Capacity Building Towards Space Based Disaster Risk Reduction in Asia Pacific: 2006-2016

(Affiliated to the United Nations)

Dr. Arijit Roy and Dr. A. Senthil Kumar

Center for Space Sciences and Technology in Asia and Pacific
Indian Institute of Remote Sensing
Indian Space Research Organization

www.cssteap.org
Email: cssteap@iirs.gov.in
ISRO’s contribution to Sendai Framework for Disaster Risk Reduction

- **Communication**: Satellite (INSAT) based Emergency Communication Systems
- **Satellite Data**: Bhuvan - International Disasters
- **Capacity Building**
Indian Institute of Remote Sensing

Transfer of technology through Capacity Building & Research in RS & GIS technology and Application

Caters to ISRO’s initiatives in
- Natural Resource Survey
- Earth and Atmospheric Sciences
- Disaster Management

**National Needs**

- Regular PG courses; Certificate courses; Decision makers courses and Tailor made courses
- International Programme (MEA – ITEC/SCAPP Sponsored Courses)
  More than 500 participants from 79 countries

**International perspective**

- Hosting CSSTEAP Headquarters & supporting its activities
- Conducting RS & GIS Educational Programs (PGD/M.Tech. & Short Courses)
- Interface with other ISRO Centres, UN offices, etc. to conduct its academic programmes.
CSSTEAP Objectives and Goals

... objective is to strengthen the existing national / regional educational institutions in the developing countries in the field of space science and technology to enhance the societal benefits.

- Increasing knowledge and understanding in Space Science & Technology
  
  ... developing skills and knowledge of university educators and research and application scientists through rigorous theory, applications, field exercises and pilot projects in those aspects of space science and technology...

- Building/Enhancing national and regional capacity

- Socio-economic development, regional cooperation, support to international programmes

- At the behest of UN General Assembly, UNOOSA and Government of India signed an agreement in 1995 to establish Regional Centre for Asia Pacific Region

- CSSTEAP became the First Regional Centre for Space Science and Technology Education in the World established in 1995 by UN-OOSA
CSSTEAP Headquarters and Host Institutes

Centre Campuses, Host Institutes and Courses

Indian Institute of Remote Sensing, Dehradun
RS & GIS
Disaster Risk Reduction
Small Satellite Missions

Space Applications Centre, Ahmedabad
SATCOM, SATMET, GNSS & NAVSAT

Physical Research Laboratory, Ahmedabad
Space & Atmospheric Sciences

ISRO Satellite Centre, Bengaluru
Small Satellite Missions

CSSTEAP Hqrs., Dehradun
CSSTEAP GB-2014
Meets once every Year

CSSTEAP AC-2015
Meets once in three years
Training Programmes

- Post Graduate Courses (9 months) – announced 4-5 months
- Short Courses (4 days to 1 month) – announced 2-3 months
- Masters Degree (9 month Post Graduate Course + One year research in home country)
- Ph. D. - facilitates advance research and analysis

**Funding: Government of India support**

- International and domestic to & fro travel for all courses.
- Fellowships to all the participants (long and short courses)
- Book and Project allowance to all the participants
- Health care, insurance, etc.

**UNOOSA - international travel for RS&GIS Courses**

UNESCAP, UNDP, ICIMOD, IWMI, SAARC, ITC, etc.
## Training Programmes – Short Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RS&amp;GIS</strong></td>
<td>Theme specific</td>
</tr>
<tr>
<td></td>
<td>4 weeks every year (IIRS, Dehradun, UNOOSA, UNSPIDER, UNDP &amp; UNESCAP, IWMI, SAARC DMC)</td>
</tr>
<tr>
<td><strong>Satellite Navigation &amp; Positioning Systems</strong></td>
<td>4 weeks every year from 2012 and now every other year (Space Application Center, Ahmedabad)</td>
</tr>
<tr>
<td><strong>Small Satellite Missions</strong></td>
<td>15 days every year from 2012 (ISRO Satellite Center, Bengaluru/ IIRS, Dehradun)</td>
</tr>
<tr>
<td><strong>Open Source Geospatial Tools</strong></td>
<td>4 days occasional (IIRS, Dehradun)</td>
</tr>
</tbody>
</table>

- **Duration**: 4 days to 4 weeks duration
- **Target Audience**: Middle level managers & professionals having 5-10 years experience in relevant field
- **Funding**: Fully funded either by DOS/GoI, UN Agencies or SAARC
- **Faculty**: Core Faculty from ISRO/DOS from IIRS, SAC, PRL, ISAC and National and International subject experts
Research Facilities

Satellite Data Archives & Instrumentation Facility

• Map & Image Library (archives of Satellite Data, Topographical Maps, Aerial Photographs, Thematic maps, etc.)

• Ground-truth equipments (Spectroradiometer, Geodetic & hand-held GPS, Total Station, Photogrammetric Cameras, GPR, Soil, water & vegetation parameters measurement instruments)

In-house Labs

• DIP, Photogrammetry & GIS Labs

• Soil & Water Analysis Laboratory

Field facilities

Flux towers, AWS, Sensors for geophysical monitoring
Achievements (last 10 years)

Total: 992 (49 AP countries*)
- 427 from PG courses
- 565 from short courses

No. of PG Courses conducted:
- RS & GIS – 10
- SATCOM – 05 (OY)*
- GNSS – 01 (OY)*
- SATMET – 05 (EY)*
- SAS – 05 (EY)*

No. of Short Courses conducted:
- RS & GIS – 21
- SATCOM – 01
- NAVSAT – 03
- SAS – 01
- SSM – 04
Special Short Courses on DRR
Special Programmes with UN Agencies

On Going...............  

• **Disaster Damage and Loss Assessment in Natural Heritage and Cultural Sites using Geospatial Techniques:** **Sep 11 to Oct 02, 2016 jointly with UNESCO, C2C**  
  **24 participants from 11 countries**

**Highlights:**

- First of its kind course incorporating 2 different aspects.
- For the first time impact of disaster on natural and cultural heritage
- 5 internationally renowned guest faculty
- Educational visit as well as lectures in various natural and cultural heritage sites
<table>
<thead>
<tr>
<th>Special Short Courses on DRR</th>
<th>Special Programmes with UN Agencies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Application of Space Technology for Disaster Risk Reduction</strong> &lt;br&gt;April 9 – May 4, 2012  &lt;br&gt;• 27 participants from 17 countries  &lt;br&gt;• Funded by UNOOSA/UNSIPDER, UNESCAP</td>
<td><strong>Flood Risk Mapping &amp; Modeling and Assessment using Space Technology</strong> &lt;br&gt;July 22-26, 2013  &lt;br&gt;• 19 participants from 11 countries  &lt;br&gt;• Funded by UNOOSA/UNSIPDER, UNESCAP and IWMI</td>
</tr>
<tr>
<td><strong>Sub-regional training on development of Geo-referenced Information Systems for Disaster Risk Management</strong> &lt;br&gt;26-29, August 2013  &lt;br&gt;• 16 participants from 9 countries  &lt;br&gt;• Funded by UNESCAP</td>
<td><strong>Short course on ‘Earth Observation for Disaster Response, Recovery and Preparedness’ for Bhutanese Officials</strong> &lt;br&gt;April 13-17, 2015  &lt;br&gt;• 19 Participants from Bhutan  &lt;br&gt;• Organized by CSSTEAP, UNDP and UNSPIDER at IIRS, ISRO, Dehradun  &lt;br&gt;• Funded by UNDP Bhutan</td>
</tr>
<tr>
<td><strong>Geospatial Technologies for Coastal &amp; Marine Disaster Management &amp; Climate Change</strong> &lt;br&gt;May 4-31, 2015  &lt;br&gt;• Conducted jointly with UNESCAP  &lt;br&gt;• 19 participants from 10 countries</td>
<td></td>
</tr>
</tbody>
</table>
Short Courses on Disaster Management / Risk Reduction
Conducted by CSSTEAP/IIRS for Asia Pacific region

  18 participants from 12 countries

  16 participants from 09 countries

- High Resolution Aerospace Image Analysis for Geo-hazard Assessment: 2010  
  18 participants from 6 countries

- Application of Space Technology for Disaster Management: 2010  
  14 participants from 10 countries

- RS&GIS Applications for Coastal Hazards Mitigation & Sustainable Development for Pacific countries: 2011  
  11 participants from 5 countries
Overall Achievements

**Total: 1614 (49 AP countries*)**

- 803 from PG courses
- 811 from short courses

* 16 countries from outside AP region

**PG Courses conducted:**
- RS & GIS – 19 (Every year)
- SATCOM – 09 (OY)
- SATMET – 09 (EY)
- SAS – 09 (EY)

**Short Courses conducted:**
- RS & GIS – 26
- SATCOM – 05
- SATMET – 02
- SAS – 01
- NAVSAT – 03
- SSM – 04

- M.Tech. degree Awarded – **131** from **16** countries
- During the year 2014-15: **07** participants were awarded M.Tech degree f(3-RS&GIS, 2-SATCOM, 1-SATMET, 1-SAS)
- CSSTEAP Merit fellowship awarded: **21** participants (RS&GIS) & **02** Participants (SAS) since 2004.
- Two alumni from Nepal did Ph.D. research work at IIRS, Dehradun under guidance and supervision of IIRS faculty.
- M.Tech fellowships for the year 2015-16, 1-India, (RS/GIS) & 3-India (SAS) have been awarded.
- Course participants are publishing research findings in Journals & National/Intl. symposia.

<table>
<thead>
<tr>
<th>Course</th>
<th>M.Tech. Awarded</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS &amp; GIS</td>
<td>64</td>
</tr>
<tr>
<td>SATCOM</td>
<td>34</td>
</tr>
<tr>
<td>SATMET</td>
<td>17</td>
</tr>
<tr>
<td>SAS</td>
<td>16</td>
</tr>
</tbody>
</table>

---

No. of Participants

- RS/GIS: 495
- SATCOM: 379
- SATMET: 142
- SAS: 151
- NAVSAT: 97
- SSM: 74

---

No. of M.Tech. Awarded

- India: 53
- Nepal: 22
- Sri Lanka: 9
- Bangladesh: 9
- Myanmar: 7
- Indonesia: 6
- Vietnam: 6
- Mongolia: 5
- Iran: 3
- Kyrgyzstan: 4
- Uzbekistan: 2
- Azerbaijan: 1
- Bhutan: 1
- Korea: 1
- Thailand: 1
- Algeria: 1
Student Projects in Disaster Detection and Risk Mitigation

2014 & 2015

Close range Photogrametry for urban Disaster Aplication
Marzhan Shaimerdenova, Kazakhastan

Agriculture drought risk assessment using Remote sensing and GIS
Altannavch Magsarjav Mongolia

Integration of Satellite Remote Sensing and Geophysical Methods for Landslide Characterization at Kalimath, Garhwal Himalaya, India
Dilhani Jayalath, Srilanka

Landslide Susceptibility Mapping and Debris Flow Modelling in a part of Tons Valley, Uttarakhand, India
Chathuri Nadeesha Subasinghe, Srilanka

Structural and tectonic analysis for slope stability and landslide studies in Yamunotri region, India
Manuchehr Baydulloev Otambekovich, Tazikistan
Future Directions
Crowd Sourcing

Damage Assessment During Kedarnath, Disaster, Uttarakhand, India - 2013

Requirements

- Need for rapid and large volume of data collection
- Geospatial platform for data repository and analysis (including QC)
- AI based algorithms for tagging disaster risk from random crowd sourced data

Damage Assessment During Nepal Earthquake - 2015
EDUSAT Based Outreach Programs

- IIRS has initiated its interactive distance education based capacity building under IIRS outreach programme in the year 2007, wherein over 35,000+ students and researchers from 470+ universities/institutes across the country have been trained in the field of geospatial technology.

- This was accomplished through ISRO's communication satellites, satellite interactive terminals and A-View software.

Courses Completed

<table>
<thead>
<tr>
<th>Basic Course on RS, GIS &amp; GNSS (12 weeks)</th>
<th>Advance Courses (4 Weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module 1: Remote Sensing and Digital Image Processing</td>
<td>Applications of RS&amp;GIS for NRM</td>
</tr>
<tr>
<td>Module 2: Geographical Information System</td>
<td>Microwave (SAR) Remote Sensing for Natural Resources</td>
</tr>
<tr>
<td></td>
<td>Open Source GIS (February-March, 2011)</td>
</tr>
</tbody>
</table>
IIRS launched e-learning based certificate courses
Under Distance Learning Programme

Registrations are open from 15th August 2014 onward

http://elearning.iirs.gov.in

Following courses are available under IIRS e-learning programme through Internet using NKN connectivity.

Four (04) months duration:
- Comprehensive certificate course on Remote Sensing and Geo-information Science.

One (01) Month Duration certificate courses on:
- Fundamentals of Photogrammetry and Cartography.

Target Groups:
- State and Central Government Ministries and Departments.
- Geospatial Industries.
- PSU/entrepreneurs / NGO.
- Students and Researchers.
Passing Out

Alumini Meets

Nay Pyi Taw, Myanmar
March 22, 2012

Field Work and Facility visits

Thimpu, Bhutan
November 15, 2011

Cultural Exchange
Questions?

Acknowledgements: IIRS, SAC, ISAC, PRL Teams

Thank You for Your Kind Attention