than 3 months. During this period the scholar shall be in contact with the CSSTEAP guide through e-mail, fax, phone etc., to get necessary technical guidelines. (As in the past each scholar will have two guides: a home country guide and a CSSTEAP appointed guide at the host centres conducting the courses). At the end of this period he/she shall submit a report highlighting the work he/she has done and future plans through home country guide. After which depending on the performance of the scholar, he/she will be offered nine months fellowship to do further work at CSSTEAP, during which period he/she does the data analysis, interpretation and thesis submission under the supervision of CSSTEAP guide. Such an approach will not only enhance the scholar’s direct participation in applying space data to tackle a national problem, but also allows more students to get the benefit with the same budget.

Currently only RS&GIS course participants have utilized the fellowship, and is to be extended to other disciplines also.

5.2 Continuing Education

Short courses are conducted for middle level managers to give training in specialized themes. Till date 20 short courses/workshops of duration ranging from 5 days to 4 weeks have been conducted, benefiting a total of 342 participants.

5.3 Awareness Programme

Awareness programme for policy and decision makers are being planned. More details are given in section 7.
5.4 Data Management Unit

Currently IIRS, Dehradun which is the host institution for conducting RS&GIS courses has satellite images covering most regions of India, in various resolutions and for different seasons, which are being used for the training and pilot projects of the PG Course.

At Space Applications Centre, Ahmedabad the metrological data collected by the Indian Satellites and other international meteorological and oceanographic satellites are organized in a data base (MOSDAC, www.mosdac.gov.in), which are available to CSSTEAP scholars. But none of these are linked to global data centres. However, the lack of linking to global databases has not been felt as a hindrance to conduct the courses.
Increasing the Outreach

Since its inception in 1995, CSSTEAP has established a viable system to impart education and training in Space Science and Technology to countries in the Asia-Pacific region. However, the outreach is limited. Though each course can accommodate 20 candidates, we are not able to admit students to the full capacity, because of lack of suitable applicants. This is graphically shown in Fig. 5. We shall analyse the data for RS&GIS, for which maximum scholars have undergone the PG course. The average throughput varies; at the best is about 2 per year (India, Mongolia, Nepal and Sri Lanka) to less than 1 per year. In order to have the impact felt at national level regarding the effectiveness of using space technology to address national problems, each nation requires a minimum number of trained personnel for each discipline. While this ‘critical mass’ requirement varies from nation to nation, it is essential to have the minimum (optimal) number of professional in place at the earliest, who can contribute to national development. Therefore, the throughput of scholars who acquire this specialized knowledge has to be substantially increased.

6.1 Interactive satellite based distance education

One possible solution is to have the lectures via satellite in an interactive mode. Here the lectures from the CSSTEAP lecture room (teaching end) in India are uplinked to a geostationary satellite, then, it can be received over the regions where the transponder ‘foot print’ is covered. The signal is received in the classroom through a VSAT. Teacher-student interaction is vital for proper education. To achieve this, at the end of each lecture session, students can ask questions to the teacher via satellite, or through other means like fax, email etc. Therefore, it is essential that teacher is physically present at the teaching end (and not just the tape is played).

Annexure-3 gives the details of such system with necessary technical details. Here INSAT 4A/4B coverage is taken as an example. The rough budget requirement for a typical tele-education system is also given in the document.

To ensure that the tele-education system meets our end goal of capacity building for national development, the lecture material has to be specially tuned to have liberal practical modules giving step by step approach which the students should be able to perform. Therefore every tele-classroom should have adequate laboratory facility (essentially computers with relevant software and satellite data, wherever required). After every module, there will be an interactive session via satellite which could extend to couple of days where in students has the opportunity to clear their doubts.

For the practical sessions to be effective, it is necessary to have a resource person at each class. The students who have undergone CSSTEAP PG Course could act as local resource person. To find out the practicability and effectiveness of this scheme we may first start with RS&GIS course, for one or two countries.
Since English language, which is the medium of instruction is an issue for students coming from certain countries, this may be first tried in those countries, where higher education is in English.

Fig. 5 Course wise intake of students (all countries)
The following steps are suggested:

1. Select a member country within the coverage area of INSAT-4A/B, who is willing to financially support the programme and can actively participate. The country should get the necessary permissions as per the country and international law to receive and transmit electromagnetic radiation.

2. Generate course content and lecture material, jointly with member countries. Since this can be used for other regional centres also, UN-OOSA may take the lead to get this organized through international experts.

3. Parallely member country should establish the reception and laboratory facilities for the class room.

4. A ‘beta’ version may be run for 1-2 months to identify all bugs before it is declared operational.

*This is feasible only if member countries can provide financial and human resources. It should be a national commitment to be successful.*

### 6.2 Multimedia Kits

In many of the member countries the scholars do not have access to high speed internet connectivity. To have wider reach, lectures with practical demonstrations as a multimedia may be prepared. Since this can be used for all regional centres, it is suggested that UN-OOSA to take the lead and get international experts to get this done. This could be given to all major institutions in the member countries free of cost and could be sold to individuals for a nominal cost. Once this is operational, examinations can be conducted as a first level screening for the selection of candidates for the PG Course at CSSTEAP.

It is needless to say that to have scholars at university level interested in Space Science and Technology, they should be exposed to exciting possibilities of space right from school level. It is recommended that a multimedia kit of higher secondary school level should be made in the local language. (The teachers should get excited about space, so that they can in turn excite their students!). CSSTEAP alumni could contribute to such an effort.

### 6.3 Teaching one and reaching many

To enhance capacity building, another approach is to impart training to teachers and development of teaching methods and materials. There will be definitely a multiplier effect by ‘teaching the teachers’, who in turn pass on the knowledge gained to a larger number of students. This also has the additional advantage that the trained teachers on returning back home country can impart education, if necessary, in their local language. However, this
requires the curriculum and the teaching material to be tuned keeping the specific objective. When such teaching materials are ready one could organize one of the programmes exclusively for teachers.

6.4 Alumni Forum

The best ambassadors to spread the advantages of space science and technology are the alumni of CSSTEAP. Member countries should financially support for organizing seminars/workshops, for all the stakeholders along with CSSTEAP alumni at least once in two years. Such a meet will provide the alumni a platform to exchange their experiences in utilizing the knowledge gained through CSSTEAP and could work out along with other concerned future activities.

THE OTHER SIDE

Though distance education via satellite is an attractive option and found useful with Indian experience, will it be useful for those countries, where the students have limitation of English language, which is the medium of education? Our experience is, even with ‘face to face’ education, the ability of scholars who do not have good working knowledge of English, to absorb the subject from the classroom lectures is matter of concern.

Each country may be having many other programme/initiative for capacity building in space science and technology. Therefore the assumption that throughput from CSSTEAP has to be substantially increased may not be a right assumption. Do member countries have any assessment of the training requirements in their countries in various disciplines of space technology? Probably till a specific demand comes from the member countries, we need not act on topics under sections 6.1 – 6.3.
Awareness Programme for Policy Makers

The ultimate objective of the education and training activities carried out by CSSTEAP should be to apply the expertise gained by the participants at CSSTEAP, for their national developmental activities by making effective use of Space Science and Technology. In practice the implementation of such developmental activities is carried out under various departments (mostly government). Therefore the decision/policy makers should be well aware of the potential and limitations of space technology for their specific areas of work. A workshop can be organized for 5 days specially designed for policy and decision makers, planners and senior executives in the government and other organization who have the responsibility of natural resource management, disaster management, environmental protection and similar activities. This will also be useful for academia to update the syllabus taking into account the potential of space technology. Others who could benefit include NGOs working on various developmental activities, including disaster mitigation.

Such a programme will

- raise the awareness among various stakeholders on the crucial role of space technologies in promoting sustainable development in areas such as natural resource management, environmental monitoring, disaster management, communication and information networking,

- provide a forum where all those involved in various resource planning/management and associated fields could meet to address various concerns of the country/region and how space technology can be used in solving these and the ways to share the available resources and expertise.

- Help to formulate a national plan of action, that will contribute to defining one or more pilot projects to demonstrate the effectiveness of space inputs in managing natural resources, disasters or any other specific area of interest for the nation.

In a nutshell, it is expected that such a programme will enhance national awareness to derive greater benefits from the space technology to achieve goals towards their national development.

7.1 Course Content

The lectures will highlight how space inputs help in decision making/planning for different themes such as:

a) Food Security
b) Water Resources Management
c) Environmental Monitoring and Conservation

d) Space in infrastructure development

e) Space for weather and Ocean forecasts

f) Space inputs for disaster monitoring and mitigation

g) Developmental Communication

h) Positioning and navigation systems

To the extent possible case studies from the region should be presented for each theme. The course content can be fine tuned depending on the country’s specific needs. It is also possible to have live demonstration of tele-education and tele-health.

7.2 Venue

It is proposed to conduct the workshop in the respective member countries for the following reasons.

- If conducted in India for all the member countries, it will not be possible to accommodate more than 2-3 participants from each country.

- Conducting at each country, all the stakeholders at various levels can attend the workshop and will be an excellent platform to formulate future action plan to make use of this technology at local/national level.

- Will give an opportunity to academia to appreciate the need to upgrade their curriculum to ensure the students are trained to take up the new challenge.

- Will give an opportunity to the CSSTEAP alumni in that country to participate in the workshop and based on the expertise gained at CSSTEAP could contribute to execute projects/research programmes.

7.3 Organisation

- Interested member country shall identify a senior level person (who can take independent decision) from a suitable institution to co-ordinate with CSSTEAP.

- All the co-ordination and financing within the country – sending out invitation, supporting the participant’s travel/local hospitality (including that of the alumni of CSSTEAP) shall be the responsibility of the country where the workshop is to be held.

- The member country shall be responsible for getting all the clearance/approval for receiving signal from the satellite to VSAT if tele-education is planned.

- CSSTEAP shall identify faculty, which will include experts from within and outside India.
CSSTEAP will prepare the course material in consultation with the international experts/faculty.

Needless to say that this is a major effort for CSSTEAP and member countries. It should be noted that unlike PG course, where the funding is mostly by host country, to organize the course substantial financial commitment has to come from the concerned member country where the programme is conducted. Equally important is the coordination effort required at the country level. (Section 11) To be practical, an institution is to be identified at each member country, to co-ordinate the activities. This co-ordinating institution should have mandate for such activities and should be financially supported.

*SATMET* students at Satish Dhawan space centre, rocket launch facility

*Space Science students get briefing on the working of the IR telescope at Mount Abu*
International Hostel at Bopal, Ahemdabad

International Hostel at IIRS, Debra Dun

Let’s have some food - Kitchnitte at IIRS Hostel
Research Programme leading to PhD

No educational programme can be sustained without research. Research programme with adequate scientific facilities and ambience attracts brightest minds and thus enriches the society. Research helps one to think logically to approach a problem. Thus independent research promotes self confidence in the scholar to critically analyse a problem and find out best possible solution out of various alternatives. This analytical and critical thinking skills make the scholar a good leader even in areas other than his specialty. The phase II programme of the PG diploma course can be considered as an ‘adaptive’ research. In contrast to this, work leading to a PhD degree is an ‘innovative’ research, wherein the students are expected to discover/apply new knowledge – that is creating new knowledge appropriate to the subject (problem) chosen. Therefore, it is essential to select the right candidate, who has an aptitude for research.

It should be remembered that CSSTEAP should not be construed as an academic institution that gives degrees. The basic motive of setting up regional centres by UN OOSA is that the scholars will contribute to development of their respective countries by applying (providing) inputs from space technology as applicable. Therefore, the choice of the research subject chosen should have relevance to the country’s development and of interest to the candidate. Preference may be given to teachers. A person who has carried out independent research will be able to convey the subject to students in a much better way than those who did not have that opportunity. In general, research helps one to gain a richer understanding of many inter related issues of the subject under study and hence the teacher who takes up research can improve pedagogical practices.

The following guidelines are suggested for selection of candidates for PhD.

1. Initially we would admit those who have acquired MTech from CSSTEAP. Preference may be given to those who are engaged in teaching profession.

2. Since we have maximum number of scholars from RS&GIS discipline, we first start with PhD programme in the area of RS&GIS.

3. The candidate shall be sponsored by their organization.

4. The candidate in consultation with the organization shall select basic area of research.

5. Preliminary study should have already been initiated at the scholars parent organization, so that he/she has sufficient academic background to start the research work.

6. If the students have to make best use of this opportunity they should have good
working knowledge of English. *Therefore only those candidates who have passed internationally accepted test for English (like TOEFL) will be admitted.*

7. The organization shall consider the period of research as on duty and hence the candidate shall get the pay and other privileges associated with his/her job.

8. Age not exceeding 45 years at the time of admission.

9. CSSTEAP to provide suitable stipend for three years (by which time the candidate is expected to submit thesis) and in exceptional cases may support for one more year.

10. To ensure that the scholars after getting the degree do not go to ‘greener pastures’, the respective organization may take suitable guarantee from the students so that they go back and serve the country, for a minimum period.

THE OTHER SIDE

*The PhD programme is suggested since any educational institution to sustain as a centre of excellence should have research activity. However in the context of regional centres we should be very clear, what is expected from these centers. The immediate task should be to train candidates from the member countries so that they can apply space science and technology for the social and economic development of their country. Therefore the emphasis should be on imparting training that is to increase skill and knowledge to carry out specific task (tasks); in other words it is an orientation of how to do a task. However we do not want just ‘black box’ operators, who do not know why they do it, hence it is necessary to educate them with theoretical background. This is precisely what CSSTEAP is doing: - to prepare an individual to be a knowledgeable application scientist. Is it not better to impart training till a ‘critical mass’ is reached? Should we spread thin our resources by starting PhD programme? Is it not better to use the resources to give scholarships to more students to do MTech at CSSTEAP?*
CSSTEAP Satellite
(For the distant future)

The UN document on “Education and Training in Space Science and Technology” (A/CONF.184/BP/10, 1998), among other things, has made the following observation/suggestion “The present areas of education and training in space science and technology, namely, remote sensing, basic space science, satellite meteorology and satellite communication, need to be expanded to cover education and training in the development of micro satellites and nanosatellites”. This suggestion is a good step forward. However, education and training in satellites to be meaningful and effective at the individual (scholar) and national level, the countries, from where the scholars come to participate in the above programme, should have some activities related to building satellite (sub systems) and associated tasks. Why not build a satellite? – ‘CSSTEAP Satellite’.

If member countries are interested to get trained in satellite technology one could jointly plan to build a simple satellite. Countries could develop a set of hardware depending on their technical capability. One could think of a medium resolution multiband camera as the payload. Since amongst the member countries India has the best expertise in space technology, India could configure such a satellite and take the lead. However, the cost shall be shared by all the participating countries. Needless to state the excitement of those contributed to the satellite, when they find their sub system works. In the long run to sustain capacity building we should develop scientific temper especially the excitement of space amongst the younger generations. Such a programme will stimulate technical interest and awareness of the space technology among the younger generation. A detailed assessment is required before one embarks on such a project.

THE OTHER SIDE

Are we moving away from the basic purpose for which the Regional Centres are established? Is the technology skill development expected of Regional Centres? Does member countries have any interest or inclination for such activities? Will the member countries make investments for a technology development programme? These issues need to be critically and objectively addressed, before we embark on such an ambitious programme.
10 year commemoration function of CSSTEAP
Selection of Students

Selection of candidate to attend the CSSTEAP programme is very important to the success of the programme. Currently the announcement of the start of a course is circulated to various organizations of the member countries, alumni, GB, AC members, embassies and is also put on the CSSTEAP web. Interested individuals forward their applications with other relevant documents through the head of the organization and their embassy in India. This is very similar to sending application to any educational institution by an aspiring scholar. (The feedback received from the scholars in this regard is analysed and presented in Annexure-4).

CSSTEAP cannot be considered as ‘another’ institution for getting a diploma or degree. The intention of setting up regional centres is to develop human resource, who can contribute for their national development. No doubt the candidate should have motivation to learn. Equally important is that they should be conscious about their role after completion of the course at CSSTEAP – to act as ambassadors of space science and technology. Therefore, a national initiative may be better.

One possible scenario is

- Each country should establish a local mechanism to identify the training needs in various areas of space science and technology.

- A pool of scholars should be identified for undergoing training at CSSTEAP across various institutions/organization, who are motivated to learn and committed to work for national development.

- The concerned departments recommend such short listed candidates based on the overall training needs.

However, the centre will take the final decision to accept the application.

This has the advantage that such short listed candidates can prepare themselves in advance for undergoing the courses including getting adequate working knowledge of English. One of the ways to have such a coordinated activity is to set up a National Advisory Council (NAC) as given in the next section.
Post Graduate Diploma Convocation procession

Valedictory function - RS/GIS
Each country may set up a National Advisory Council (NAC) for CSSTEAP. The NAC should have representation from

- Departments who can be benefited from the use of space application for their developmental work
- R&D organizations who are engaged in developing technology/applications to apply space inputs for practical applications.
- Higher educational institutions in the area of science and technology

The council shall be chaired by a senior functionary of an organization in the country, which has mandate to promote development and application of space science and technology, to assist in all round development of the nation.

The NAC should have the mandate from the respective government, to co-ordinate the activities related to CSSTEAP within their country and funds should be allocated to this institution for this purpose. Such an organizational structure also signifies the commitment of member countries at government level towards the activities of the regional centres.

Among other things, the NAC could contribute to the following:

- To identify their nation specific training needs and the thrust areas that need immediate attention.
- Set up a mechanism for selection of trainees in their country (from different organizations) and recommend/forward their applications to CSSTEAP to undergo training programme (PG and short courses).
- Ensure the candidates selected by CSSTEAP are given intense training in English language (wherever required).
- Identify developmental issues of that country and formulate pilot projects, to demonstrate the effectiveness of input from space.
- Ensure that the scholars, when returned are given adequate support/facility to conduct one year project work.
- To work with CSSTEAP in evaluation of research thesis.
- Monitor how persons trained at CSSTEAP are utilized and give a feedback to CSSTEAP for corrective action if any.
To build data base of institutions in each member country involved in using space input to support various developmental activities.

To generate a directory of experts in their country in various fields of space science and technology.

NAC may organize alumni meet once in two years, along with their department functionaries to assess how effectively the training could be put to practical use and give feedback to CSSTEAP. (This could be in the form of a national seminar on space applications).

The GB may constitute a Programme Advisory Committee (PAC), consisting of chairperson (or his representative) of the NAC, who will give feedback on effectiveness of the past courses conducted and future training programme to be taken up. PAC is the foundation on which CSSTEAP can perform more effectively, under the overall guidance of GB. It is suggested that PAC may be chaired by UN-OOSA with Dean, IIRS, Dehradun (where CSSTEAP HQ is situated) as Member Secretary. Other members include Director CSSTEAP and Course Directors. PAC brings together from different countries of the region, those who are really responsible for applying space applications in the respective countries, which may also help regional cooperation, which is one of the goals of the regional centres (A/AC.105/749).

*It is recommended that PAC may meet once in two years in one of the member countries. This opportunity should be used to have an alumni meet and a two day seminar devoted to ‘Advances in Space Science and Technology Applications’, including a short session for decision makers.*

Appendix-6 gives the rationale for setting up PAC.

Since setting up NAC has to be done at government level, only UN can take up this issue at appropriate forum – may be COPUOS.

*Establishing such a mechanism fueled by national motivation will enable each country to make best use of the efforts put by the regional centres.*
Core Faculty

The recommendation of the Committee on the Peaceful Uses of Outer Space, which is endorsed by the UN General Assembly states “..... to establish regional centres for space science and technology education in existing national/regional educational institutions in the developing countries” Such an arrangement wherein the centre is part of an existing educational institution has many advantages such as

- Expertise of the existing professional staff and infrastructure, without ab initio building up facilities and looking for expert faculty.
- The participating scholars could be professionally enriched in the company of other students in the institutions.
- The centres can concentrate on academic activities without worrying about routine administrative issue.

However, it is felt, in addition to the existing arrangements additional 2-3 full time faculty for each discipline can enhance student-teacher interaction at various stages. If we plan any activity in addition to what is going on, full time faculty is desirable to carry out the activities. However, this will have additional financial burden on the host country.
Signing agreement between CSSTEAP & ITC

Prof. Hans Haubold of UN-OOSA inaugurating SATNAV, short course
How effective is CSSTEAP educational programme in meeting the objectives of UN

Imparting best possible education is only a means to achieve much broader objective, and not an end in itself. “It should be emphasized that the overall mission of the centres is to assist participating countries in developing and enhancing the knowledge and skills of their citizens in relevant aspects of space science and technology in order that such individuals can effectively contribute to national development programmes.” (A/AC.105/703). There are three partners (other than the scholars) to make this happen – UNOOSA, host country, member countries. To achieve the overall objective each of the players has to make sure that their part is played well.

The preparatory documents made by UN OOSA laid necessary framework in organizing the regional centres. UN OOSA has prepared the curricula for all the four courses making the content of the syllabus at par with best educational institutions. The presence of UN representative in the Governing Board gives a special status to the centre. Their continued financial support through UN OOSA is also to be appreciated. We have now only 15 countries of the Asia Pacific region who are signatories to establish the centre. In fact more than 25% of the scholars are from countries other than the member countries. UN-OOSA could use their good office to persuade other members of the region to join the centre. UN-OOSA could persuade governments to set up NAC.

The physical and laboratory facilities provided by the host country are comparable to the best in the world. The education and training is imparted by very experienced staff. Thus the trainees get the best possible education. Host country apart from providing the infrastructure also contributes more than 95% of the operational cost. I understand the host institution has a budget head under CSSTEAP, which shows the commitment at government level to support the activities of CSSTEAP.

Member countries have to play a very important and crucial role, right from the selection of appropriate scholars for training, to ensuring that they are gainfully employed when they are back home. UN-OOSA documents are very clear in these aspects. The important ones are summarized below:

- For selection of the scholars each country would need to establish a local mechanism for screening its applicants.
- To get the best talent, the entitlements that a participant had before being admitted to the centre will be honoured by the nominating institution/country for the duration of his/her participation in the centre’s programme.

Feedback received from the alumni in this regard is analysed and summarized in Annexure-4.
Of equal importance is the future of the participating scholars in their own countries on the completion of their studies at the centres.

- In order to ensure that appropriate and rewarding employment opportunities exist for these returning scholars, the sponsoring governments/institutions are obliged to sponsor development-oriented activities that will gainfully utilize the newly acquired knowledge and skills of the returning scholars. Thus, the sponsoring government/institutions should provide appropriate infrastructure and undertake requisite preparations and plans for the careers of the returning scholars on a long term basis.

- The sponsoring government is also obliged to guarantee that the returning scholar will remain in such a position with commensurate and progressive remuneration and other entitlement for a minimum period of 3-5 years.

Sections 10 & 11 of this document also give some details how the member countries can proactively contribute to the success of the mission.

‘Bridging the last mile’ by the member country will eventually decide how well the noble intentions of UN translated through UN-OOSA have borne the desired fruits.

The success of the regional centres’ programme should be assessed from the impact the scholar’s education and training have made in their home country. In the past it was suggested that we should get feedback from the past students. Accordingly questionnaires were sent to the past students and their organizations. However the response was very poor. The contribution of the returning scholars will also depend on the infrastructure and opportunities provided to him. Thus assessing the impact of the scholars back home is a complex process. I think no one can make an assessment better than those represent the country. Therefore I request honorable GB members to make an assessment of how the returning scholars have contributed to the respective countries and give that information during the GB meeting. CSSTEAP can give the list of candidates and their address and contact information as available to us.

CSSTEAP have made a set of questionnaire and again sent to alumni. The response is poor. The analysis of the received input is given in Annexure-4.
**Summary**

Some of the major points discussed in this paper are:

- Since inception of CSSTEAP, on an average about 72 scholars per year have undergone various types of training programmes spanning 31 countries. This is quite impressive. However, of the PG Diploma course participants only about 33% of them have undergone phase II programme. Efforts should be made to increase this.

- In order that the programme to be effective at national level, it is necessary to increase the outreach to larger number of professionals (section 6).

- Should we take up PhD programme? Is it not better to use the financial resources for training more people to apply space technology for national development?

- It is recommended to have the awareness programme periodically conducted, in the member countries with initiative and full involvement of the member countries with resource persons from CSSTEAP, other international organisations and member countries.

- Selection of candidates at the country level depending upon the overall needs is very important. For this purpose, it is felt very useful to set up National Advisory Council (NAC) in each country.

Member countries may also consider the suggestions made in the selection of participants mentioned in various UN documents (also refer the analysis of feedback in Annexure-4).

- A Programme Advisory Committee (PAC) may be set up after the formation of National Advisory Council (NAC), to work closely with CSSTEAP as partners for capacity building.

- It is recommended that member countries organize regularly, CSSTEAP alumni meet along with all the stakeholders.

- The possibility of having a few core faculty for each discipline who will be full time employees for CSSTEAP programme is desirable, if the programme has to expand beyond what is carried out today.

- From the feedback received from a limited number of alumni, it appears most of them are contributing to their national programme and found the training offered by CSSTEAP quite useful. However, some systematic evaluation may be carried out by member countries to gauge how effective CSSTEAP educational programmes are in
meeting the objectives of UN.

- CSSTEAP has established itself as an educational institution of excellence with a strong foundation. Honourable GB members contributed to this success, during the formative stage of the Centre. It is time to revisit the management structure. I see urgent need to define/understand who should represent their country as members of Governing Board. What policy decision is expected from the GB members? The Governing Board could consider restructuring the present GB. In my view chairpersons of the NAC should represent their country in the GB, who can advice what their country needs in terms of training and how to implement – that is the policy or the direction the Centre needs! UN need to discuss this in appropriate forum.

- Though Govt. of India is fully supporting all the activities of CSSTEAP, to get a sense of participation the member countries also should make financial contribution, in cash or kind towards the governance of the Centre. This will also give an international flavour to the management of the Centre.
ACKNOWLEDGEMENTS

Some of the suggestions made in the CSSTEAP future strategy document prepared by Dr. Navalgund Committee are found quite relevant and have been used in the preparation of the document. The present document also uses information available in various publications of CSSTEAP. I am grateful to Dr. R. R. Navalgund, Director, SAC and Prof. J.N. Goswami, Director, PRL for critically going through the document and giving very valuable suggestions. I also acknowledge useful discussions I had with Dr. V.K. Dadhwal, Dean, IIRS for the preparation of this document. I am also thankful for Dr. Yogesh Kant for going through the manuscript patiently. The secretarial support of Ms. Meena Jethi and Ms. Shilpi Singh is gratefully acknowledged.

Course participant receiving merit medal

Valedictory function
Valedictory Function

Participants at Forest Research Institute, Dehradun

Students spending time in Library

Students spending time in Hostel
ANALYSIS OF CSSTEAP MTech PROGRAMME

A total of 520 scholars have undergone 9 month PG Diploma course. Of these 96 have been awarded MTech degree by Andhra University (AU) and 75 scholars have expressed interest to carry out research leading to MTech. To understand how the MTech programme has been carried out course wise and country wise the available data has been analyzed and presented here.

All the charts are self explanatory. Particular attention is drawn to Fig. A1.2 of the total 78 MTech awardees from the member countries 39 are from India and 14 are from Nepal. Thus only 25 MTech awardees are from rest of the 12 member countries.

We have also analyzed time taken by the scholars to submit the thesis. It is gratifying to note that more than 70% of scholars have submitted within 2 years (as of now AU requirement is that the thesis should be submitted within 4 years of admission to CSSTEAP). Thus once they have decided to do MTech most of them took it seriously.

However, the basic issue is how to make Phase II activity mandatory, whether the students want MTech degree or not.

Fig A1.1- Course wise number of students received PG diploma (a) & number of students received MTech degree (b)

<table>
<thead>
<tr>
<th>Number of participants for PG courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPACE SC. (59)</td>
</tr>
<tr>
<td>SATCOM (92)</td>
</tr>
<tr>
<td>SATMET (106)</td>
</tr>
<tr>
<td>RS/GIS (263)</td>
</tr>
<tr>
<td>Total = 520</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of PGD alumni who were awarded MTech</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPACE SCIENCE (10)</td>
</tr>
<tr>
<td>SATCOM (20)</td>
</tr>
<tr>
<td>SATMET (13)</td>
</tr>
<tr>
<td>RS/GIS (53)</td>
</tr>
<tr>
<td>Total = 96</td>
</tr>
</tbody>
</table>
Fig. A1.2 Country wise output of total passed out/MTech awarded/MTech in progress
Fig. A1.3  Time period of MTech thesis submission of all course participants
Fig. A1.4  Number of years taken by the students to submit thesis

(?) = Date of thesis submission not available
CURRENT STATUS OF PHASE II PROGRAMME

Phase II

The activities at each Centre was originally planned to be undertaken in two major phases. Phase I will emphasize the development and enhancement of the knowledge and skills of the scholars. In both the physical and natural sciences as well as in the analytical disciplines over a nine-month period. Phase II will focus on ensuring that the participating scholars apply the skills and knowledge gained in Phase-I in their pilot project. The pilot project is to be conducted over a one-year period in the scholars own country.

However, the obligatory Phase II programme of undertaking a pilot project at the home country is not happening. It is useful to recapitulate the background, which lead to this situation.

Going through the records, it is seen the Phase II programme for the scholars have been discussed in Advisory Committee and the present situation has evolved over a period, I give below how the Phase II programme has been made not obligatory over the years.

During the second Advisory Committee meeting held in July 2000 this aspect was discussed and after discussion the following recommendation was made

32.4 “The assessment of the sponsoring agency (mainly for assessing the ability to support 1-year projects) could also be done by incorporating appropriately in the application form.”

From the above recommendation it seems that AC was concerned that many did not take up the one year research work. The recommendation of AC was further discussed by the 5th meeting of Governing Board, as stated below:

39.3 “Need for obtaining firm support from sponsoring agencies for students for one-year project to be taken up by the students in the home country.”

However during the 3rd meeting of AC held in 2001, the difficulty of ensuring the completion of 1 year project was further discussed. The opinion varied regarding the practicability. However the members did feel the usefulness of such a project work, which is amply reflected in the minutes (11.7), part of which is reproduced below:

“Prof. Deekshatulu and Dr. Camacho indicated that the 1 year project was important to reinforce the knowledge acquired by the students. Whether it led to a MTech degree should be seen as a bonus beyond the acquired knowledge.”

However, finally the AC recommended to do away with 1year project, except those who want
to pursue MTech programme, as given below:

34.3 “Concerning the relatively low number of 1-year projects, the Centre must fine-tune a two-tier approach whereby it would offer 9-months Diploma courses while selected candidates will have opportunity of being awarded MTech if they complete the 1-year project. The selection of candidates can be based on criterion of the interest and capability of the student, sponsoring agency’s commitment and facilities/data availability”.

Facilitating the scholars to get the MTech degree should be considered as a motivating factor to do a high quality work (motivation is an essential factor to get the best from an individual). However, the pilot project gives the scholar an opportunity to apply the skills he has acquired during the nine month programme at CSSTEAP to a practical problem of relevance to the country.

After having completed more than a decade, it is worth reconsidering the implementation of Phase II activity, to get the full benefit of the programme to the scholar as well as the country. However, this can be achieved only with the active support and involvement of the home institution.

If we decide to have status quo, it is necessary to reflect in the announcement brochure appropriately.
1. Introduction

Education is a major indicator of human development. It takes the centre stage of any development effort. It is now recognised that distance education is an additional method to provide quality education to a large number of students spread over wide geographical area in a short period of time. Communications technology, particularly, space based communications networks, is a very important component in distance education. Indian Space Research Organisation was working with different technologies on distance education and has recently launched a program of distance education all over India using a dedicated Satellite named EDUSAT. This program covers Secondary and Higher secondary Education at school level and graduate and post graduate education at university level education.

In the Asia Pacific region many countries are having open universities and they are exposed to distance learning method of education. UNESCO through its ICT programme has created general awareness on open and distance learning and training in the Asia-Pacific countries. Considering the satellite coverage availability over the Asia Pacific member countries of CSSTEAP, it is proposed that in addition to its regular in-campus courses, CSSTEAP could also conduct short courses in distance education mode. This section briefly describes the communication configuration and infrastructure required for a proposed CSSTEAP Distance Education System. Only the network configuration and communications resources required are described here. This configuration is not dependent on any specific course content and schedule.

2. Elements of Satellite based distance education

Formal teaching and learning is a real time end-to-end process in a near and closed environment called classroom. When the teacher and the students are separated by long geographical distance and yet real time teaching is required, then both ends are to be separately equipped with display and telecommunications equipment so that students can see and hear the teacher. For effective interaction the teacher also should be able to see as well as hear the interacting students. As the satellite foot print covers a very large geographical area, there could be many such classrooms simultaneously attending a lecture from one teacher.

To educate such a large number of students in a disciplined manner, a teaching session is divided into two parts, lecture session and interactive session.

The lecture session:

In this session the teacher speaks and uses visuals like, he writes on the board or show from the

*Prepared by Mr. Kalyan Bandyopadhyay, Course Director, SATCOM-VI, Space Application Centre, Ahmedabad.
readymade computer made graphics. This audio and video from the teacher need to reach all the class rooms simultaneously.

The interactive session:

In this session following events happen sequentially.

- Students from the classrooms who need some clarification indicate they have queries. This is similar to raising hands in a formal classroom.

- The teacher selects one of the classrooms out of those who have requested for queries. The query and selection is done through the network signalling automatically.

- The student from the selected classroom asks the questions. The audio and video of the student from the selected classroom should reach the Teacher as well as all the other participating classrooms.

- The answer to the query from the teacher in the form of video and audio should reach the classroom that raised the queries. It should also reach all the other participating classrooms to clarify the doubt of any other student having similar queries.

- The above process repeats till the close of the interactive session.

To meet the above flow of information, suitable communications infrastructure including the communications protocols are incorporated in distance education network configuration.

Communication system for satellite based distance education consists of three major elements.

1. Teaching-end
2. Satellite link including the satellite transponder
3. Classroom-end

The Teaching-end consists of earth station and communication equipment and also suitable peripherals and accessories for the teacher to conduct the class. This includes multimedia peripherals. This multimedia signals are sent through a larger earth station called Hub. The Hub also controls the network of Teaching-end and Classroom-end trans-receive equipment through orderly signalling. Generally Teaching-end and Hub are collocated. In some special cases the Teaching-end could be away from Hub which needs a separate link. For CSSTEAP Distance Education configuration, Teaching-end and Hub are collocated.

Satellite transponder provides the communication resource in terms of coverage, power and bandwidth for the required quality of service. Simple teaching is of broadcast nature. But effective learning needs to have two way interactive communications among the teacher and
the participating students. The satellite transponder must provide both broadcast and the two way communications capability from the Teaching-end to multiple Classroom-ends.

The Classroom-end consists of Very Small Aperture Antenna (VSAT) which communicates with Hub. Classroom-end has peripherals like LCD projector/display, camera, microphone, audio amplifier, PC etc. for interaction and storage.

The course materials and related ancillary information, question bank etc. are made available to the students from an ftp and web server located at the Teaching end. These are accessed from the Classroom-end client PCs during the non teaching session using ftp or web access.

A simple satellite based distance education schematic diagram is shown in Fig. 1

![Satellite schematic diagram]

3. CSSTEAP Distance Education Configuration

CSSTEAP Distance education configuration has following elements. The Hub is located at Space Applications Centre, Ahmedabad, India. It consists of a 9m Earth station that can operate with any satellite in the visible arc. The Hub has the necessary signaling equipment to manage the network. The Teaching-end is collocated at the Hub. The main equipment at the Teaching-end are the accessories like, Camera, microphone, white Boards, electronic writing boards and multimedia computers and a server computer containing course material archival.

For demonstration configuration it is planned to use INSAT 4A or INSAT 4B. About 4 MHz bandwidth is required from the INSAT transponder for this system. The classrooms could be located anywhere in the coverage area of the satellite. Each classroom consists of a 2.4m VSAT with classroom accessories like camera, audio system, multimedia PC as client and the LCD projection system. To demonstrate the efficacy of this system a short course could be conducted from the Teaching-end and the Hub located at CSSTEAP, SAC, Bopal campus at
Ahmedabad, India with ten VSAT located at the member countries near the satellite edge of the coverage.

As shown in Fig. 2 the CSSTEAP member countries fully covered by INSAT 4A or INSAT 4B footprint are India, Kyrgyzstan, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand, and Uzbekistan; member countries partially covered are Indonesia, Kazakhstan and Mongolia; member countries not covered are Philippines, DPR Korea, Republic of Korea and Nauru. Some of the important features that are beneficial to the CSSTEAP for this distance education network are,

- This system could be used for awareness generation courses and refresher courses at the member countries.
- It can address larger group of participants using multiple classrooms.
- No need for all the participants to travel to CSSTEAP campuses in India. Only the participants for exhaustive longer term education need to attend CSSTEAP in-campus courses.
- Evaluation can be conducted live.
- Computer based simulation and software based practical exercises can also be conducted.

![Fig.5 Course wise intake of students (all countries)](image)
using access to server at Hub.

- With additional satellite resources more than one course can be conducted simultaneously.

Indicative Satellite transponder requirement and cost estimate is given below.

**Satellite:**
- **INSAT 4A / INSAT 4B**
- Band of operation: C band
- Transponder Bandwidth: 3.5 MHz (including forward & return link)
- Transponder power required: 25 dBw
- Transponder cost: $90 K per year

**Hub at Teaching-end:**
Cost of Hub Earth station is not included as it is assumed to be available at SAC, ISRO, Ahmedabad, India

**Other equipment required at Hub for this purpose:**

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modem &amp; signaling units</td>
<td>$18.2 K</td>
</tr>
<tr>
<td>PC, video conf. accessories etc.</td>
<td>$9.1 K</td>
</tr>
<tr>
<td><strong>Total for Hub equipment</strong></td>
<td><strong>$27.3 K</strong></td>
</tr>
</tbody>
</table>

**Classroom-end:**

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSAT (2.4m Antenna &amp; 2 WRF ODU)</td>
<td>$3.8 K</td>
</tr>
<tr>
<td>IDU (Modem)</td>
<td>$1.6 K</td>
</tr>
<tr>
<td>PC, Projector, camera and other peripherals</td>
<td>$3.0 K</td>
</tr>
<tr>
<td><strong>Total per classroom</strong></td>
<td>$8.4 K</td>
</tr>
<tr>
<td><strong>Cost for ten Classrooms</strong></td>
<td><strong>$84 K</strong></td>
</tr>
</tbody>
</table>

Mains power, Room and Furniture are assumed to be available at VSAT locations.

It should be noted that in this proposal INSAT is taken as an example. Any other satellite having similar characteristics could be used for this network. Before setting up a VSAT system, permission needs to be taken from the local wireless regulatory authorities.

4. Conclusion:

This section shows the technical feasibility to provide CSSTEAP short courses in satellite based distance education mode to member countries. In this section the communications configuration of CSSTEAP Distance Education system is addressed. The local regulatory permission is required for VSAT installation where the Classroom-end is to be set up. ISRO could be approached to provide bandwidth from the INSAT system and infrastructure required at the Teaching-end and some Classroom-end free of cost. This system will definitely benefit the students to avail CSSTEAP courses while staying in their home country and without the need to travel to India.
LINK BUDGET ESTIMATE
FOR CSSTEAP NETWORK THROUGH INSAT

Network Parameters

Forward Link
  Rate = 2 MSPS
  Modulation = QPSK
  Hub Antenna Size = 9.3 M
  VSAT G/T = 18 dB/K

Return Link
  Rate = 512 KBPS
  Modulation = QPSK
  VSAT Antenna size = 2.4 M

Satellite transponder requirement
  Total required Bandwidth = 3.5 MHz
  Total required EIRP = 25 dBW (approx)

Requirement at Classroom-end

- Room (size depends on number of students) with clear visibility of sky to the south from roof top for erecting the antenna
- Mains power: 230V, 50 Hz, 5A
- UPS (1 KVA)
- VSAT with suitable ODU as per the link requirement
- L-band IDU with LAN port
- LAN switch
- One Table for Indoor Hardware (6 x 3 x 3 ft)
- PC (Pentium IV with minimum 128 Mb RAM and Windows 2000 or higher version)
- Microphone
- 20 watt speaker (depends on the size of the room)
- PTZ camera
- LCD projector for Video
- VLC software and Osprey card for PC interface
ANALYSIS OF FEED BACK RECEIVED FROM SCHOLARS

In order to improve the selection process we have sent (in 2007) a few questionnaire to about 300 scholars outside India who have passed out of PG Diploma course. We have received response from 109 scholars, including those undergoing current courses.

Figure A4.1 gives the distribution of the response received. The response received has been analyzed as two sets – (i) from member countries other than India, (ii) outside member countries. It should be remembered that the number of respondents are very few, the statistical accuracy is low. However, they are definitely indicative of certain trends. Though, the charts are self explanatory, some highlights are given below.

1. How did the scholars come to know about the course? (Fig. A4.2)

CSSTEAP past students seem to be our best ‘ambassadors’. Scholars’ department and CSSTEAP alumni account for 70% of the information dissemination channels (A few have indicated multiple sources). In the past we have been sending to our alumni, copies of the brochure. In order to enable them to easily transmit the information to their friends in the future, in addition we shall send soft copies via email, which they can forward to potential applicants.

2. The type of organization scholars come from. (Fig. A4.3)

Most of the scholars come from government organizations followed by universities.

3. Who took the initiative to depute them to CSSTEAP. (Fig. A4.4)

About 2/3 cases department took the initiative to nominate them which is a welcome sign.

4. Whether the scholars are provided salary during their deputation to CSSTEAP. (Fig. A4.5)

Of the respondents about 50% did not get the salary. Are we loosing some good scholars since they do not want to leave the family without any income? These aspects need to be critically evaluated and corrective measures, if necessary to be taken. Fig. A4.6 gives organization wise, those who were not paid salary.

More than 85% of the scholars joined back to their parent organization after completing the course. (Fig. A4.7)
Fig. A4.1 Year wise (a) & country wise (b) distribution of the feedback received
(All countries other than India)

From Your Department 40% (52)
Through Circular 13% (16)
CSSTEAP Past Students 31% (39)
CSSTEAP website 10% (12)
CSSTEAP Publication 6% (7)
Total = 126*

(Member countries other than India)

From Your Department 37% (35)
Through Circular 11% (10)
CSSTEAP Past Students 34% (32)
CSSTEAP website 12% (11)
CSSTEAP Publication 6% (6)
Total = 94 *

(Other than member countries)

From Your Department 53% (17)
Through Circular 19% (6)
CSSTEAP Past Students 22% (7)
CSSTEAP website 3% (1)
CSSTEAP Publication 3% (1)
Total = 32 *

* Some students have given multiple inputs

Fig. A4.2 – Source of information regarding the PGD courses
* Information not available from one candidate

Fig. A4.3  – Type of organization from where scholars have been deputed
14 scholars didn’t answer to this question

Fig. A4.4 Who took the initiative to depute you to CSSTEAP?
Fig. A4.5 Scholars who didn't get salary during their deputation to CSSTEAP (Country wise)
Fig. A4.6 Scholars who didn't get salary during their deputation to CSSTEAP (Organization wise)
Fig. A4.7 After completion of PGD, did you join the same organization?
ALUMNI BACK AT HOME

The success of the regional centre’s programme, depends on how effectively the returning scholars utilise the knowledge acquired back home for their national development. The impact of scholars’ input in their national programme depends on many factors and can be assessed only by the respective countries. Though this aspect is often discussed in the GB meetings, no inputs have been received. We have made an effort by sending a set of questionnaire to all the alumni. Out of 520 alumni to whom the questionnaire was sent via email, 208 bounced back because probably the contact details we have may be obsolete. We presume that the rest 312 did receive the questionnaire. Of these only 45 responded. Course wise break up of the response required is given in fig. A5.1 and Fig. A5.2 gives response received countrywise. The received data is analysed and given in the Fig. A5.3 – A5.7. The major highlight is 38 out of the 45 respondents are involved in research, teaching or carrying out application projects. This is heartening though the conclusion is based on the response received from less than 10% of alumni. More than 90% of the respondents felt that the usefulness of the CSSTEAP course is excellent or very good.
Fig. A5.1 - Course wise response received

Fig. A5.2 Country wise response received
Fig. A5.3  Current job responsibilities of the alumni

Fig. A5.4  Number of alumni, who receive further training after completion of their course
Fig. A5.5 The number of students who could not complete MTech (a) and the reasons for not pursuing (b)
Fig. A5.6  The problems faced by the alumni in applying the knowledge gained at CSSTEAP in their organization

Fig. A5.7  The overall assessment of the alumni regarding the usefulness of CSSTEAP course for their national development
Having fun in the river Ganges

Celebrating Holi festival
A PROPOSAL TO HAVE A CSSTEAP PROGRAMME ADVISORY COMMITTEE (PAC)

Background

1. The main bodies which guide the activities of the Centre are
   • Governing Board – which is the overall policy making body
   • Advisory Committee – which provides advise to the governing board on all scientific and technical matters, particularly on the centre’s education curricula, and consists of experts in the field of space science and technology.

The terms of reference of the Advisory Committee are

• Guiding the technical programmes of the Centre – specifically with reference to the conduct of the education courses. As part of this, the Advisory committee will evaluate and review the course curriculum, laboratory/field exercises for the courses, project definition for the courses, faculty for the courses, criterion for selection of candidates etc.

• Evaluating the courses. The Advisory Committee will also design and suggest Post-course evaluation mechanisms and feed back mechanisms from students and faculty for implementation by the Centre. Based on the evaluation, the Advisory Committee can suggest technical and organizational improvements for the courses.

• Advice the Centre in establishing technical facilities – establishment of computing environments, laboratories, computerized education aids etc.

• Address all issues of coordination of the Centre with other agencies/institutions – in terms of facilities linkage, exchange of personnel and faculty, manpower support, etc. The Committee may address this issue – both in the immediate and long-term perspective, keeping in mind the overall programmes of the Centre. In this context, the Advisory Committee may also suggest about the linkage of the Centre to Universities and recommend on the procedures to be adopted.

• Any other matter – referred to by the Governing Board from time to time.

2. The goals of the Regional Centres are clearly spelt out in the UN OOSA document A/AC. 105/649 as

   “Thus the principal goal of each Centre is the development of skills and knowledge of university educators and research and applications scientists, through rigorous theory, research, applications, field exercises, and pilot projects in those aspects of space science and technology that can enhance social and economic development in each country.”
Thus the ultimate objective is that the education shall lead to social and economical development in each country. The education and training imparted should not be taken as an end in itself but a means to meet the end goal of the development of the respective countries of the scholars.

3. The quality of imparting education and training by any academic institution primarily depends on the quality of FACULTY and FACILITY available. Both of these are as good as any other academic institutions involved in similar activities. What criteria we can adopt to judge how excellent is the performance of the Centre?

In the case of a research institution the indicator to judge its scientific output could be – number of publications, weighted by the ‘impact factor’, number of discoveries/inventions etc; for an institution involved in technology development could be number of patents. To find out similar indicators which are realistic and meaningful for regional centres is difficult.

Even to assess the end goal – social and economic development of the member countries – due to the education and training of the regional centres is not possible, since application of space technology is only one (but important) of the many means leading to the development of a country.

Probably the next best we can assess is - are we imparting training to the right people? (It is presumed that the scholars when they go back are properly utilized). In order to understand this, we analysed the information available from feedback received and our database. Some of the salient features are:

- 70% of the scholars get the information from scholar’s department and our alumni (a few have indicated multiple sources). Thus our alumni are our best ambassadors. However, this has a drawback since most of the participants from a country come from the same 2-3 institutions. This may be because there is no national effort to sponsor candidates to CSSTEAP.

4. We should take into account the experience of more than a decade in managing CSSTEAP. In the formative stage Advisory Committee played an important role in ensuring that the quality and quantity of academic programme is commensurate with international standards. Once the syllabus, training methods and materials are finalized, it is not necessary to review every year and suggest modifications. We should also realise the ‘ground’ reality, how much can be taught in nine months considering varying academic level of the scholars (and also the poor English standard of many students). This is not an excuse not to expose them to the latest development and its application potential in space science and technology. We still definitely require such an expert committee reviewing and advising the regional centres, periodically - may be once in every five years.
5. In order that the educational programme is effective to realize the goal of setting up the regional centres, the centre should be contributing for capacity building at national level. That is, every (most) department/organization which has a major role to play in using space application for national development should have trained people. Therefore the question is, is this happening? If not what mid-course correction can be taken. One of the major hindrances for such an analysis is that there is no information of such institutions from any country. We have analyzed how member countries have made use of the opportunity available for PG Course in RS&GIS. Table A6.1 gives number of scholars attended the course from member countries and the number of organizations participated from each country. Though we have conducted 13 courses (14th is on), all countries have not fully utilized the opportunity. Only six countries (excluding India) have 12 or more participants. We have analyzed distribution of participation, organization wise and the distribution of the training received for various themes through pilot projects. A few typical cases are described below:

From Nepal 22 scholars participated from 12 organisations. It is seen that they have been trained in all six disciplines (Nepal is land locked and no interest in marine sciences) (Fig. A6.7). In the case of Sri Lanka, the 23 scholars though come from 14 organisations, they have not covered all the disciplines. 45% of the scholars are trained in just one discipline (Fig. A6.9). Indonesia with 12 scholars from 7 organisations has missed training in two important disciplines i.e. forest and environment and water resources (Fig. A6.1).

Another important aspect is the type of organization from which they are deputed. In the case of Kyrgyzstan of 13 participants ten are from academic institutions (university) and only 3 from line departments (Fig. A6.4). While there is no participation of scholars from universities from Indonesia and DPR Korea (Fig. A6.1 and A6.3).

It is seen that the number of organizations participated from the member countries varies from 4 to 16. Participation from larger number of organizations in a very general sense, is an indicator that the training imparted has been used for different themes (assuming each organization has some core area of competence). To have a ‘sustainable’ human resource development there should be a good mix from universities, line departments and R&D organizations. Analysis shows that this also varies from country to country - no representation from universities to predominantly from universities. In most of the cases the participants seem to predominantly come from 2-3 organisations. We could make the following broad conclusion that, the fruits of the training provided by CSSTEAP are not reaching across the country and in all potential areas, where space technology can make contributions to national development.

6. In order to alleviate the problem cited above each country may set up a National Advisory Council (NAC) for CSSTEAP. The NAC should have representation from

- Departments who can be benefited from the use of space application for their developmental work
- R&D organizations who are engaged in developing technology/applications to apply space inputs for practical applications.
- Higher educational institutions in the area of science and technology.

Among other things, the NAC shall be, responsible for

- To identify their nation specific training needs and the thrust areas that need immediate attention.

- Set up a mechanism for selection of trainees in their country (from different organizations) and recommend/forward their applications to CSSTEAP to undergo training programme (PG and short courses).

- Ensure the candidates selected by CSSTEAP are given intense training in English language (wherever required).

- Identify developmental issues of that country and formulate pilot projects, to demonstrate the effectiveness of input from space.

- Ensure that the scholars, when returned are given adequate support/facility to conduct one year project work.

- To work with CSSTEAP in evaluation of research thesis.

- Monitor how persons trained at CSSTEAP are utilized and give feedback to CSSTEAP for corrective action if any.

- To build data base of institutions in each member country involved in using space input to support various developmental activities.

- To generate a directory of experts in their country in various fields of space science and technology.

NAC may organize alumni meet once in two years, along with their department functionaries to assess how effectively the training could be put to practical use and give feedback to CSSTEAP. (This could be in the form of a national seminar on space applications).

This council shall be chaired by a senior functionary of an organization in the country, which has mandate to promote development and application of space science and technology, to assist in all round development of the nation. (I presume that each member country has such a national organization set up by the respective governments.
The NAC shall be set up by the respective governments, with suitable terms of reference, so that NAC has certain legitimate authority. If NAC has to be effective they should be financially supported by the government (my personal conviction is – any responsibility without authority and financial support will be blessed with failure!). Establishment of such an institution also reflects the importance given by the government for making best use of the regional centres’ human resource development programme in the area of space science and technology. (It also emphasizes the political will to make space technology as an integral part of overall strategies for national development).

7. The GB may constitute a Programme Advisory Committee (PAC), consisting of chairperson (or his representative) of the NAC, who will give feedback on effectiveness of the past courses conducted and future training programme to be taken up (Fig. 6). PAC is the foundation on which CSSTEAP can perform more effectively, under the overall guidance of GB. It is suggested that PAC may be chaired by UN-OOSA with Dean, IIRS, Dehradun (where CSSTEAP HQ is situated) as Member Secretary. Other members include Director CSSTEAP and Course Directors.

PAC brings together from different countries of the region, those who are really responsible for applying space applications in the respective countries, which may also help regional cooperation, which is one of the goals of the regional centres (A/AC.105/749).

*It is recommended that PAC may meet once in two years in one of the members countries. This opportunity should be used to have an alumni meet and a two day seminar devoted to ‘Advance in Space Science and Technology Applications’, including a short session for decision makers.*

Since setting up NAC has to be done at government level, only UN can take up this issue at appropriate forum – may be COPUOS.

*Establishing such a mechanism fueled by national motivation will enable each country to make best use of the efforts put by the regional centres.*
<table>
<thead>
<tr>
<th>S. N.</th>
<th>COUNTRY</th>
<th>RS &amp; GIS</th>
<th>Number of Organization Participated</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>India</td>
<td>27</td>
<td>15</td>
</tr>
<tr>
<td>2.</td>
<td>Indonesia</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>3.</td>
<td>Kazakhstan</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>4.</td>
<td>Korea DPR</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>6.</td>
<td>Kyrgyzstan</td>
<td>13</td>
<td>9</td>
</tr>
<tr>
<td>7.</td>
<td>Malaysia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Mongolia</td>
<td>25</td>
<td>16</td>
</tr>
<tr>
<td>9.</td>
<td>Myanmar</td>
<td>19</td>
<td>10</td>
</tr>
<tr>
<td>10.</td>
<td>Nauru</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Nepal</td>
<td>22</td>
<td>12</td>
</tr>
<tr>
<td>12.</td>
<td>Philippines</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>13.</td>
<td>Sri Lanka</td>
<td>23</td>
<td>14</td>
</tr>
<tr>
<td>14.</td>
<td>Thailand</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td>15.</td>
<td>Uzbekistan</td>
<td>16</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Total Participants</td>
<td>193</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Countries</td>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

Table - A6.1 - Country wise participation of organization in RS & GIS course from member countries

Communication Antenna - facility for SATCOM participants

INSAT/KALPANA MET Data receiving Antenna
Fig. A6.1· Organization wise participation from Indonesia (a)
Theme wise pilot project carried out by participants (b)

Discipline wise abbreviations:

ARS & GIS = Advance RS & GIS
AS = Agriculture & Soils
FE = Forestry & Ecology
GS = Geosciences
MS = Marine Sciences
WR = Water Resources
UR = Urban
Fig. A6.2 - Organization wise participation from Kazakhstan (a)
Theme wise pilot project carried out by participants (b)
Fig. A6.3 - Organization wise participation from Korea DPR (a) and Theme wise pilot project carried out by participants (b)
Fig. A6.4 - Organization wise participation from Kyrgyzstan (a) and Theme wise pilot project carried out by participants (b)
Fig. A6.5 - Organization wise participation from Mongolia (a) and Theme wise pilot project carried out by participants (b)
Fig. A6.6 - Organization wise participation from Myanmar (a) and Theme wise pilot project carried out by participants (b)
Fig. A6.7 - Organization wise participation from Nepal (a) and Theme wise pilot project carried out by participants (b)
Fig. A6.8 - Organization wise participation from Philippines (a) and Theme wise pilot project carried out by participants (b)
Fig. A6.9 - Organization wise participation from Sri Lanka (a) and Theme wise pilot project carried out by participants (b)
Fig. A6.10 - Organization wise participation from Thailand (a) and Theme wise pilot project carried out by participants (b)
Fig. A6.11 - Organization wise participation from Uzbekistan (a) and Theme wise pilot project carried out by participants (b)
Having some extra curricular activities
ALUMNI SHARES THEIR EXPERIENCE

In CSSTEAP newsletter we have a column titled 'Alumni Speaks'. Under this the alumni shares with us his/her experience at CSSTEAP and how they have used the knowledge gained at CSSTEAP back home. We present here a few of the feedback received.

Please check this should be "SHARE"
Dr. Myint Myint Khaing
Lecturer/ Head
Remote Sensing Department
Mandalay Technological University
Mandalay, Myanmar

RS&GIS Course Student (2002-2003 Batch)
Email: drmkkhaing@gmail.com

After successful completion of my PG Course in 2002-2003 under the CSSTEAP Programme in India, I continued my Master Course and PhD course successively and successfully. I was awarded PhD degree from University of Computer Studies, Yangon, Myanmar. My PhD thesis title is Ocean observation for fishery forecast using Remote Sensing & GIS technology.

Later, I was appointed as Deputy Director of Remote Sensing Center, under the Ministry of Science and Technology. I could share my educational knowledge and technical skills gained from CSSTEAP for my country not only in intra-governmental training programme but also for the routine works of our department such as, feasibility studies in natural resources management, mineral exploration and site survey and mapping of infrastructure buildings.

I am currently a member of the technical committee of the national project ‘Delineation of the outer limit of the extended continental shelf’, as a RS & GIS expert. I am also serving as project co-ordinator of two activities taken up by my country. One project is on ‘Establishing a benchmark for assessing the radiological impact of nuclear Power activities on the marine environment in the Asia-Pacific region’, wherein remote sensing technique are being utilized for the assessment of the coastal zone and inner shallow marine shelves of Myanmar to aid the monitoring of the contamination of radionuclides, and dispersion pattern of contaminated radionuclide. The other project is study on ‘Extent of transfer of nuisance organisms in South/SE Asia region by shipping’ to assess on the coastal zones by remote sensing for the classification and delimitation of the study areas, tracking the inversion pattern and dispersion pattern of the nuisance species. I also have been presenting research papers in number of scientific meetings.

Recently, our Center is restructured into the Remote Sensing Department, as a constituent of Mandalay Technological University and I am the Head of the Department. Now we have Postgraduate diploma degree program on RS and GIS and MSc program is under planning. Moreover, I impart my knowledge to new recruits in our Center and hands-on training programme of RS and GIS technology by giving lectures and practical.

I would like to stress that the educational knowledge and skills that I gained at CSSTEAP surely benefited not only to me but also contributed to the development of my country as well.
Thank you very much for the invitation to contribute for the Alumni speaks column in CSSTEAP newsletter. Of course this is really a wonderful opportunity for me to share my experience at CSSTEAP with others. During the period of stay at CSSTEAP, I not only got sufficient knowledge in space science but also fulfilled a life long ambition to visit India. I visited and enjoyed a lot of impressive museums, places, uncountable things. I met excellent professors and very active classmates from many other countries. I gained much from CSSTEAP for my professional, language and career opportunities. The course at CSSTEAP helped my career growth, since after CSSTEAP I was admitted to study at National Tsing Hua University for PhD in my professional field, Wireless communications, under Taiwan government scholarship from 2007. I was also invited to become a principal candidate for next year Fulbright Science and Technology Award of USA from Mongolia.

My English language has also improved very much, as is evident from the impressive high TOEFL score, ibt 113, on 28th February, 2009. I wrote one book namely “TOEFL/IELTS preparation self study book for intermediate level people” in 2006 in English language. I wrote the first edition of my professional book in 2004. This was “Data Communication and Computer Network Technologies” which has 386 pages. The second edition of the professional book, two series books (first, Fundamentals of Computer Network, data transmission technologies, second, Computer Network Technologies) is under preparation to republish very soon. Since the graduation of CSTEAP, I have been writing one more book (“Fundamentals of Wireless communications and Space Science Theory”) in my professional field including space science and is about to complete.

I also try to do good contribution in my professional field via my students, research papers and professional jobs. These few examples show the improvement of my career, professional and English language proficiency as result of education at CSSTEAP.

My paper of PG thesis using signal processing in Satellite communication from CSSTEAP was presented in the national young scientists conference in 2007, in Mongolia, and published in national recognized scientists journal.

The CSSTEAP education not only helps the participants to enhance their own knowledge and experience but also a valuable contribution for their home countries through the participation of the scholars back at home.

I am really happy with the satellite communication course and all associated activities of the course. I especially thank director of CSSTEAP, all professors, and engineers, staffs who helped us during the course period wholeheartedly to enhance the development of Asia and the Pacific Region.

Thank you once again for your kind invitation.
Mr. Saraj Gunasekera  
Head, Space applications division  
Arthur C Clarke Institute for Modern Technologies  
Sri Lanka

Space Science Course (2004-2006 Batch)  
Email: saraj@accmt.ac.lk saraj@accmt.ac.lk

It is my great pleasure to share with you some of my thoughts and memories of being a participant of the 4th Postgraduate course in Space and Atmospheric Science of CSSTEAP.

I graduated from the University of Colombo with a B.Sc. Special Degree in Physics in 1994 and later joined Space Applications Division of the Arthur C Clarke Institute for Modern Technologies (ACCIMT) in Sri Lanka as a scientist in 1995. I was assigned to initiate astronomical activities with the 45cm Cassegrain optical telescope facility at ACCIMT. I was provided with a training opportunity at the Besei Astronomical Observatory in Okayama, Japan, in 1996. On return home, I initiated basic research in astronomy in collaboration with the University of Colombo. Our first research paper was published at the annual sessions of the Sri Lanka Association for Advancement of Science (SLAAS) in 2002.

In 2004, I was given an opportunity to be a participant of the 4th Postgraduate course in Space and Atmospheric Science of CSSTEAP, which was conducted by Physical Research Laboratory (PRL), one of the most prestigious academia in India. This was the first time that I had to study, share and care with colleagues from countries of different cultures and different walks of life. I must say, we had many more things in common to share despite of our cultural differences.

The PG course in Space and Atmospheric Science at PRL is very comprehensive and well structured. This course has a very wide scope and has been designed to cover all most all the fundamentals in atmospheric and space science during its 9 months time span. Unlike the present day cheap mushrooming PG courses all around, PG courses of CSSTEAP has an extensive practical component which help course participants understand how the theories learned in the classroom are applied in pragmatic scientific problems.
The theoretical components of this course have been incorporated with practical components through laboratory experiments and field visits. The two field visits, rather educational tours, that we took part during our stay in India were kept indelible memories in our lives. Through the educational tours we were not only exposed to the technical achievements of India but also to the proud historic cultural legacy of India.

Being a person engaged in astronomy the time I spent at solar observatory in Udaipur and IR observatory at Mt. Abu. during our educational tours was very valuable for me. The exposure that I had at these two observatories help me a lot profile our research work in astronomy on return to Sri Lanka. In fact, I have chosen my pilot project in astronomy and continued my project work under the supervision of my kind teachers at Thaltej. There I was able to be familiarized with reducing and analyzing spectroscopic data using powerful software package called IRAF.

The knowledge and experience that I gained during this course also facilitated me to complete several collaborative research projects with Sri Lankan universities in recent times. I have presented the work that I competed for my pilot project at the UN/ESA/NASA workshop held in Tokyo, Japan in 2007. My colleague scientist and I have also done a study on B type emission line stars and presented our work at the same workshop held in Bulgariya in 2008. For the first time in Sri Lanka, we observed a few novae (Nova scorpi 2007, Nova Sagittari 2007) through our telescope and presented our work at the same workshop in Korea in 2009.

I believe that participating in CSSTEAP courses not only help shape up one's career path but also help develop the institutional capabilities by effectively passing down the one's knowledge and exposure gained during the course to fellow scientists.

Finally, I took this opportunity to convey my gratitude to my teachers at PRL who work hard to broaden our horizons and to give maximum out of the course. I would also like to express my thanks to CSSTEAP for considering me for their PG course and inviting me for an alumni talk which I consider as a privilege given to me.

Saraj Gunasekera
Head of Space Applications Division
Arthur C Clarke Institute for Modern Technologies
Sri Lanka
Mr. S.R. Jayasekera
Dy. Director in charge
National Meteorological and Early Warning Centre
Sri Lanka

SATMET Course Student (1998 batch)
Email: jsiriranjith@yahoo.com

I completed the SATMET PG Diploma Course with distinction in 1998 and was eligible to continue for the Master of Technology. Andra University awarded me the MTech degree in year 2001. At present I am working as the Deputy Director in Charge of National Meteorological and Early Warning Centre. Supervising the duties of National Meteorological Centre, Met offices at Airports, Responding for queries and media inquiries, Attending to WMO & ICAO work, Liaison with disaster management institutes, Impart the knowledge in training activities are my responsibilities.

It is a great pleasure to dream about the life spent at SAC (Satellite Application Centre), in Ahmedabad in 1998. The staff of the SATMET course gave me excellent knowledge while the colleagues were overwhelming me with memorable companions. One way we enjoyed the time celebrating the birthdays, Navarathris and Deevalis, participating in study tours to remarkable places. On the other way it was not only a Remote Sensing Course but also a Masters degree programme in Meteorology which gave a thorough knowledge about Tropical weather like Monsoons, Cyclones, waves and about Modeling and climate.

The knowledge gained by me was conveyed not only to the Meteorologist but also to the officers from various discipline like Pilots, Air Traffic Controllers, Dispatchers, Navy officers and University Students in their training programme in Meteorology.

Both the theoretical and practical knowledge helps me always in duties as the in charge of early warning centre and as the liaison officer with the disaster management institutions.

I with my other four alumni’s in the Department of Meteorology, Sri-Lanka would like to wish CSSTEAP and the SAC a great success.

Sririranjith Jayasekera
SATMET Student 1998 batch
Email: jsiriranjith@yahoo.com
Advisory Committee meeting in progress

Participants of 7th Advisory Committee meeting
Governing Board meeting in progress

Governing Board members during meeting
CSSTEAP Headquarters, Dehradun

IIRS Campus, Dehradun

PRL Campus, Ahmedabad

SAC Campus Bopal, Ahmedabad

Indian Institute of Remote Sensing,
P.B. No. 222, 4, Kalidas Road,
Dehradun 248 001
E-mail: cssteap@iirs.gov.in
E-mail: cssteap@gmail.com
Website: www.cssteap.org

Space Applications Centre,
SAC Bopal Campus (Technical Area),
Bopal Post Office,
Ahmedabad 380 058
E-mail: cssteap@sac.isro.gov.in
Website: www.sac.gov.in

Physical Research Laboratory
Navrangpura,
Ahmedabad 380 009
E-mail: director@prl.res.in
Website: www.prl.res.in