

The background of the slide is a photograph of a person in a dark suit and white shirt, holding a globe of the Earth. The person's hands are visible, and the globe is the central focus of the image.

Capacity Building Activities @ ISRO: Challenges and opportunities

A. Senthil Kumar
Director, IIRS/CSSTEAP

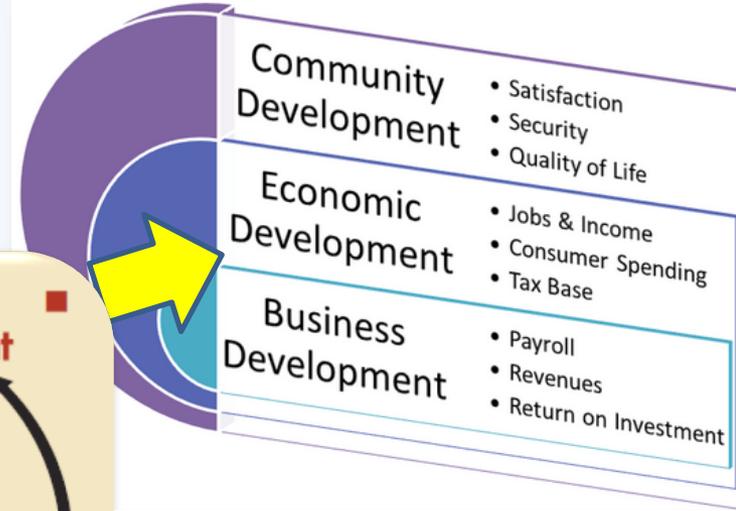
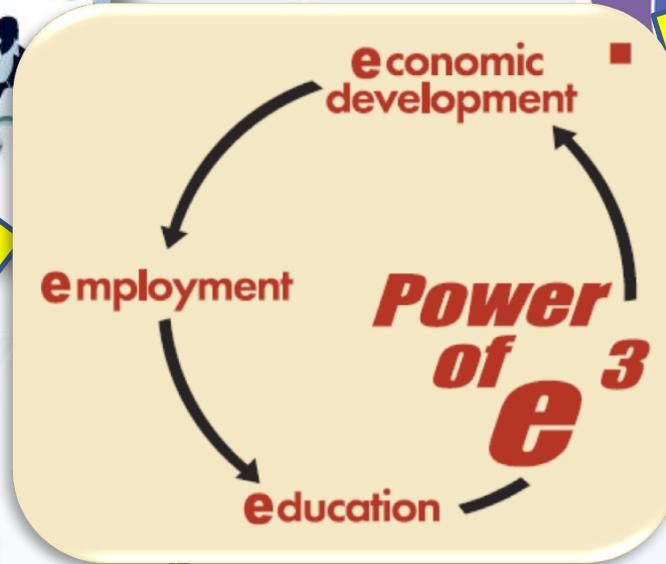
CONTENTS

1. BACKGROUND
2. CAPACITY BUILDING@ISRO
3. BEST PRACTICES
4. CONCLUSIONS

Drivers to Quality Education/Training



“Place” for everyone



Job & Security

Choice of education/training



education

Questions in Learners' minds

Education on Technology

Occupation Title	Total Employment
------------------	------------------

Total geospatial technology industry	78,990
Aerospace engineers	13,290
Engineering managers	2,110
Computer software engineers, systems software	2,030
Management analysts	2,010
Inspectors, testers, sorters, samplers, and weighers	1,870
Production, planning, and expediting clerks	1,590

Geospatial Technology-Related Occupations

- Environmental engineers
- Environmental engineering technicians
- Surveying and mapping technicians
- Cartographers and photogrammetrists
- Geoscientists, except hydrologists and geographers
- All other drafters, engineering, and mapping technicians
- Engineering managers
- Industrial engineering technicians
- Surveyors
- Architectural and civil drafters
- Mechanical drafters

Source: U.S. Bureau of Labor Statistics Operational Employment Statistics @www.bls.gov/oes/home.h



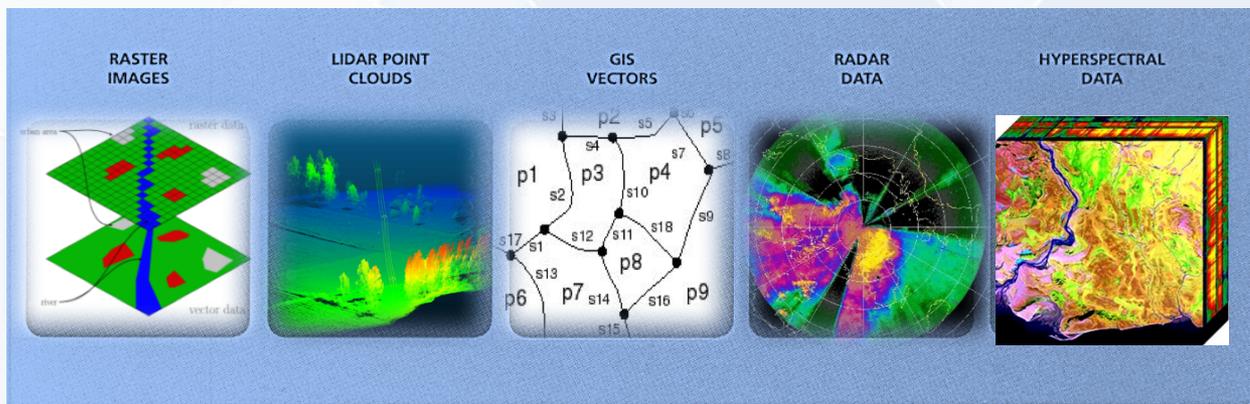
For the Mind of a Geomatics Learner

Geospatial Technology – A Glimpse

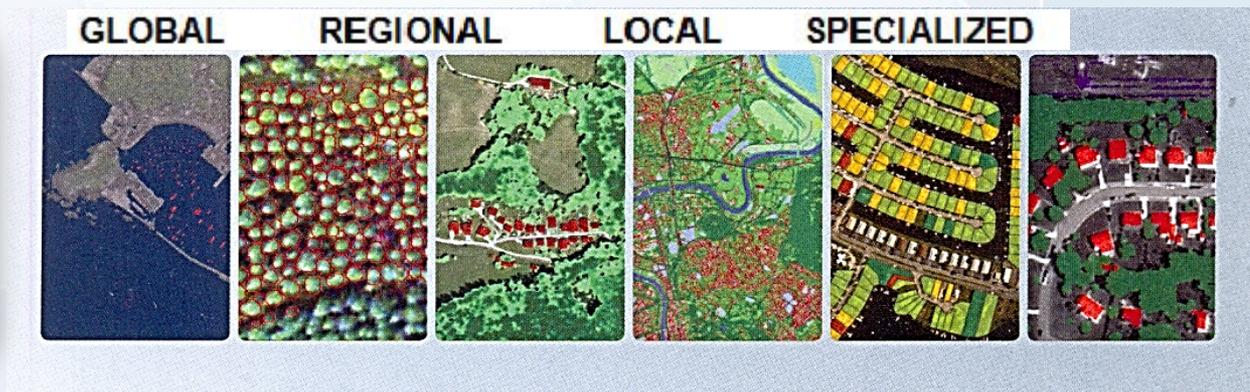
Advanced Sensors gather geospatial data and platforms for revisit needs



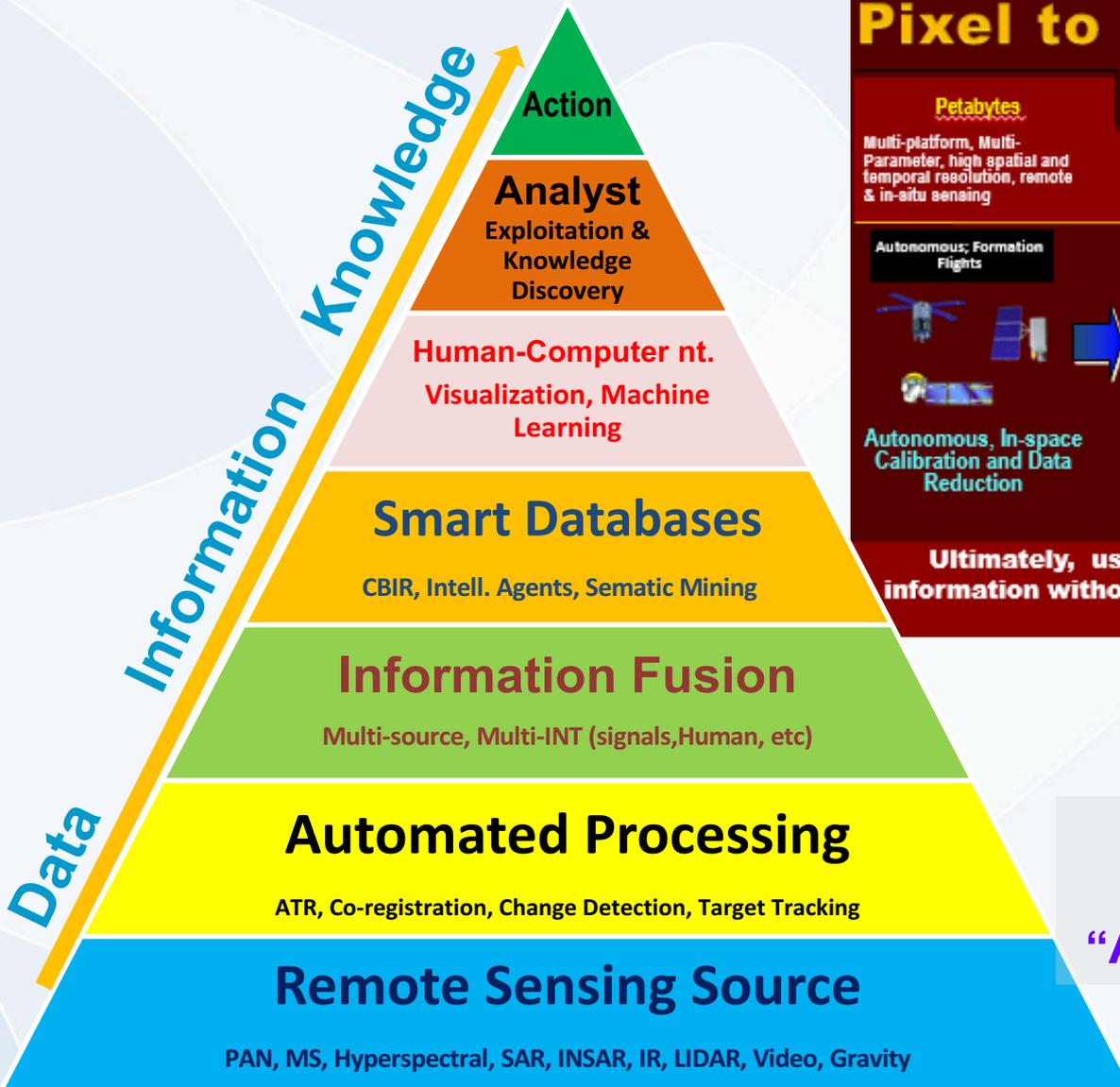
Processing a variety of geospatial data such as raster images, Lidar point clouds, GIS, vectors, radar and even hyperspectral data



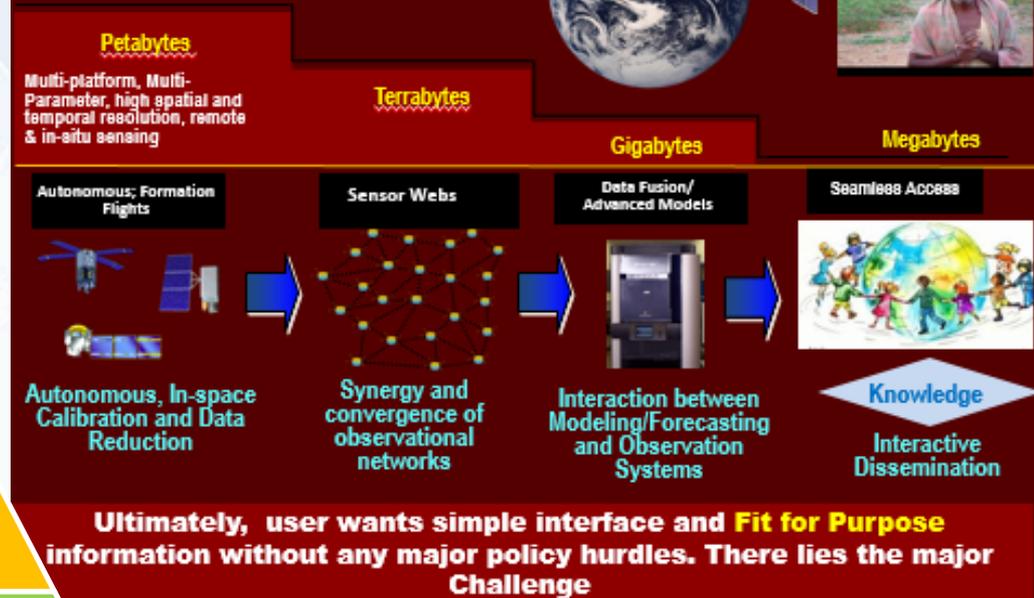
Invaluable products to all application users conducting vegetation mapping, feature extraction, change detection and object recognition



Geo-Spatial Information Convergence :



Pixel to People



**Integrated Solutions for
“Fitness for Purpose” or
“Analysis Ready Data (ARD)”**

Geo-Spatial Technology – Road Map

Smart
Cities

Smart
Automobiles

Internet of
Things

Defense
Surveillance

Disaster Risk
Management

Some Challenges ahead ...

- Two-thirds of the World is yet to be mapped..
- 2D/3D city maps, Road and Utility Networks, Thematic maps...
- Integration of disparate sources, applications and data bases in real time....

Dimensions of Indian Space Program

Space Infrastructure

- Launch vehicles (PSLV, GSLV)
- Spacecrafts (LEO, GEO and beyond)
- Sensors and Transponders

Ground Segment

- Data Acquisition, Processing, Cal-Val
- AWS Ground stations, DSN
- TTC Network

Applications

- Natural Resources Management
- Meteorology & Ocean Studies
- Satcom & Navigation
- Synergy: EO/ Satcom/ Navigation – VRC, DMS

Capacity Building

- Formal education through IIRS, CSSTE-AP, NRSC....
- Indian Institute of Space Science & Technology

Institutionalization

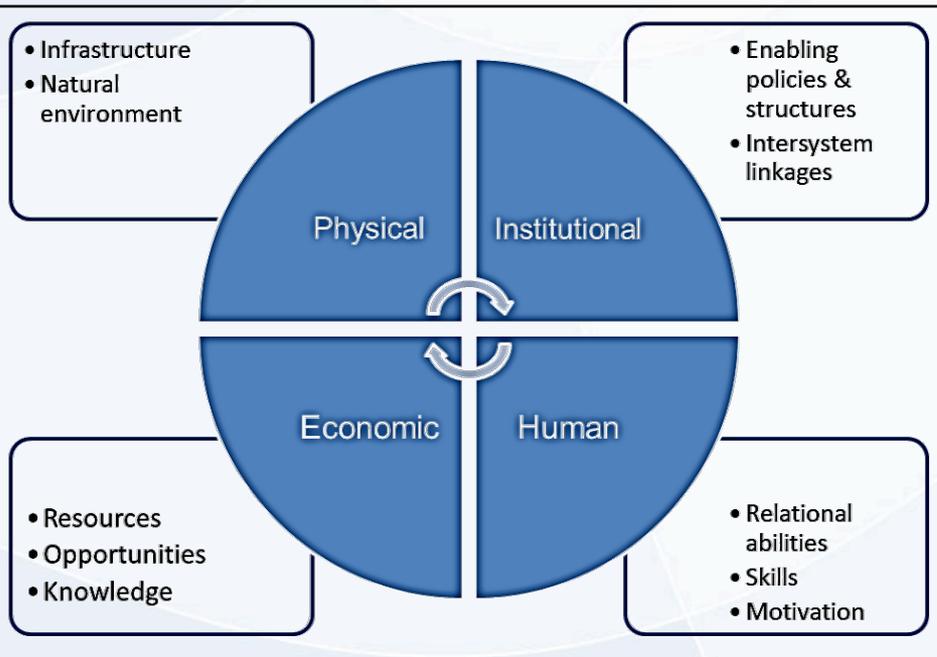
- National Natural Resources Management System
- Involvement of stake-holders from the planning level
- Antrix

International Cooperation

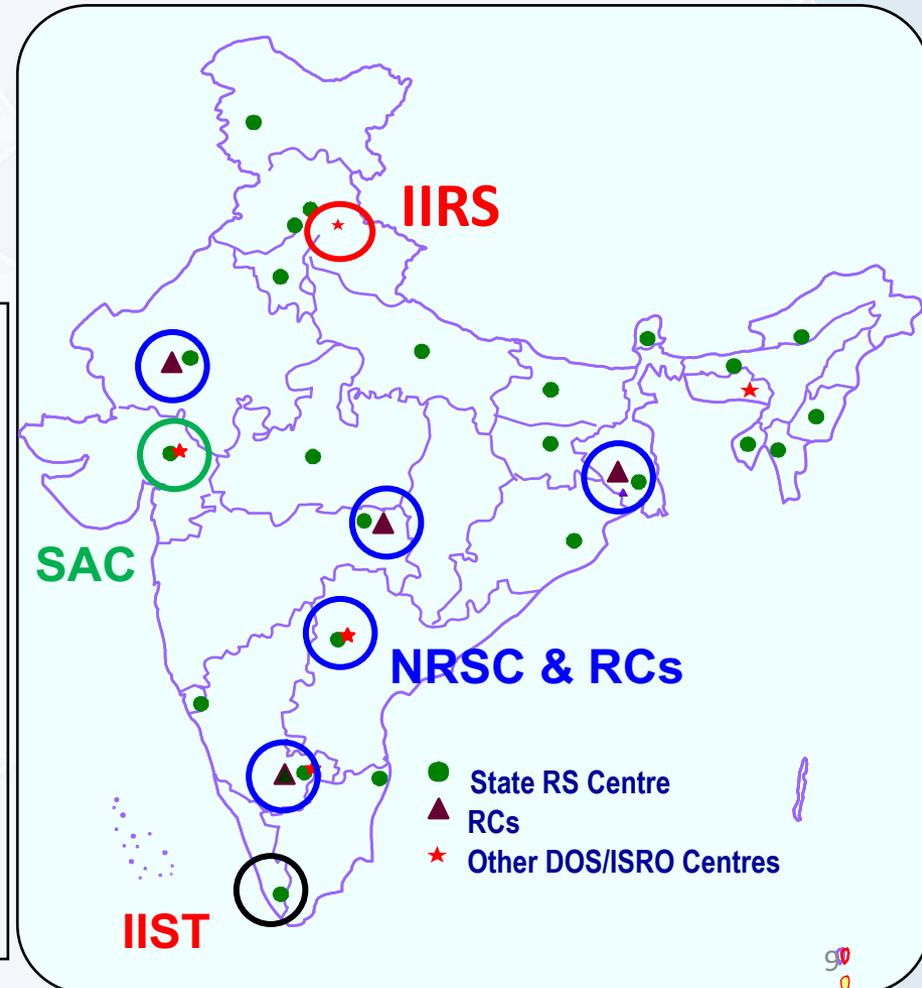
- Bilateral and multilateral cooperation with various countries and international Organisations

ISRO Institutions for Capacity Building

- Indian Institute of Remote Sensing (IIRS)
- Indian Institute of Space Science & Technology (IIST)
- National Remote Sensing Centre (NRSC)
- Space Application Centre (SAC)

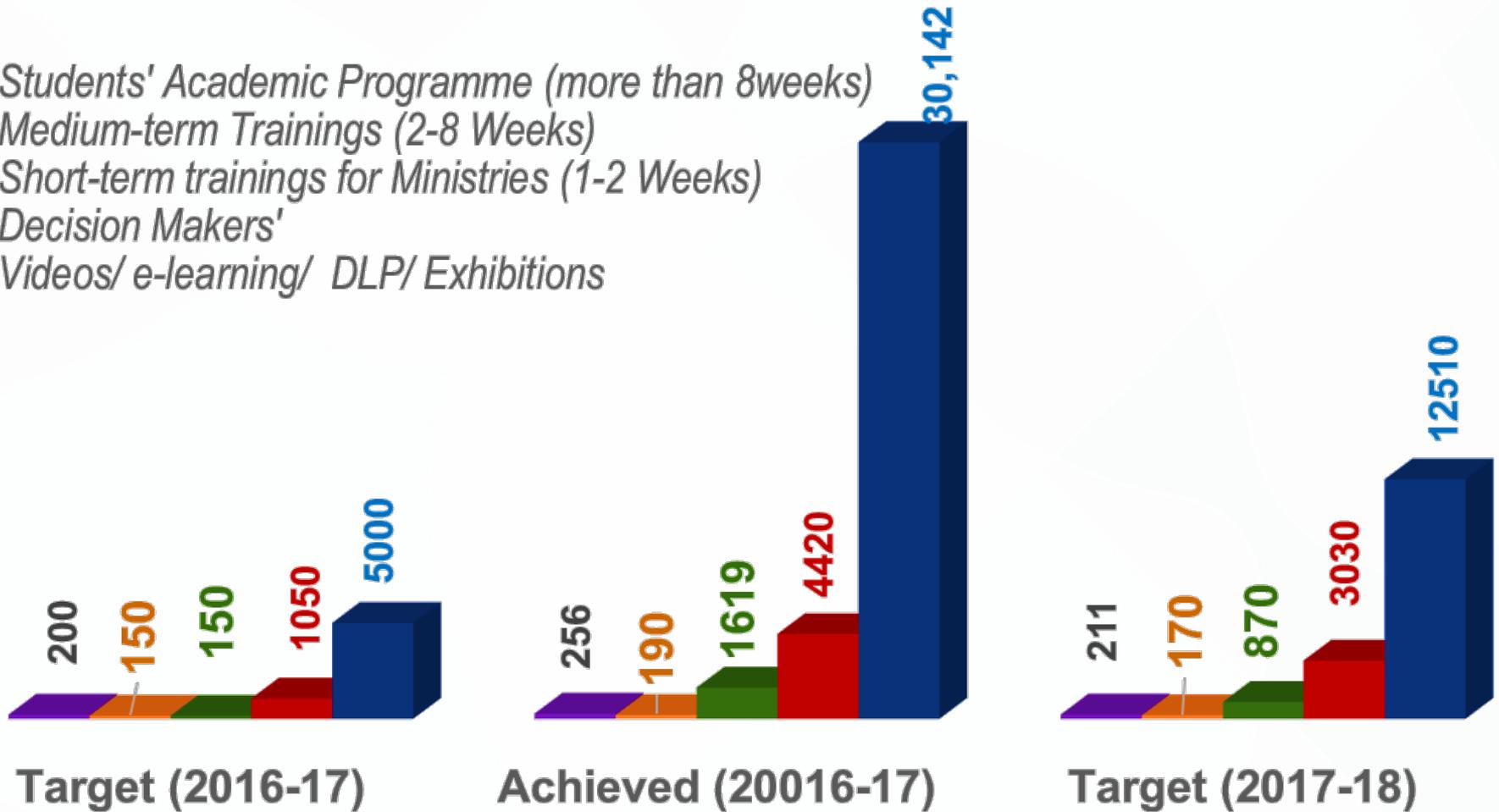


ISRO's Capitals to achieve programs

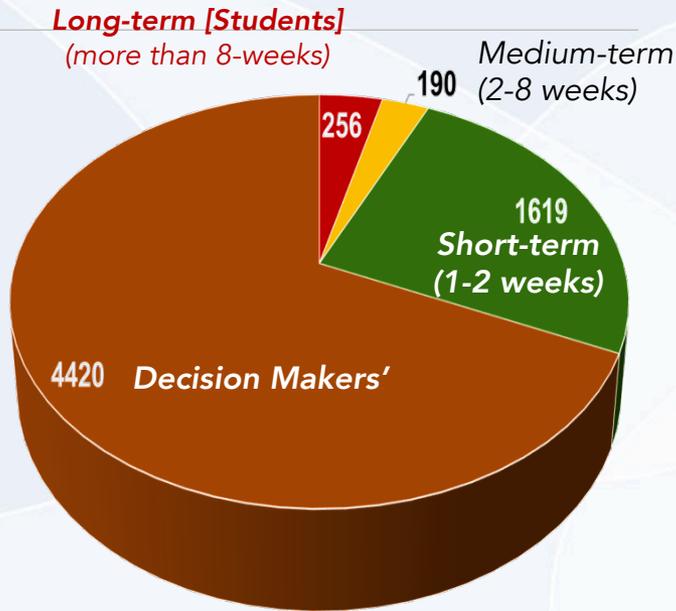


Beneficiaries & Time lines ...

- Students' Academic Programme (more than 8 weeks)
- Medium-term Trainings (2-8 Weeks)
- Short-term trainings for Ministries (1-2 Weeks)
- Decision Makers'
- Videos/ e-learning/ DLP/ Exhibitions



Face to Face Stakeholders - 2016-17



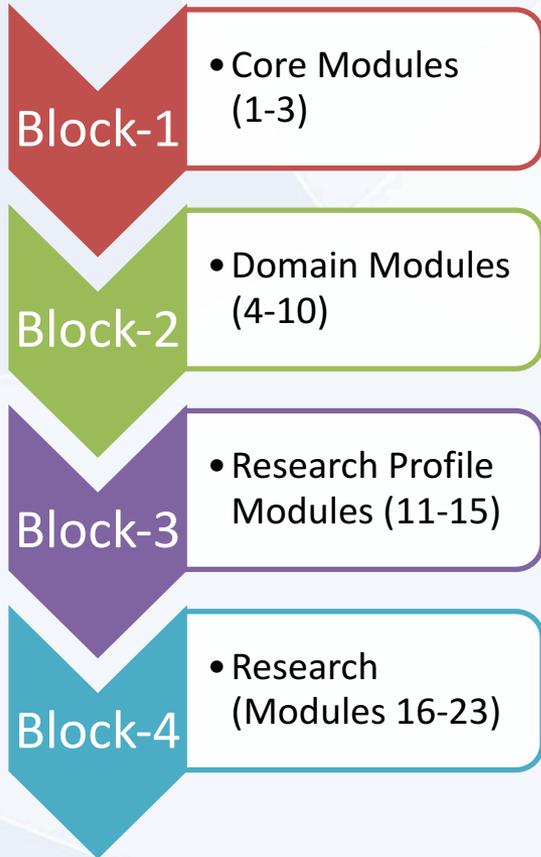
✓ **M .Tech. in Remote Sensing & GIS**

- 24 Months, since 2002
- Affiliated to Andhra University, Visakhapatnam
- 8 Specializations
- Includes 14 months research

✓ **M.Sc. in Geo-information Science & Earth Observation**

- 18 Months, since 2002
- Offered as JEP with ITC (University of Twente), The Netherlands
- Specialization: **Geoinformatics**
- Includes 4.5 months course work at ITC and
- 6 months research

M.Sc. in Geo-information Science & Earth Observation (Specialization – Geoinformatics)



Module	Duration	Module Topic
1	3 Weeks	Geographic Information Science
2	3 Weeks	Earth Observation
3	3 Weeks	System Earth
4	3 Weeks	Databases, Mathematics & Programming
5	3 Weeks	Principles of Spatial Data Quality
6	3 Weeks	Spatial Data Modelling & Processing
7	3 Weeks	Base Data Acquisition
8	3 Weeks	Image Processing
9	3 Weeks	Web GIS & Programming
10	3 Weeks	Visualisation & Dissemination of Geospatial Data
11	3 Weeks	Research Skills
12	3 Weeks	Advanced modules, advanced group project, and finalisation and defence of research proposal by M.Sc. students
13	3 Weeks	
14	3 Weeks	
15	3 Weeks	
16-23	6 months	M.Sc. research and thesis defence

Programming Skills

Note:
 Module 1 to 10 are common for both M.Sc. and PG Diploma.
 PG Diploma students carry out project work during Module 11 to 14.
 Module 11 to 16 are offered at ITC for M.Sc. students.



- ✓ **Postgraduate Diploma – 9 Specializations (10 months)**
- ✓ **Certificate Courses for University Faculty – 8 themes (8 weeks, NNRMS–ISRO Sponsored) - Train the trainers**
- ✓ **Certificate courses – Remote Sensing/ Geoinformatics (8 weeks, Sponsored by ITEC/MEA, Govt. of India)**
- ✓ **Decision Makers Course (1 week)**
- ✓ **Special /Tailor made Courses (1-8 weeks)**

International Programme

MEA – ITEC*/SCAPP** Sponsored Courses

- Initiated in 2001 to share Indian development experience in Geospatial technologies to International community
- **Two courses** are conducted annually:
 - Remote Sensing with emphasis on Digital Image Processing
 - Short course on Geoinformatics
- **Target Group:** Middle level resource managers and professionals from Government, Universities, Research Institutions
- **468 participants** from **79 countries** are benefitted from this program



*Indian Technical & Economic Cooperation **Special Commonwealth African Assistance Programme

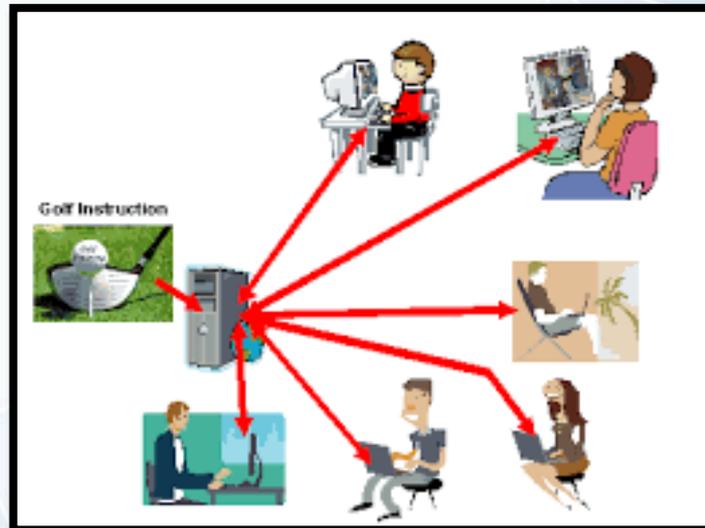
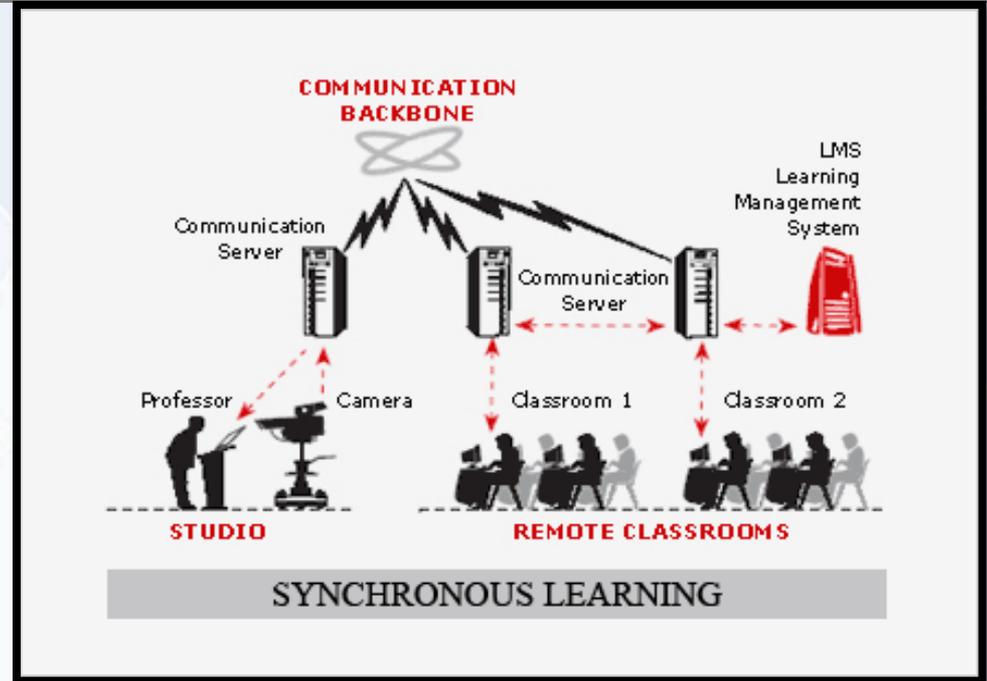
Special / Customised Courses

- Customised courses for various **User/ Stakeholder departments**, viz. Ministry of Environment & Forests/ Water Resources/ Home Affairs/ Railway and other Central & State Govt. departments
- Geospatial Technology for **Smart City Planning**
- UAV Remote Sensing & Applications
- **ISPRS Summer School** (Open Source GIS, Online sharing of data, algorithm & models, Research & teaching methodology for Master & PhD students)
- Basic course for **Higher Secondary School Teachers**
-



Modes of Distance Learning Program

- **Synchronous Learning-** occurs in real-time, with all participants interacting at the same time through some media;
- **Interactive Webinars, EDUSAT ...**
- **Asynchronous Learning-** self-motivated & allows learner to engage in the exchange of ideas or information.
- **Anywhere, anytime learning**



Night

Day

A. (Satellite based interactive & internet based e_learning Initiatives)

- Initiated in 2007 to complement educational programs of Indian universities
- About 38,300 students from 550 Indian Universities/Institutions benefited so far

Who Can Participate?

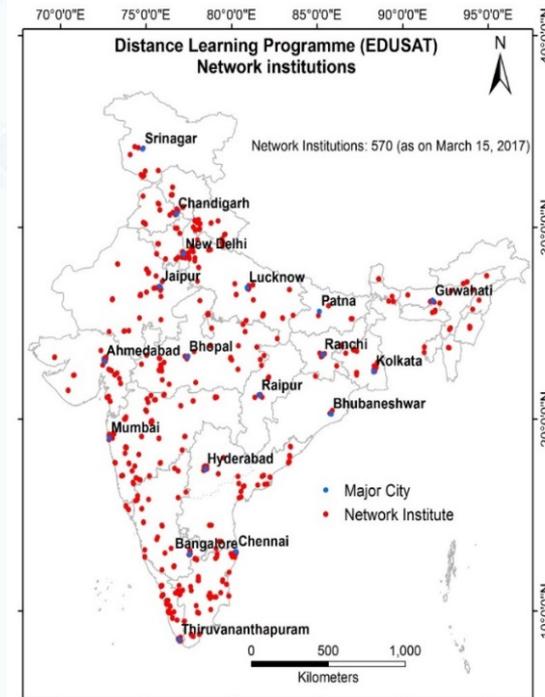
- UG & PG students/ Researchers/ Faculty
- Individuals with good internet facility (>2Mbps)
- Institutions on high-speed National Knowledge Network (NKN)

Courses Offered

- Basic Course on RS, GIS & GPS (12 Weeks)
- Advanced and Thematic Courses (1-3 Weeks)

B. MOOC Initiative

- certificate course of 4 months
- Rich e-learning content is being developed with high quality animations / flash interactions and easy understanding modules
- Focus on e-learning theme is Principles of Remote Sensing, GIS and GPS
- Indians: 3515; Foreign: 210



University Network with IIRS/ISRO



User Feedback

Interactive Course Highlights

Complete Digital Learning Management System
Live Streaming server setup at IIRS

DLP: Internet / Satellite based Live & Interactive Courses

(<http://iirs.gov.in/EduSat-News>)



IIRS studio-end



Receiving-end classroom



Feedback Session



<https://www.youtube.com/channel/edusat2004>

National Award
by Govt. of India



DLP: Internet Based e-Learning Courses (<http://elearning.iirs.gov.in/>)

- Self-paced, any-time/any-where learning
- **Four months** Comprehensive Certificate Course on 'Remote Sensing and Geo-information Science'
- **One month** fundamental Certificate Courses on (1) Remote Sensing; (2) GIS; (3) Digital Image Processing; and (4) Photogrammetry
- **Registration – Free and Open to All**



The screenshot shows the homepage of the Indian Institute of Remote Sensing (IIRS) e-learning program. The header includes the IIRS logo, the text 'INDIAN INSTITUTE OF REMOTE SENSING Indian Space Research Organisation Department of Space, Government of India', and the date 'Tuesday, March 10, 2015'. The main navigation bar contains 'Home', 'Programme Overview', 'Course Delivery', and 'Contact'. A large banner image shows a satellite in space with the text 'On mission for transferring technology through capacity building & research'. Below the banner, there are sections for 'Members Login' with fields for 'username' and 'password', a 'Welcome to IIRS e-learning Program' message, 'Latest Updates', 'Latest Events', 'Current News & Events', 'About the Course', 'Helpdesk', and 'Important Links'. The footer contains copyright information: 'Copyright © 2013 IIRS, ISRO. All rights reserved. Browser Compatibility: IE 7+, Firefox 2.0+, Chrome 9.0+'.

Topics

- Image Statistics
- Basic Remote Sensing
- Photogrammetry and Cartography
- Digital Image Processing
- Geographical Information System
- Global Navigation Satellite System
- Customization of Geospatial Tools
- Applications of Geospatial Technologies

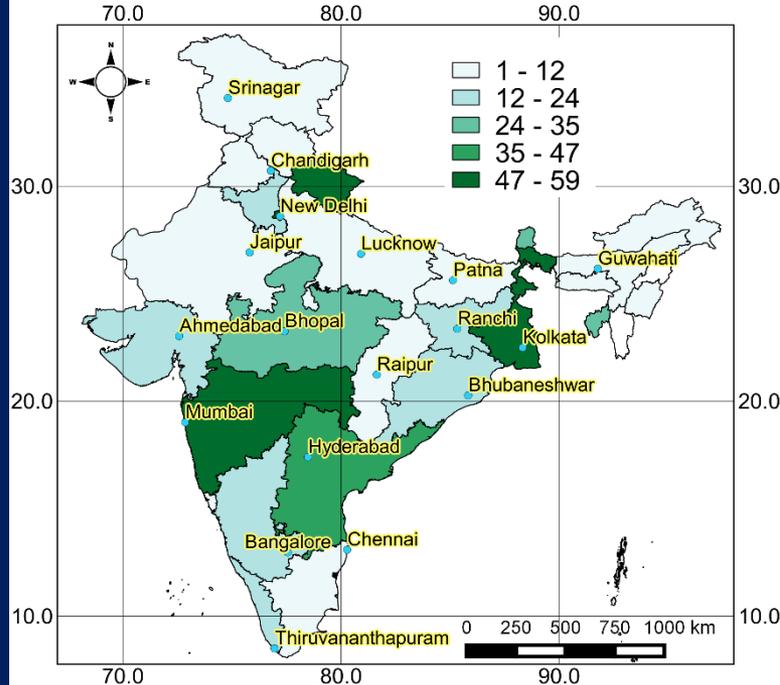


The screenshot shows the interface of the IIRS Outreach E-learning Education Program. The header includes the IIRS logo, the text 'INDIAN INSTITUTE OF REMOTE SENSING Indian Space Research Organisation Department of Space, Government of India', and the date 'Tuesday, March 10, 2015'. The main navigation bar contains 'Home', 'Programme Overview', 'Course Delivery', and 'Contact'. A large banner image shows a satellite in space with the text 'On mission for transferring technology through capacity building & research'. Below the banner, there are sections for 'Members Login' with fields for 'username' and 'password', a 'Welcome to IIRS e-learning Program' message, 'Latest Updates', 'Latest Events', 'Current News & Events', 'About the Course', 'Helpdesk', and 'Important Links'. The footer contains copyright information: 'Copyright © 2013 IIRS, ISRO. All rights reserved. Browser Compatibility: IE 7+, Firefox 2.0+, Chrome 9.0+'.

DLP: Internet Based e-Learning Courses (<http://elearning.iirs.gov.in/>)

IIRS E-LEARNING CERTIFICATE COURSE ENROLMENTS

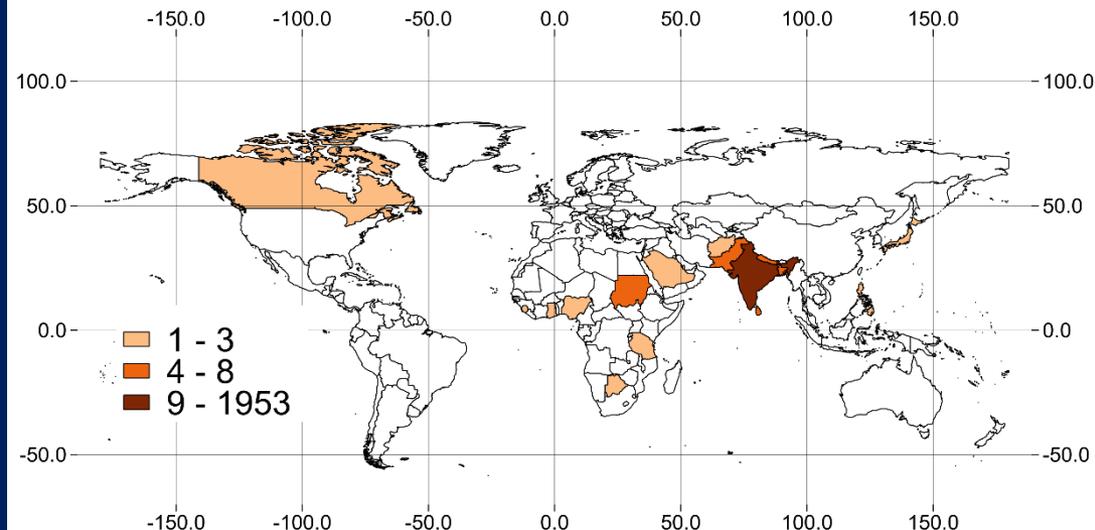
As on October 15, 2015



India: 3515
Foreign: 210

GLOBAL DISTRIBUTION OF IIRS E-LEARNING ENROLMENTS

As on October 15, 2015



Research – An integral part of Capacity Building

Multi-disciplinary and problem oriented research agenda that focuses on technology development as well as land/ ocean/ atmosphere applications.

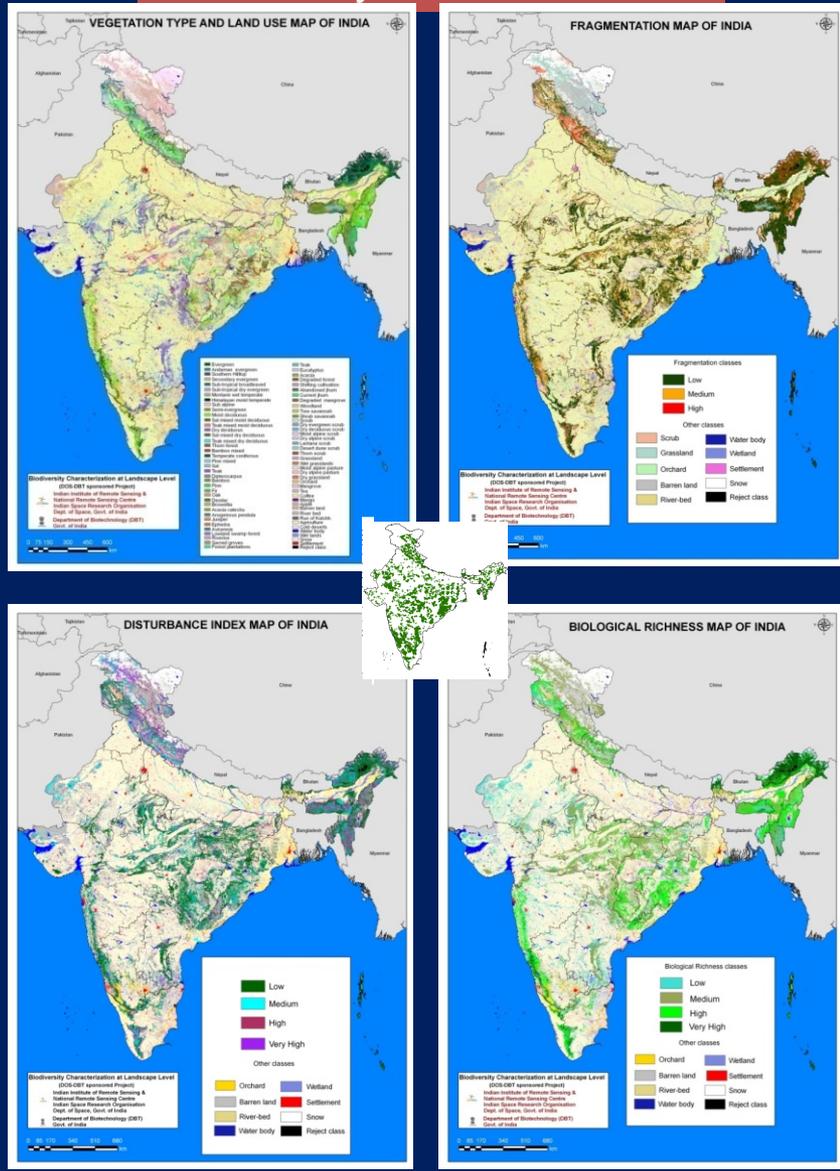
Benchmark Studies

- Engineering geological/ geotechnical surveys for hydropower and road alignment
- Biodiversity characterisation at landscape level
- Landslide hazard zonation
- National Carbon Project (soil carbon pool, vegetation carbon pool, soil-vegetation-atmosphere fluxes)

Contributions in National Mission Projects

- Natural Resource Census Projects (LULC, Land Degradation, Geomorphology)
- **Rajiv Gandhi National Drinking Water Mission**
- National Urban Information System
- **Biodiversity Characterisation at Landscape Level**
- Space-based Information Support for Decentralised Planning
- **Establishment of VRCs (HP, UP, Uttarakhand)**

Biodiversity Characterisation

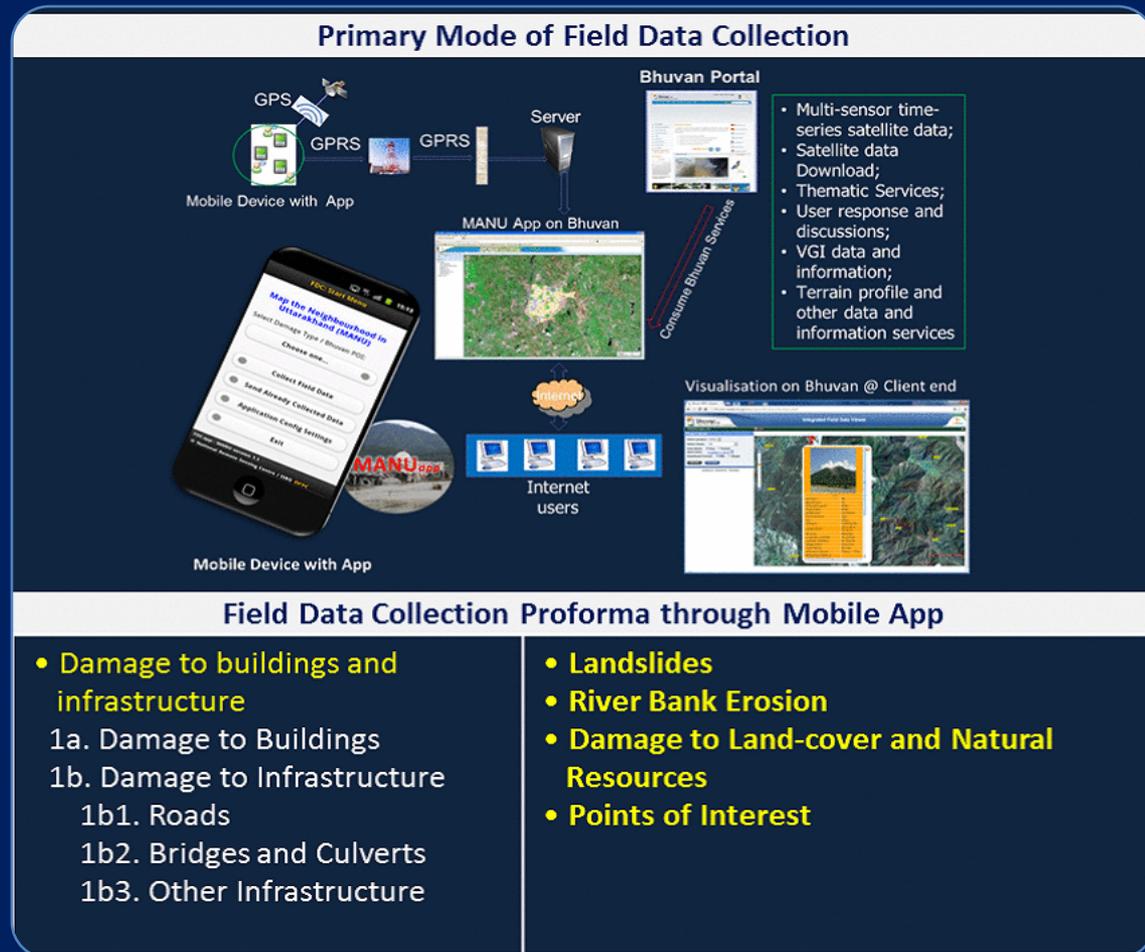


Map the Neighborhood in Uttarakhand (MANU)

- **Development of appropriate tools for field data collection through crowdsourcing and integration with Bhuvan geoportal.**
- **Capacity Building** for field data collection by students from the local region.
- **Geospatial analysis** of field data for understanding the major controls and patterns of damage.

Area covered: Alaknanda, Mandakini, Bhagirathi, Yamuna, Ganga, Pinder and Kali river valleys

End use: Inputs towards formulating guidelines for restoration & developmental activities



Teams: IIRS, NRSC, SOI, DST, WIHG, HNB Garhwal Univ, Kumaun Univ.

Hands-on Short-term Programs @ IIRS

Capacity Building for Ministries & Departments (April, 2016 to Feb, 2017)

S.No.	Course Name (User Department)	Duration	Professionals Trained
1	Special course on Capacity Building Programme in GIS	3 Weeks	16
2	Special Course on Image Interpretation and RS application (<i>Indian Air Force Personnel/ MoD</i>)	2 months	14
3	Special course on GIS Based Utility Mapping of ISRO/DOS Campuses (<i>ISRO/DOS</i>)	1 week	33
4	Special course on Orthorectification of Very High Resolution Satellite Data (<i>FSI/ MoEF&CC</i>)	1 week	11
5	Refresher course for IFS officers on RS&GIS Application in Working Plan Preparation (<i>MoFE&CC</i>)	1 week	15
6	RS&GIS with Special Emphasis on Medicinal Plants (<i>Ministry of AYUSH</i>)	1 week	10
7	Special course for GSI officers on SAR Applications in Geosciences (<i>GSI/ MoES</i>)	2 week	12
8	Orientation course for Range Forest Officers on Application of RS&GIS in forestry (<i>MoFE&CC</i>)	1 week	39
9	Application of RS&GIS for NRM for ISS Officers (<i>Ministry of Statistics and Programme Implementation</i>)	1 week	18
10	ISRO-sponsored NNRMS Course on Space Technology Applications in Governance and Development (<i>MHRD</i>)	1 week	23

Activities: IIRS DLP 2017 -18

S.No	Course	Tentative Slot	Starting date for online Registration	Duration	Tentative date for Examination
1	Recent Trends in Remote Sensing and GIS Application in Carbon Forestry	February 16 – March 10, 2017	03/01/2017	3 weeks	March 10, 2017
2	Microwave Radar Remote Sensing and its Applications	April 10-21, 2017	16/02/2017	2 Weeks	April 24, 2017
3	RS & GIS Applications in Water Resource Management	May 08-26, 2017	01/04/2017	3 Weeks	May 29, 2017
4	UAV Remote Sensing and Applications	June 12-16, 2017	01/05/2017	1 Week	Not Applicable
5	Remote Sensing and Digital Image Analysis	August 21 -September 15, 2017	01/06/2017	4 Weeks	September 15, 2017
6	Global Navigation Satellite System and Geographical Information System	September 18 - November 03, 2017	01/06/2017	6 Weeks	November 03, 2017
7	RS & GIS Applications	November 06 – 24, 2017	01/06/2017	3 Weeks	November 24, 2017
8	Basics of “Remote Sensing, Geographical Information System and Global Navigation Satellite System	August 21 – November 24, 2017	01/06/2017	13 Weeks	*
9	Close Range Photogrammetry and Terrestrial Laser Scanning	December 11-15, 2017	01/11/2017	1 Week	Not Applicable

Capacity Building @ NRSC

Future Courses Planned in 2017-18

Sl. No	Course Type	Course Name	Duration
1	Regular	Microwave Remote Sensing and Applications	2 weeks
2	Special	Remote Sensing Ground Segment Systems	6 days
3	Special	Open source GIS	2 weeks
4	Special	Advances in GIS	2 weeks
5	Special	Hyperspectral Remote Sensing	1 week
6	Regular	Geospatial Technologies & Applications	12 weeks
7	Special	Bhuvan Overview Training with Hands-on Practical	2 days
8	Special	Satellite Navigation	2 days
	Customized Courses	Organized in Specific Areas Based on Request from User Organizations	

Sl. No	In House Training	Planned in
1	ISRO-STP on “ Space Technology Applications for Governance and Development ” for ISRO Scientists	July, 2017

Hands-on Training Programs @ SAC

Training & Research in Earth Ecosystem (TREES) VEDAS Research Group, SAC

162 participants

Sr.	Event Name	Date	Participants	Institutes
1	Satellite Calibration and Validation	June 13-17, 2016	04	02
2	Remote Sensing & Geo-Informatics – Basics	August 30 –September 02, 2016	20	10
3	Satellite based Hydrology and modelling	December 12–16, 2016	17	09
4	Polarimetric SAR data Processing and Analysis	December 20–21, 2016	21	12
5	Hyperspectral remote sensing with AVIRIS-NG data over India.	January 4–6, 2017	50	25
6	Handling of MARS Orbiter Mission (MOM) Data (MCC, MSM and TIS)	February 28 – March 01, 2017	29	24
7	Training on Chandrayan-1 TMC and HySI data analysis	March 2-3, 2017	21	18

Satellite Meteorology & Oceanography Research and Training (SMART), MOSDAC, SAC

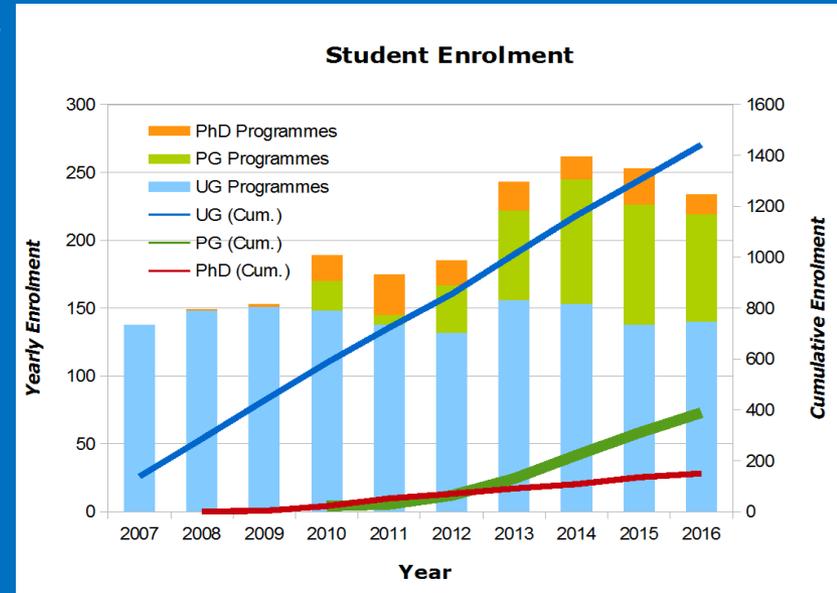
108 participants

No	Topic of Training	Date	Participants	Institute
1	Introduction to Satellite Scatterometry with special emphasis on ScatSat-1 (Batch-1)	19-21 October 2016	18	16
2	Introduction to Satellite Scatterometry with special emphasis on ScatSat-1 (Batch-2)	23-25 November 2016	18	15
3	INSAT-3DR: Observations to Applications (Batch-1)	14-17 February 2017	36	26
4	INSAT-3DR: Observations to Applications (Batch-1)	07-10 March 2017	36	19

Capacity Building @ IIST

Undergraduate level programmes

- Three undergraduate programmes:
 - B.Tech in Aerospace Engineering – 60 seats
 - B.Tech in Avionics – 60 seats
 - Dual degree (B.Tech & MS/MTech) – 20 seats
 - All seats were duly filled.
- Admissions to UG programme were based on
→ National Competitive Examination



Yearly & Cumulative Student Enrolment

PhD Programme

Total Admitted: 165; (ISRO Staff: 40); Completed: 27

ADMISSION (Jan & July)

PhD : Full-Time

All Departments

UGC Norms

PhD : Part-time

All Departments

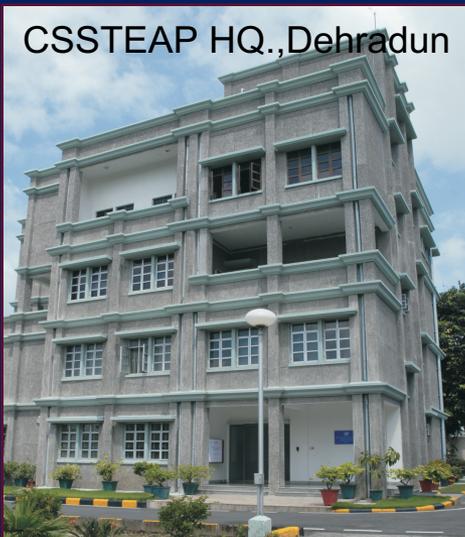
For ISRO/DOS Only - Interview-based

(PhD: IIST-ISRO) High Value

Closed (Total =11)

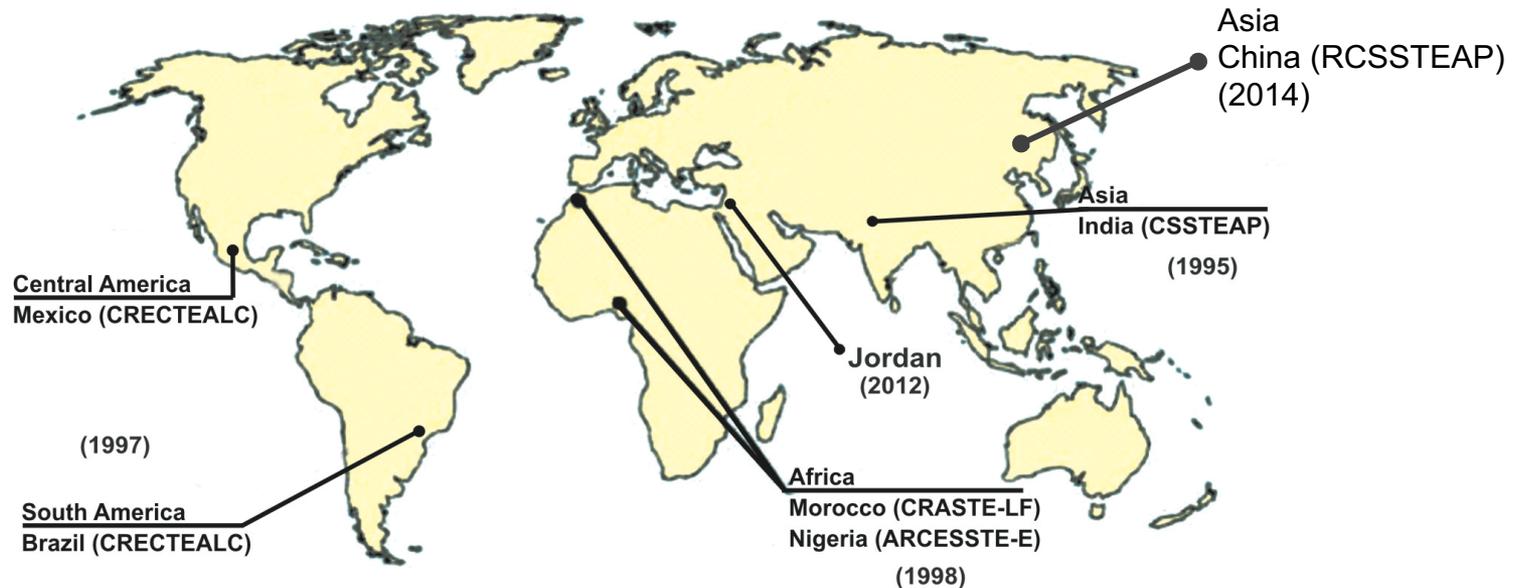
IIRS Contributions to CSSTEAP (UN Affiliated Centre)

- 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.



Six Regional Centres for Space Science and Technology Education in the World

Regional Centres for Space Science and Technology Education
(Affiliated to the United Nations)

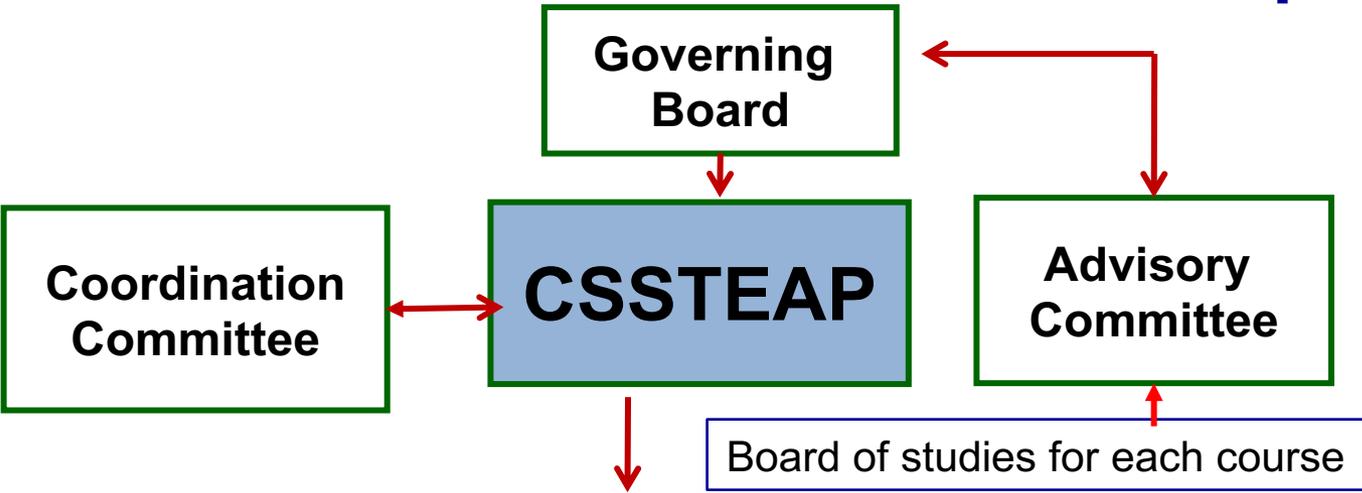


- CSSTEAP is the 1st Regional Centre of UN-OOSA established in 1995
- CSSTEAP has 16 GB members and two observers for guiding the activities of the Centre.

CSSTEAP completed 21 years.

Total 1670 participants from 35 Countries are benefitted

Academic Structure and Campuses



- Remote Sensing & GIS
- Satellite Communication
- Satellite Meteorology & Global Climate
- Space & Atmospheric Sciences
- **Global Navigation Satellite Systems**



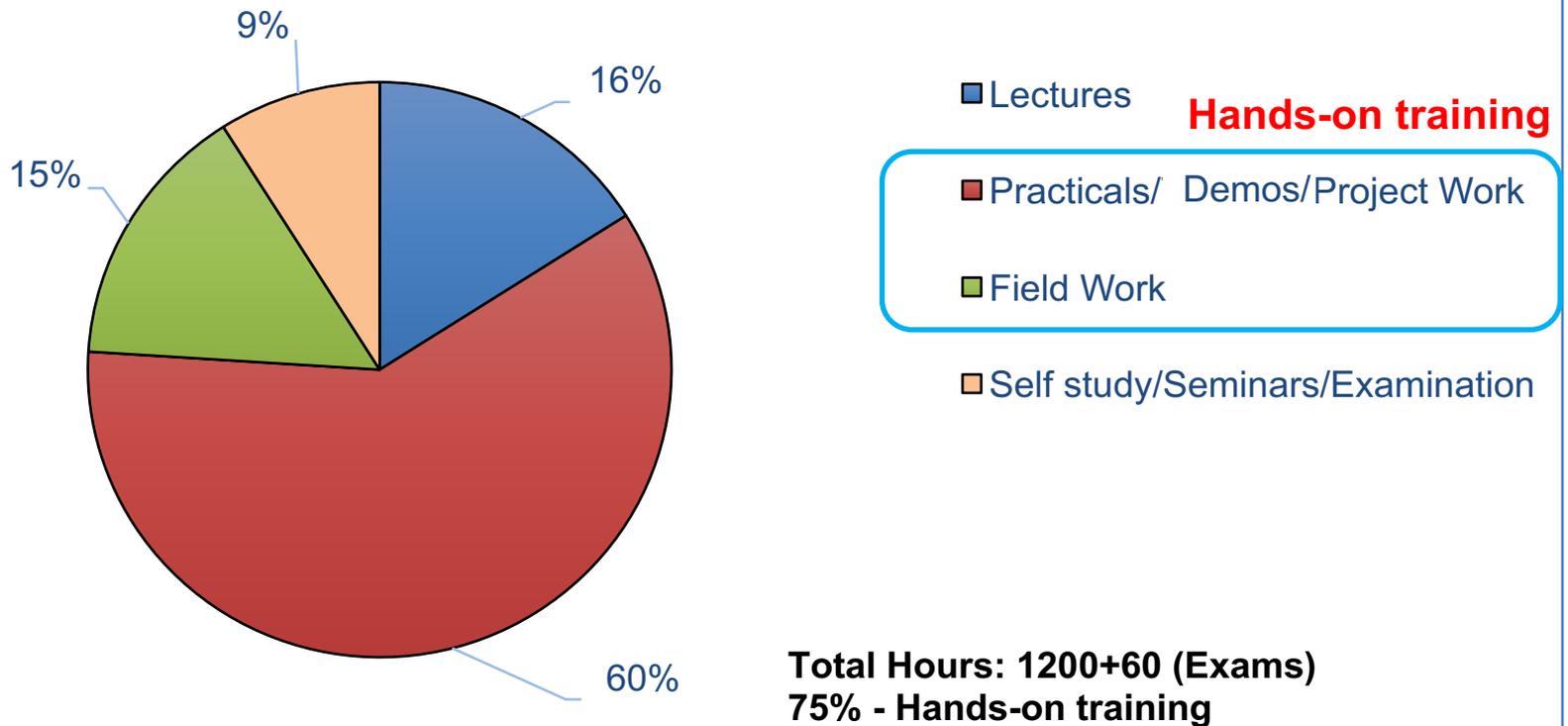
Facilities Provided to Participants

- Monthly Fellowship
- International travel support
- Single Occupancy Hostel Accommodation with kitchenette facilities, Gym, Sports
- 24x7 digital Library
- Medical facility
- Tuition fee, course fee waived off
- English Coaching
- Live lectures & video recording
- Technical Visits

- Symposium/Seminars participation
- Field visits / Institutional visits
- International Experts / Lectures/ Tutorials
- Satellite data (India / International)
- Books/ Project Allowance / Field work allowance
- Other administrative expenses (Visa, baggage allowance etc.)



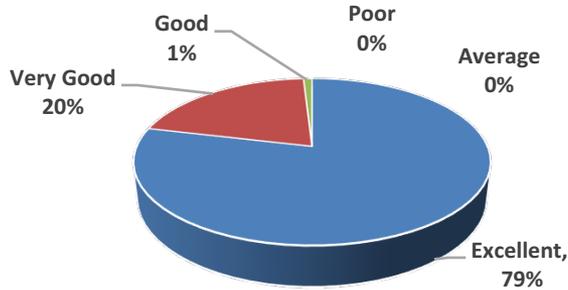
Overall Organization of PG Courses



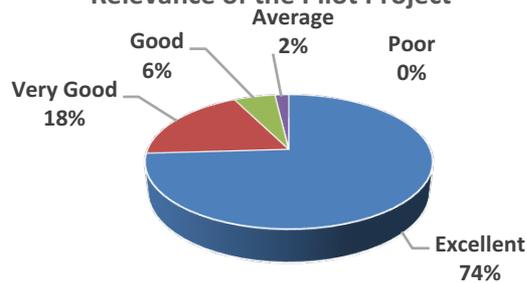
Feedback from Alumni

During the Course ...

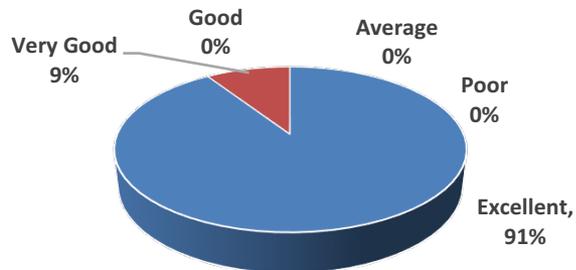
Overall Objective of the Course Achieved



Relevance of the Pilot Project

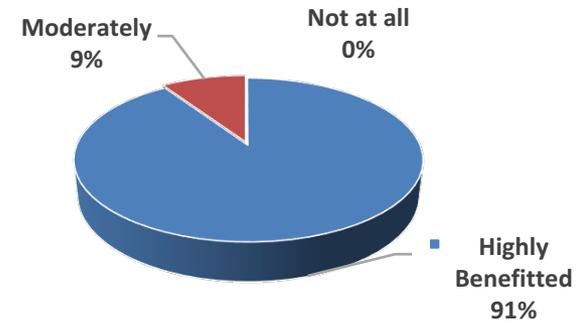


Physical Facilities (Class Room, Computer Room and Lodging)

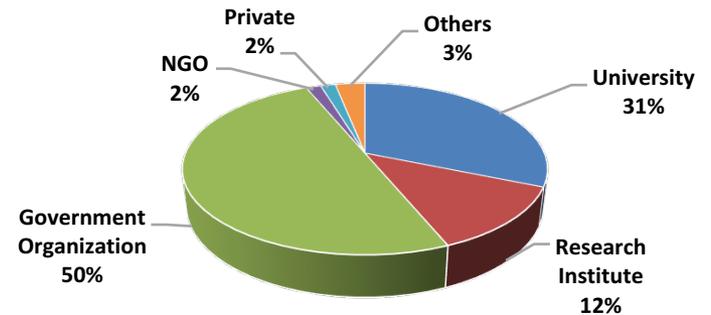


After the Course ...

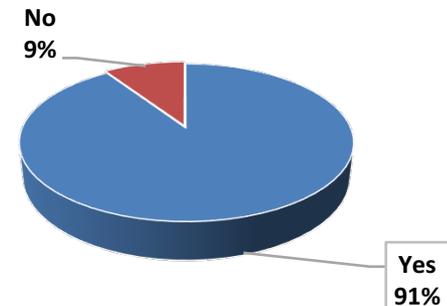
How CSSTEAP Course Benefitted to your current job



Current Organization



Do you need any Refresher Course

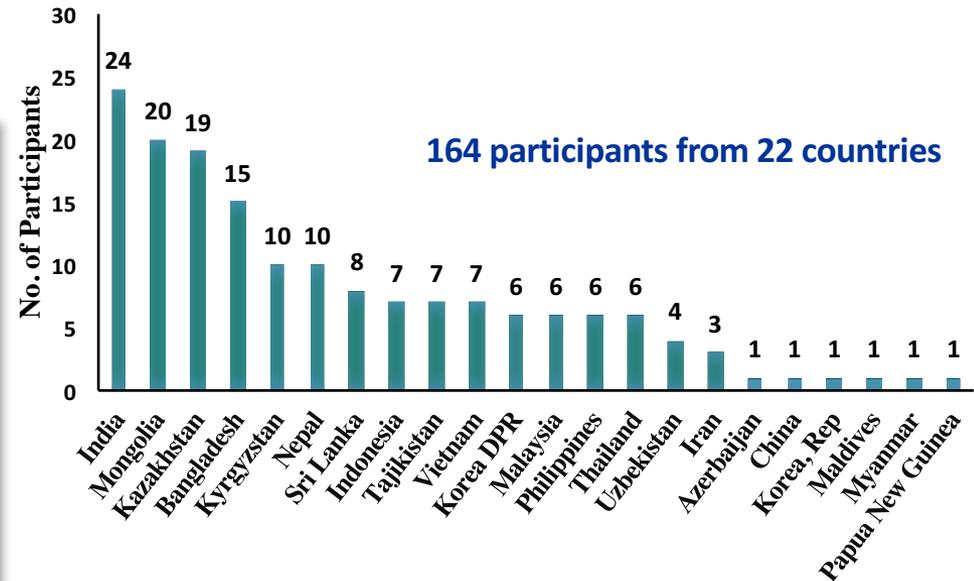


Post Graduate course on Satellite Meteorology & Global Climate

August-April every alternate even year

Conducted at SAC, Ahmedabad
Sponsored by CSSTEAP, Dehradun

- Total 10 SATMET PG courses have been conducted since 1998
- Total participants 164 from 22 countries of **Asia-Pacific region** benefitted.



Valedictory Function: 24-Apr-2017

Broad Syllabus for PG course in Satellite Meteorology

The course is designed towards the professional and specialists working in the meteorological Centre, educational institutes, and involved in active research in weather forecasting & climate.

Module 1: Fundamentals of Satellite Meteorology, Global Climate and Relevant Techniques (3 months)

Sub-Module 1.1	Concepts in Meteorology and Climatology	No. of Lectures
Section 1-1 MET	Basic concepts of Meteorology, Climatology and Oceanography	35
Section 1-1 MATH	Mathematical and Statistical, Computational Techniques for Satellite Meteorology	15
Sub Module 1.2	Concepts in Satellite Meteorology	
Section 1-2-SM	Principles of Meteorological Remote Sensing	25
Section 1-2-MSI	Overview of Meteorological Satellites / Orbits	15
Sub Module 1.3	Image Processing , Interpretation and GIS	
Section 1-3-DIP	Image Processing Techniques and Geographic Information System (GIS)	15
Section 1-3-WF	Image Interpretation in Meteorology and Weather Forecasting	25

Module 2: Advanced Concepts and Techniques in Satellite Meteorology and Global Climate (3 months)

Sub Module 2.1	Geophysical Parameter Retrieval	
Section 2-1 AP	RT Theory, Atmospheric Parameters	30
Section 2-1 LOP	Land and Oceanic Parameters	10
Sub Module 2.2	Applications of Satellite Derived Parameters	
Section 2-2-AWF	Applications in Meteorology and Weather Forecasting	25
Section 2-2-NM	Satellite Data Assimilation in Numerical Models	15
Sub Module 2.3	Global Climate and Environment	
Section 2-3-SC	Short Term Climate Variability	20
Section 2-3-LC	Long Term Climate Change	20
Section 2-3-ESI	Environment Issues and Societal Impacts	10

Total no. of Hrs (Theory+Pract) = 400 hrs

Total no. of Hrs (Theory +Pract) = 400 hrs

Module 3: Pilot Project (3 months) = 400 hrs

Workshop in Emerging Trends in Satellite Meteorology: Technology & Applications

March 2008

Conducted at SAC, Ahmedabad
Sponsored by CSSTEAP, Dehradun

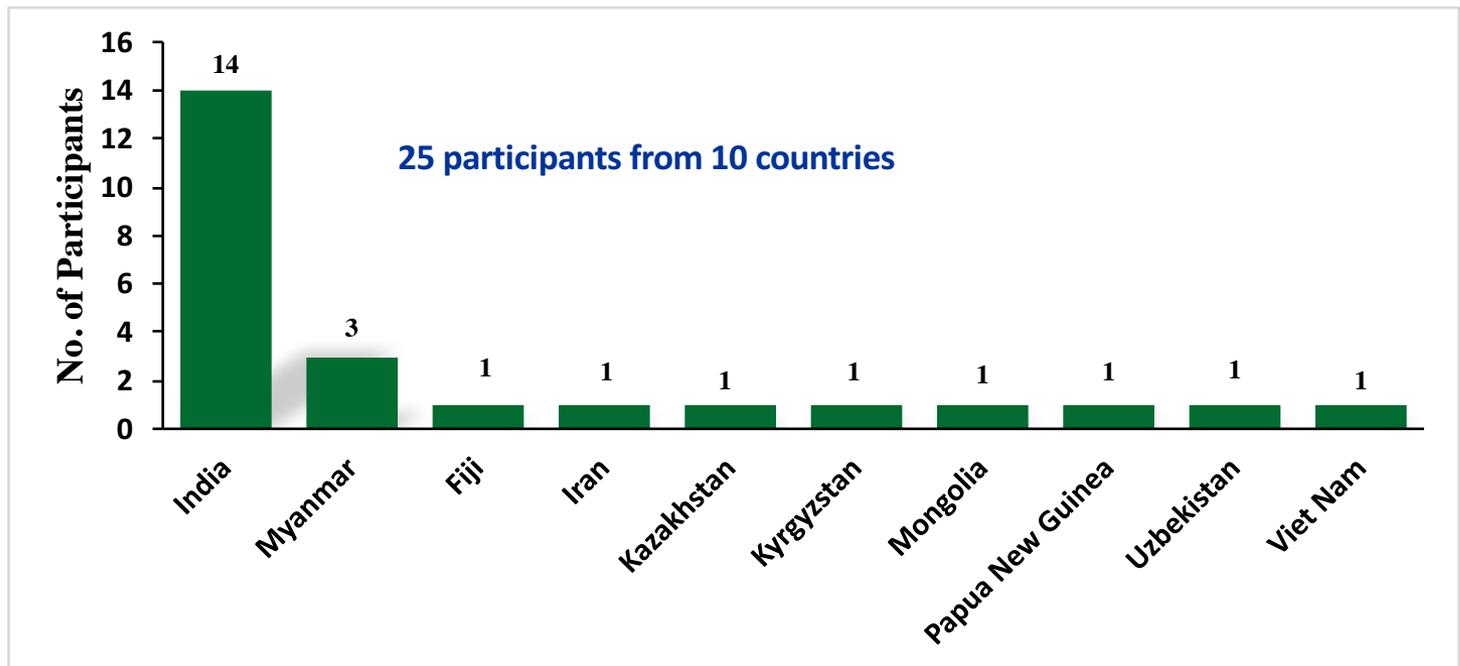
8 participants from India

Short course in Emerging trends in Satellite Meteorological Applications with special emphasis on MW RS

May 6-17, 2003

Conducted at SAC, Ahmedabad
Sponsored by CSSTEAP, Dehradun

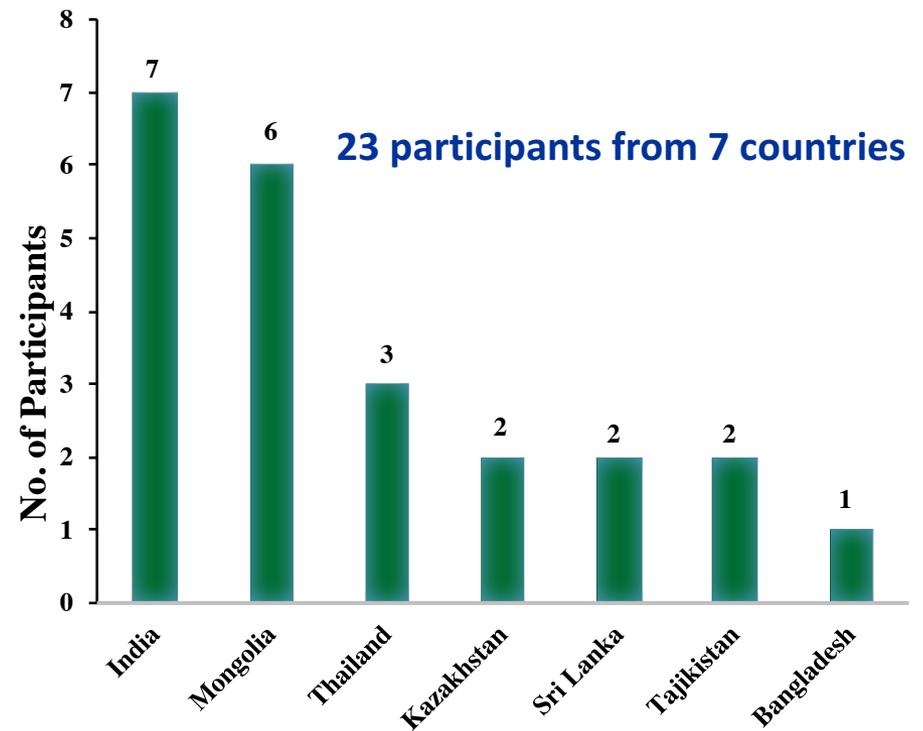
17 participants from 10 countries



Short course on Weather Forecasting Using Numerical Prediction Models

18 April-17 May, 2016
23 participants 07 countries

Conducted at IIRS Dehradun
Sponsored by CSSTEAP, Dehradun



Syllabus -short course in Weather Forecasting using NWP Models

The overall objectives of the training course was to generate awareness among users/researchers/professionals/academicians on fundamental of numerical weather prediction and data assimilation. The participants will be familiarized with the use of numerical weather prediction models, particularly the world's most widely used model for weather prediction, the Weather Research and Forecasting (WRF). The Mesoscale and Microscale Meteorology (MMM) Division of National Center for Atmospheric Research (NCAR) supports the WRF system to the user community. In addition to this, participants will be made aware of assimilation techniques to make best use of conventional and satellite observations in prediction of extreme weather events.

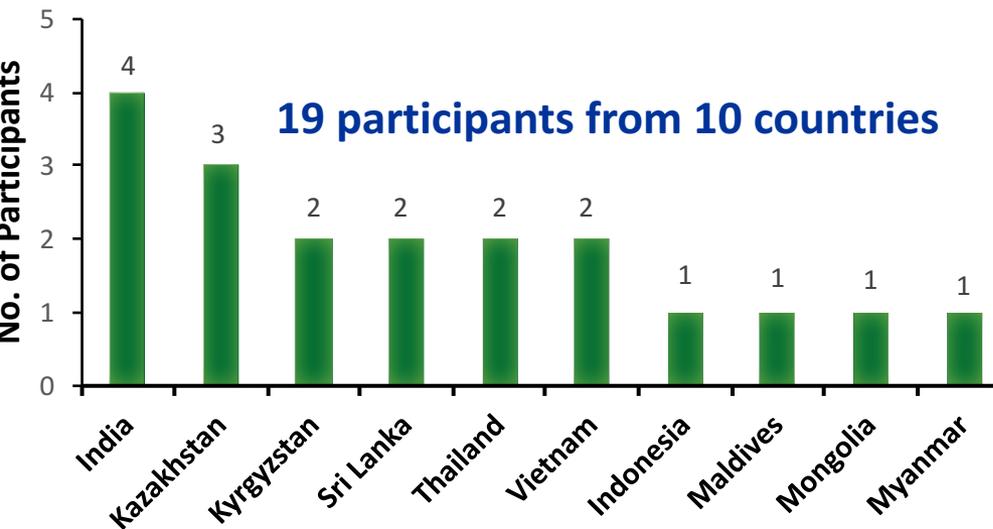
- History of NWP, NWP model type, resolution and boundary condition
- Familiarization with Linux OS environment, Grid Analysis Display System
- Weather prediction equations
- Scale analysis of weather prediction equations; Grid Analysis Display System (GrADS)
- Physical processes and parameterizations
- Download and build process of WRF model
- Post processing of NWP model output and forecast verification
- Coupled model and role of ocean in coupled weather and climate system
- Global observing system for NWP with special emphasis on ISRO's current and future satellites
- Multi-model ensemble forecasting
- Post processing and visualization of WRF model output
- Retrieval temperature, moisture and ozone profiles from satellite observations
- Retrieval of AMVs and ocean surface winds from satellite observations
- Retrieval of AMVs from satellite observations
- Retrieval of land surface parameters, sea surface temperature and rainfall from satellite observations
- Indian summer monsoon: Interannual and intra-seasonal variability
- Data assimilation: basic concepts, optimum interpolation & variational methods
- Modelling of observations and background error covariance; Tangent linear and adjoints
- Land surface data assimilation
- GPS radio occultation and its use in numerical weather prediction
- Setting up and running WRF Data assimilation system
- Data assimilation activities at NCMRWF
- Applications of land surface parameters in weather and climate models and simulation using WRF model
- Impact of different observing systems on weather prediction over the Indian region
- Simulation of atmospheric trace gases using chemistry transport model and simulation using WRF model
- Observations and forecasting of extreme weather events and simulation using WRF model
- Aerosol retrieval and its impact on weather and climate
- Dust storm forecasting using NWP models
- Modelling of coastal hazards and simulation using WRF model
- Tropical cyclone: observations and prediction and simulation using WRF model

Short course in Geospatial Technology for Coastal and Marine Disaster Management and Climate Change

May 4-31, 2015

19 participants 10 countries

Conducted at IIRS Dehradun
Sponsored by CSSTEAP, Dehradun



Summer School on Data Assimilation

16-20 December, 2013

17-21 December, 2012

Conducted at IIRS Dehradun (As part of ISRO-UK Space Agency collaboration)

13 and 21 participants from various organizations like VSSC, SPL, PRL, SAC, NARL, NRSC, ISAC, NCMRWF, IMD, IAF, INCOIS, NIO & IIRS participated in the programme.

Dr. Jan Van Leeuwen of University of Reading, UK and Director, NCEO was the chief instructor for the training programme and his team members included Dr. Tristan Quife, Dr. Anthony Brown, Dr. Melanie Ades and Dr. David Livings of Data Assimilation Research Centre, University of Reading, UK

Broad Syllabus: introduction to data assimilation and further insight was given on various methods of data assimilation like: variational methods (3DVar and 4DVar), Kalman Filters, particle filters etc. Its implementation to various case studies. Details of technical limitations of different data assimilation techniques. Hands on exercises includes the exposure to the Python (freely available programming language), and application of the 3DVar, 4Dvar, Kalman and Particle filters.



Educational activities in- and out-side the campuses



How Capacity Building more than training?

Before

- What is the best way to accomplish
- To whom are we trying to accomplish
- How do we measure that it is the best way

While

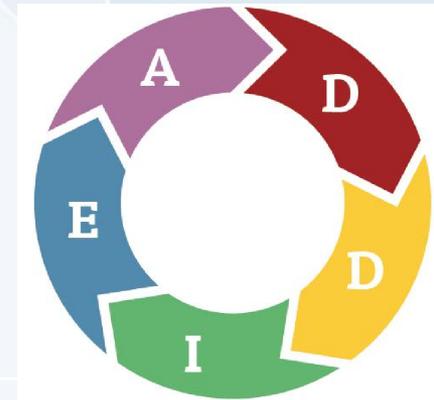
- How to quantify the performance of trainers, trainees, material and methodology ..

Post

- What measures to be taken for improvement..
- What new topics for future training needs..
- Alumni Feedback and suggestions
- How to enhance retention of knowledge gained

Instructional Systems Design (ISD)

- **Definition:** Practice of creating "instructional experiences which make the acquisition of knowledge and skill more efficient, effective, and appealing."
- **Purpose:** Determining the state and needs of the learner, defining the end goal of instruction, and creating some "intervention" to assist in the transition.
- There are many instructional design models but many are based on the **ADDIE model** with the five phases:
 - Analysis
 - Design
 - Development
 - Implementation
 - Evaluation



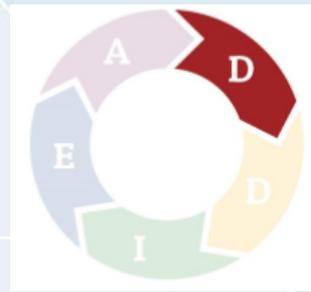
Best Practices: ADDIE

ANALYSIS - more general

- **Gather all information** which includes:
 - ❖ Instructional objectives, or what you wish to teach
 - ❖ Who the learners are, their abilities and circumstances
 - ❖ The setting and model of information delivery (online, classroom, workplace?)
 - ❖ Teaching considerations and barriers to learning
 - ❖ The timeline you're working with

After Analysis .. *Learning Solutions* → **DESIGN** model

- ❖ Short/Long Course
- ❖ Delivery mode (online, onsite)
- ❖ Practical (Hands-on)/Theoretical
- ❖ Planning Milestones
- ❖ Deliverables
- ❖ Competencies
- ❖ Expected Outcomes
- ❖ Assessment design



ADDIE Model ... in a nutshell

Gain Attention

- Present the learner with an introductory activity that engages him/her

Inform objectives

- Present the learner with learning objectives

Stimulate recall of prior learning

- Present the learners with an experience that stimulates their prior knowledge

Present Stimulus

- Present the learner with content materials

Provide Guidance

- Present the learner with examples

Elicit Performance

- Present the learner with practice activities

Provide Feedback

- Present the learner with practice and feedback

Assess Performance

- Present the learner with post-assessment items

Enhance Retention & Transfer

- Present the learner with resources that enhance retention & transfer of knowledge

What to Accomplish? - Context

1) SAR / Geoinformatics Workshops

Process Context	Sensors & Data Acquisition	Processing & Modeling	Storage & Retrieval	Dissemination & Use
Application Domain	Second Priority	Second Priority	Second Priority	Second Priority
Technology	First Priority	First Priority	First Priority	First Priority
Information Management	Second Priority	Second Priority	Second Priority	Second Priority
Institutional Setting & policy	Third Priority	Third Priority	Third Priority	Third Priority

Source: *Prof. Martien Molenaar, ITC, Netherlands* www.isprs.org/proceedings/XXXIV/6-W6/papers/molenaar.pdf

What to Accomplish?:

Disasters Management Programs

Process Context	Sensors & Data Acquisition	Processing & Modeling	Storage & Retrieval	Dissemination & Use
Application Domain	Second Priority	Second Priority	Second Priority	Second Priority
Technology	Second Priority	Second Priority	Second Priority	Second Priority
Information Management	First Priority	First Priority	First Priority	First Priority
Institutional Setting & policy	Third Priority	Third Priority	Third Priority	Third Priority

Choice of “context” should be prioritized as per program demands...

and so on

Whom To Accomplish ?

PURPOSE	PRIME FOCUS
Human Resource Development	Supply of Technical and Professional Personal (K12, UG/PG students, Teachers)
Organizational Strengthening	Strengthen Govt./NGOs <ol style="list-style-type: none">1. Management Capacity on Geo-ICT solution (systems, processes)2. Strategic Management Principles (professionals, field managers, trainees...)
Institutional Strengthening	Strengthen Capacity of Organizations to <ol style="list-style-type: none">1. Develop appropriate Mandates & Modus Operandi2. Legal & Regulatory Frameworks (Decision makers, Local & National Govt. / NGO Administrators, Law and Policy staffs, ...)

Challenges in multi-cultural / multi-ethnic learning environment

- Multi-cultural environment creates obstacles and opportunities for research and learning.
- Students/trainees come from different higher education systems each with a unique mission, history, and societal context
- Learning and teaching styles differ depending on cultural identity and heritage.
- Question is how to bridge differences in culturally dependent learning and teaching styles related to cultural identity and heritage
- This calls for specific feedback Questionnaire that helps to understand how the students feel about current courses offered.



Promoting Space Applications in Central Ministries/ State Governments

Prime Minister urged Dept. of Space (DOS) to pro-actively engage with all stakeholders to maximise the use of space technology in governance and development.

160 Space Applications Projects/Activities
Across **58** Ministries / Departments

- Majority of these projects (over 110) are related to geospatial applications
- About 30 projects are related to applications of satellite communication and navigation
- About 20 projects require technology development.
- About 55 projects have pan-India coverage.

Capacity Building as ISRO Projects



Prj. ID	Dept./ Mins.	Project
147	DoSEL	Practical/ Interactive exercises on GIS for schools for NCERT
148	--do--	Training of trainers - PG teachers (Geography) of Kendriya Vidyalaya / Navodaya Vidyalaya/ CBSE
149	--do--	Updation of existing course content & introduction in other disciplines
150	DoPT	Training of Civil Service Officials as part of LBSNAA Programs
151	--do--	Capacity building of faculty members of LBSNAA & updation of GIS lab
152	--do--	Training of Dy. Secy and other officers as part of ISTM Programs
153	--do--	Capacity building of faculty members of ISTM
154	DoYA	Mobile Application for collection of information by NYKS
155	--do--	Capacity Building of RGINYD personnel
159	--do--	Monitoring Rashtriya Uchchar Shiksha Abhiyan (RUSA) Funded Projects in States

148. Training of trainers - PG teachers (Geography) of Kendriya Vidyalaya/ Navodaya Vidyalaya/ CBSE (DoSEL/MHRD)



- **442** PG teachers of Geography from KVS/ NVS/ CBSE affiliated schools nominated by NCERT trained in two batches at 20 Centres distributed across the country.
 - July 27 - August 7, 2015 [292 teachers trained parallel at 19 centres]
 - Jan 4-15, 2016 [150 teachers trained parallel at 9 centres]
- **Course content** designed jointly by ISRO and NCERT based on NCERT Geography syllabus of Class-XI and XII.
- **Course material** (lectures, hands-on exercises) was prepared in advance and used by all partner institutions for uniformity.
- Programme was completely **funded by NNRMS/ISRO**. Close-out report submitted.
- Follow-up action for training remaining teachers to be taken by NCERT. **NCERT is planning to take up internet based courses** in different phases from its office. ISRO will provide technical support as needed.

150 (WG22). Training of Civil Service Officials as part of LBSNAA Programs (DoPT)



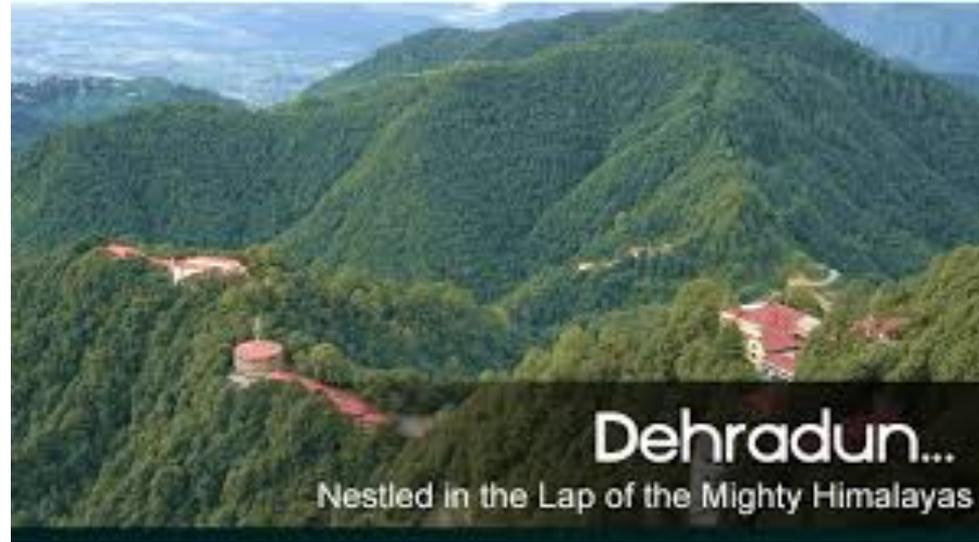
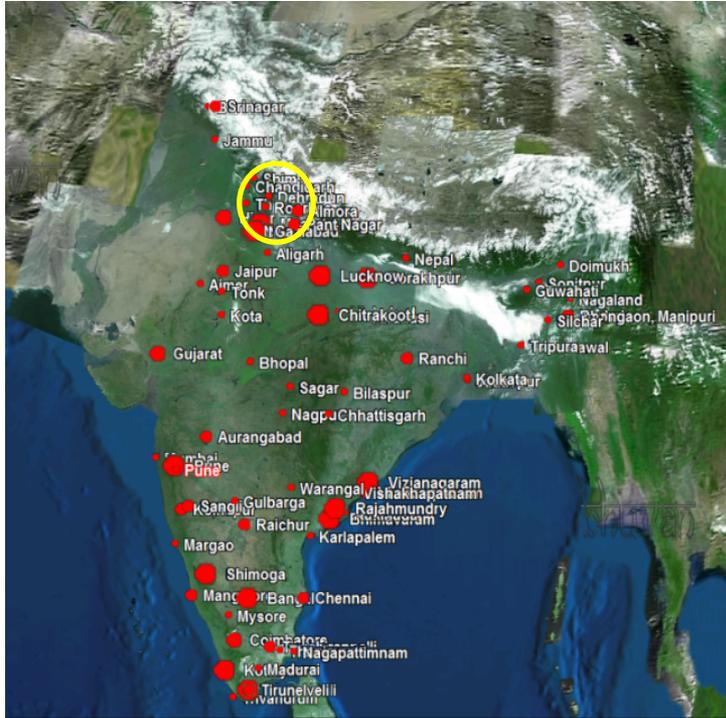
- Sessions on **Space Technology based Applications** included in the course curriculum of the training programmes conducted by **LBSNAA** for different levels of officials.
- Faculty for conducting the sessions identified by ISRO HQ.
- Sessions conducted by ISRO:
 - Space Technology and its Applications in Oct. 2015,
 - Bhuvan and its Applications in May 2016,
 - Space based Applications in Development Administration in Aug 2016,
 - Space Technology Applications in Disaster Response in Nov 2016 .
- Around **400** officers attended the sessions.
- **Continuous activity**; LBSNAA informs about the sessions to be conducted.
- Next session on ‘Bhuvan as a decision making tool’ planned on April 26, 2017 for IAS Professional Course (Phase-I). Further sessions will be conducted as and when required.

- **Upgradation of GIS Lab:**
 - Report containing recommendations for upgradation of GIS Lab submitted to Dy. Director (Sr.) & Centre Director, Centre for Rural Studies, LBSNAA on Feb 5, 2016.
- **Capacity building of faculty members of LBSNAA:**
 - Shared the academic calendars of IIRS & NRSC and requested them to depute faculty.
 - 4 faculty attended the distance learning course on 'Geospatial Technology for Urban Planning' (Feb 11 - Mar 15, 2016)
 - 1 faculty partially attended the course on 'Geoweb services & Geoportal Applications' (June 28 – July 15, 2016)
 - 2 faculty from LBSNAA attended one-week training course on 'Space Technology Applications in Governance & Development' at IIRS during March 6-10, 2017, organised especially for CTI/ATI faculty.

- **Mobile-App** & Bhuvan based solution for '**Geotagging of Youth Clubs**' developed. (http://bhuvan.nrsc.gov.in/governance/yas_nyks)
- **Videos** (Hindi & Eng.) & **Help Document** for operating the Mobile-App and geoportal prepared & made available in Bhuvan.
- Conducted training programmes:
 - **Awareness programme** at Delhi in **Feb'16**, attended by **~250 youths** from 10 States.
 - **State-level training programme** at Dehradun in **Apr'16** for Uttarakhand NYKS officials as a proof of concept, attended by **26** officials.
 - **National level training programme** for State Coordinators conducted in **Jul'16** at IIRS and NRSC; attended by **64** officials.
- Information on **2056** youth clubs is uploaded in Bhuvan portal as on April 18, 2017 out of which 117 geotags are moderated.
- MoU between NYKS and NRSC/ISRO signed in Sept., 2015.

Welcome to beautiful Dehradun

Dehradun @ Foot-hills of Himalayas



Welcome to beautiful Dehradun

A city of Institutions

Forest Res Inst



Survey of India



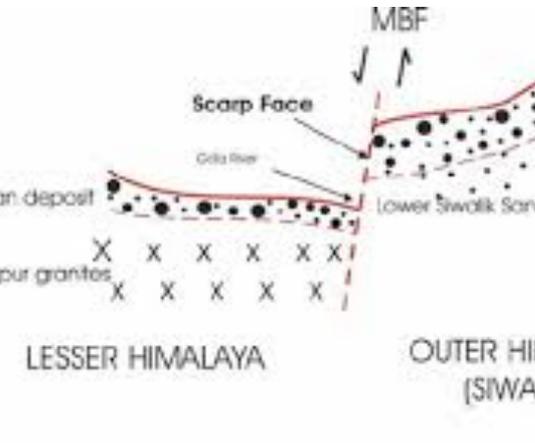
IMA

IIRS



Welcome to beautiful Dehradun

Dehradun: A Paradise for Education tour



Agro-ecosystem in Himalayan landscape, Chamba, Tehri Garhwal



26 11 2014

Summary

- Quality Capacity building needs in-depth instructional system design model for retention of knowledge
- Development of Curriculum development should gain attention of the learners and at the same time meet the objectives of the training/education program.
- Distance learning can help in mass awareness programs on geospatial technologies amongst UG and professionals across the Govt. and private sectors.
- ISRO's capacity building efforts are on at all levels to make the geospatial technology experts for the country's needs in future.

An ISO 9001-2008 Institute



Welcome to IIRS – a GJ Institute

www.iirs.gov.in

Thank you for your attention!

