

Indian Institute of Remote Sensing



**Indian Institute of Remote Sensing
(National Remote Sensing Centre)
Indian Space Research Organisation,
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Uttarakhand**

I INDIAN INSTITUTE OF REMOTE SENSING
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15.	<p>Abstract (with Keywords) This report summarizes all the major activities of IIRS during the period April 2007 – March 2008 including education, research, training , student dissertation list and faculty information. It also lists the major events and visits of important dignitaries. The important research findings of major research projects and student project/ thesis work are provided. Keywords : Training, Education, Research, Project , Publications</p>				

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1.0 IIRS MISSION STATEMENT

Promote excellence and professional education in the field of Remote Sensing and Geoinformation Science. Achieve the goal through research, user dialogues and sharing of experience in the field of natural resource survey, mapping, infrastructure development and environmental management for sustainable development. Address on inter-disciplinary interface including attention to socio-economic and environmental considerations.

Quality Policy of NRSC :

“Strive to provide high quality data products and value added services in a timely manner and facilitate enhanced utilization of remote sensing including Capacity building”

Organisational Structure

Indian Institute of Remote Sensing (IIRS), formerly known as Indian Photo-Interpretation Institute (IPI), was set up in 1966 under the aegis of the Survey of India to provide comprehensive training with hands on experience of the emerging technology in collaboration with the Government of The Netherlands, on the pattern of the International Institute for Geoinformation Science and Earth Observation (ITC), Enschede, The Netherlands. Institute was merged with National Remote Sensing Agency (NRSA) in July 1976. In 1983 IPI was renamed as Indian Institute of Remote Sensing (IIRS) and in the year 1980, NRSA came under the umbrella of Department of Space (Government of India), which is the nodal agency for the development and application of space technology and science for the socio-economic benefit of the nation. In order to enable NRSA to carry out its responsibilities in a more effective manner, the Government has converted it into a Government entity, to be called as National Remote Sensing Centre (NRSC), a Centre under DOS/ISRO, with effect from 1st September, 2008. The training activity of the institute are a group of two technology and six application divisions with the support sections namely library, IIRS data and Equipment cell (IDEC), technical , administration, purchase and stores and accounts section.

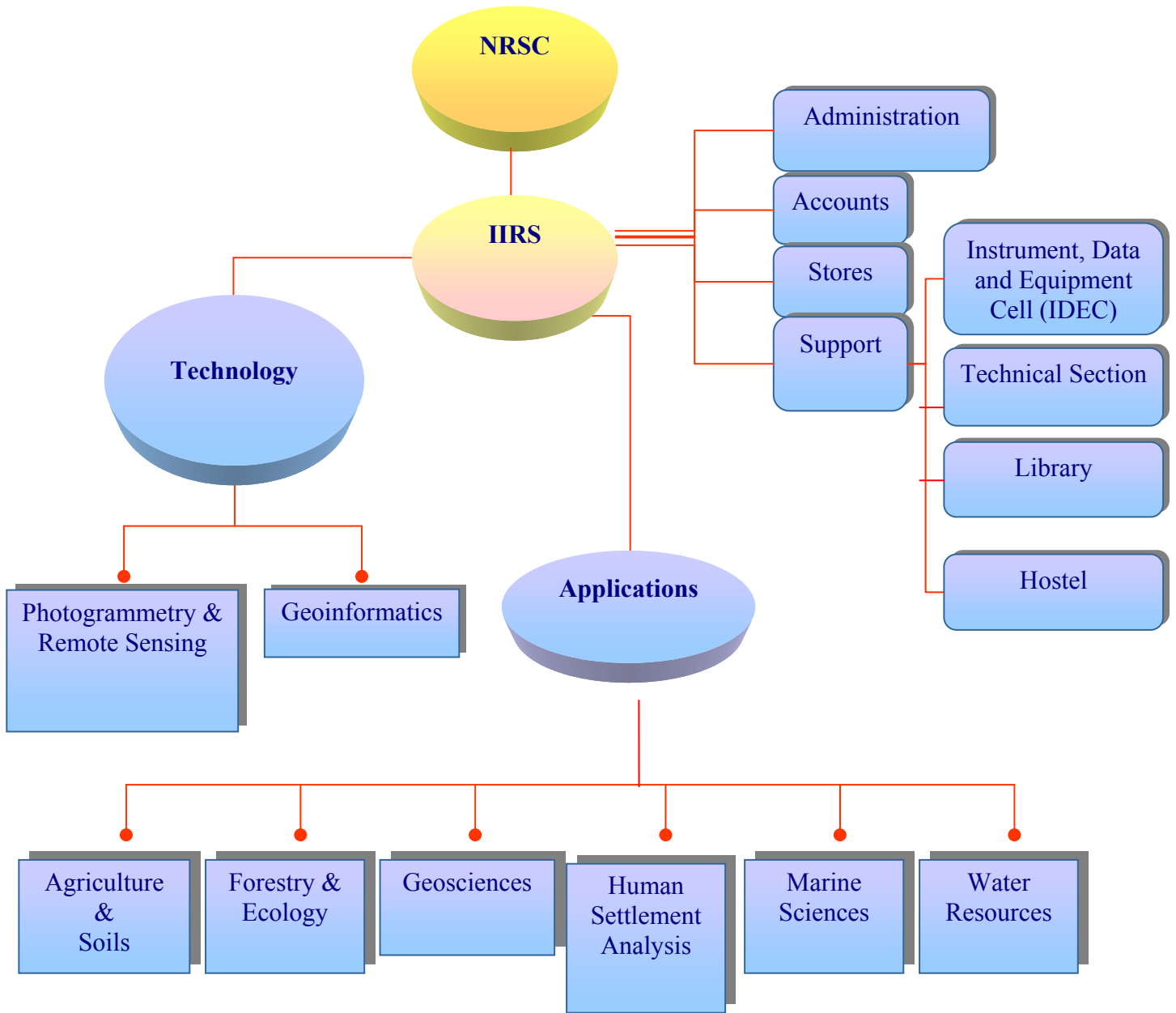


Figure : Organisational Structure

2.0 EDUCATION AND TRAINING

2.1 M. TECH.

M.Tech. program was initiated in 2001 as an accredited program with the Andhra University (AU), Vishakapatnam. AU recognizes the Post Graduate diploma awarded by IIRS as equivalent to course work for 2 semesters of M,Tech programme followed by research project making a total duration is of 24 months. The status of the programme is as under:

Batch	No. of students enrolled	No. of students awarded Degree	Remarks
2002-2004	19	16	-
2003-2005	13	13	-
2004-2006	11	11	-
2005-2007	4	3	-
2006-2008	11	9	All formalities in respect of 1 students completed i .and recommended to Andhra University for degree.
2007-09	7	Pursuing	All formalities completed and recommended to Andhra University for degree.
2008-10	10	Pursuing	
2009-2011	14	Pursuing	
Total	89	52	

Thus as of now **89** students have been admitted and **52** have been awarded M. Tech by Andhra University. The Andhra University has further agreed to continue the recognition of IIRS based M. Tech. Program for further period of five years, i.e., till 2011.

- Currently 24 students (2008-10 batch : 10 students and 2009-2011 : 14 students) are pursuing their M.Tech at IIRS

2.2 Joint M.Sc. Program with ITC, the Netherlands

IIRS presently conducts (1) M.Sc. Course in Geoinformatics and (2) M.Sc. Course in Geohazards (6 courses in Geoinformatics and 2 courses in Environment Analysis and Disaster Management and 3 courses in Hazard Risk Analysis have been conducted). These courses are of 18 months duration and

are conducted with collaboration of the International Institute for Geo-information Science and Earth Observation (ITC), the Netherlands. ITC awards the M.Sc. Degrees under IIRS-ITC Joint Logo Program.

M.Sc Geoinformatics	Completed in 2008-2009	Pursuing	Completed by March 2008	Remarks
1 st 2002-03			10	
2 nd 2003-04			10	
3 rd 2004-05			8	
4 th 2005-06			7	
5 th 2006-07			9	
6 th 2007-08	10			
7 th 2008-09		5		

As of now **59** students have been admitted and **54** have been awarded M.Sc in Geoinformatics under IIRS-ITC Joint logo programme.

M.Sc Geohazards	Completed in 2008-2009	Pursuing	Completed by March 2008	Remarks
1 st 2003-04 (M.Sc EADM)			8	
2 nd 2004-05			8	
3 rd 2005-06			7	
4 th 2006-07			5	
5 th 2007-08	7			
6 th 2008-09		10		

As of now **45** students have been admitted and **28** students have been awarded M.Sc in Geohazards under IIRS-ITC Joint logo programme.

2.3 Training Programs Completed

SL.	NAME OF COURSE	NO. OF STUDENTS	PERIOD & DATE
1	ITEC/SCAAP sponsored Short Course on Remote Sensing with Special Emphasis on Digital Image Processing	17	8 weeks 5.1.2009 to 27.2.2009
2	Basic Photogrammetry & Remote Sensing	3	4 months 3.3.2008 to 27.6.2008
3	PG Diploma Courses in: (for Venezuelan participants) - Digital Photogrammetry - Marine Science	2 1	10 months 3.3.2008 to 28.12.2008
4	ISRO-NNRMS Sponsored Courses on RS & GIS Applications in: - GIS Technology and Applications - Forestry/Botany/Ecology - Cartography and Mapping - Urban and Regional Planning - Water Resources - Geosciences - Agriculture and Soils	7 6 5 9 10 2 4	2 months 5.5.2008 to 27.6.2008
5	PG Diploma Course in Geo-Hazards 2007-08	07	10 months 2.7.2007 to 25.4.2008
6	PG Diploma Course in Geoinformatics 2007-08	13	10 months 2.7.2007 to 25.4.2008
7	ITEC sponsored short course on Geoinformatics	15	8 weeks 7.7.2008 to 29.8.2008
8	Certificate Courses in Geoinformatics : - LIS - Geosciences - Forest Management - Coastal Zone Management - Soils & Land Use Planning - Water Resources Mgt.	03 01 01 01 02 01	4 months 7.7.2008 to 31.10.2008
9	M.Sc. in Geoinformatics 2007-08	8	18 months 2.7.2007 to 16.1.2009
10	M.Sc. in Geohazards 2007-08	07	18 months 2.7.2007 to 16.1.2009
11	CSSTEAP International Training Course "International Training course on Application of Space Technology for Disaster Management Support with emphasis on Drought Monitoring, Desertification and Crop Yield Prediction	16	4 weeks 14.7.2008 to 8.8.2008
12	Remote Sensing : An Overview for Decision Makers	9	4 days 16.9.2008 to 19.9.2008

13	CSSTEAP twelfth PG course on RS and GIS	18	9 months 1.10.2007 to 30.6.2008
14	PG Diploma Courses in: <ul style="list-style-type: none"> - Agriculture & Soils - Digital Photogrammetry - Forestry & Ecology - Geology, Geomorphology and Hydrogeology - Urban & Regional Planning - Water Resources - Marine Science 	03 03 07 02 04 03 02	10 months 3.3.2008 to 28.12.2008
Total		192	

2.4 Special training programme conducted during 2008- 2009

TITLE OF COURSE	USER ORGANISATION	DURATION AND PERIOD	NO. OF TRAINEES
INTERNATIONAL			
Short Course on Geoinformatics	ITEC/SCAAP, MEA	7.7.2008 to 29.8.2008	15
Short Course on Remote Sensing with Special emphasis on DIP	ITEC/SCAAP, MEA	5.1.2009 to 27.2.2009	17
NATIONAL			
Special Course on RSGIS in Ground Water Studies	GSDA, Pune	31.3.2008 to 11.4.2008	20
Refresher Course for ISS Officers	Ministry of Statistics	31.3.2008 to 4.4.2008	09
Special Course on RSGIS in Ground Water Studies	GSDA, Pune	15.4.2008 to 25.4.2008	18
RS and GIS with Special Emphasis to Drinking Water Supply	Department of Drinking Water Supply, Ministry of Rural Development, New Delhi	12.5.2008 to 16.5.2008	26
MODIS Workshop	Antrix Corporation	12.5.2008 to 15.5.2008	25
Special Course on RS and GIS for PG students	University of Pune	9.6.2008 to 20.6.2008	10
Aerial Photogrammetry and Remote Sensing	Commissioner, Survey Settlements & Land Records, Bangalore	23.6.2008 to 4.7.2008	10
Application of RS and GIS in Forestry	Ministry of Environment and Forest	7.7.2008 to 11.7.2008	20

Spl. Course on GISc. for NCERT PG Teachers / Resource Persons	NCERT	1.7.2008 to 25.7.2008	22
Spl. Course on GIS applications in Irrigation Water	UP Irrigation Dept.	1.9.2008 to 26.9.2008	19
Spl. Course on Application of RS and GIS for Natural Resources Management for ISS Officers	Ministry of Statistics and Programme Implementation	22.9.2008 to 26.9.2008	16
Spl. Course on Terrain Height Data Generation	-	29.9.2008 to 17.10.2008	11
Spl. Course on GIS using Mapinfo	GSDA, Pune	13.10.2008 to 24.10.2008	20
Spl. Course on Concept and Application for Geoinformatics to Hazards (Module IV)	TISS, Mumbai	29.9.2008 to 7.11.2008	13
Spl. Course on Application of RS and GIS for Natural Resources Management for ISS Officers	Ministry of Statistics and Programme Implementation	17.11.2008 to 21.11.2008	19
Spl. Course on RS and GIS with special emphasis to drinking water supply	DDWS, Ministry of Rural Development	1.12.2008 to 5.12.2008	12
Special Course on "Applications of RS and GIS in Groundwater Studies"	CGWB	19.1.2009 to 30.1.2009	17
RS and Photogrammetry	Govt. Polytechnic, Dehra Dun	16.2.2009 to 20.2.2009	10
Application of RS and GIS for natural Resources Management for ISS Officers	Ministry of Statistics and Programme Implementation	2.3.2009 to 6.3.2009	12
RS and GIS Applications to Water Resources Management	IMTI, Trichy	16.2.2009 to 27.2.2009	18
Radar RS & Applications	DOS	16.3.2009 to 27.3.2009	23
Total			350

2.5 Quality Assurance (QA)

As part of our QA effort, especially for educational programs, written test followed by interview of qualifying candidates interview has been adopted as mode of selection, thus done for M. Tech., M.Sc. (GIT and HRA). The M. Tech. and other students registered at IIRS to undertake research work form Ph.D. are required to make presentations on (a) Recent work plan; (b) mid term progress and (c) pre thesis submission

2.6 ISO certification of IIRS

In order to be a part of NRSC ISO Quality system, IIRS started taking initiation for streamlining various training activities and in house processes towards standard ISO procedures. Towards this, two internal audits by NRSC audit teams visited IIRS and suggested the ways for ISO standard procedures. Finally, Mr. B. Satish Rao, External Auditor, Visited IIRS, Dehradun towards ISO certification on 20.02.2009. Mr. Joseph Arokiadash, Management Representative, NRSC and V. Subramanian, internal auditor, NRSC were also present. Dean, IIRS and all heads/in-charges of the divisions along with the involved people were present during the opening meeting. The audit process started with thorough checking of the various processes towards admission, curriculum development, document control, corrective and preventive actions etc. Auditor also visited Geoscience division and MIDAS Laboratory to have an on-site feeling how the system works at IIRS. Finally, Auditor explained his findings in the closing meeting and has raised three minor non-conformaties towards the ISO certification of IIRS and recommended IIRS for ISO 9001:2000 certifications after duly complying the non-conformaties.

2.7 STUDENT DISSERTATION PROJECTS

2.7.1 IIRS-AU M.Tech Program (2007– 2009)

Sl.No.	Name	Title of the Dissertation	Guide
1	Mr. Guatam Ghosh	Spectral Characterization and Mapping of Salt Affected Soils using Hyperspectral Satellite Data	Dr. Suresh Kumar
2	Mr. Prashant Patil	Geospatial Modelling Approach for Estimation of Biomass and Carbon in North West India Analysis of Productivity and Biomass Dynamics using Remote Sensing	Dr. Sarnam Singh
3	Shri Mahendra Singh	Hydrogeochemistry of surface and ground waters and carbon fluxes in riverine environment of Doon Valley.	Shri. S.K.Shrivastava
4	Mr. Abhijit Basu	Understanding and modeling of regional carbon cycle over Indian Subcontinent (Estimation and analysis of Carbon Dioxide Fluxes over land and ocean surfaces.	DR. R.K.Nayak
5	Mr. ML Srivastava	Geospatial Analysis of Productivity and Biomass Dynamics using Remote Sensing and Field Inventory Data	Dr.S.P.S.Kushwaha

2.7.2 IIRS-ITC M.Sc GEOINFORMATICS (2007– 2009)

STUDENT	RESEARCH TOPIC	IIRS GUIDES	ITC GUIDES
Mr. Shashi Kumar	Forest parameter retrieval from ENVISAT ASAR data for biomass inventory in Dudhwa Tiger Reserve, U.P., India	Dr. S.P.S. Kushwaha & Dr R.S. Chatterjee	Dr. Wietske Bijker
Mr. Vijay Shanker Pandey	Sampling scheme optimization using Uncertainty in fuzzy agriculture parcel classification in the context of urban expansion in urban fringe areas	Ms. Shefali Agrawal	Prof. Alfred Stien
Mr. Naveen Kumar Sidha	A framework for the management of spatial data quality information	Dr. Sameer Saran	Dr. Ivana Ivanova
Mr. Rahul Raj	Analyzing the effectiveness of different aggregation algorithms for reliable land covers area estimation	Dr. Yogesh Kant	Dr. Nicholas Hamm
Mr. Kumar Gaurav	Image mining for modeling (dynamic) land Cover elements to assess landslide Vulnerability	Mr. Iswar Das & Dr. Sameer Saran	Prof. Alfred Stein
Mr. Navneet Kumar	To investigate the potentiality of regression kriging in the estimation of soil organic carbon versus the extract result from the soil map	Dr. A. Velmurugan Dr. S.P. Agarwal	Dr. Abbas Farshad Dr. Nicholas Hamm
Mr. Amitabh Dutta	Fuzzy C-Means classification of multispectral data incorporating spatial contextual information by using Markov Random Field	Dr. Anil Kumar	Dr. Valentyn Tolpekin
Ms. Alka Singh	Analyzing tea replantation pattern by wavelet and geospatial technique	Dr. Anil Kumar	Prof. Alfred Stein & Mr. Rishiraj Dutta (advisor)

2.7.3 M.Sc Geo-Hazards (2007– 2009)

S. No.	Name	Tentative Topic	Supervisors	
			IIRS	ITC
1.	Amarinder Singh	Characterizing runoff generation mechanism for modelling runoff and soil erosion, in small watershed of Himalayan region	Dr. Suresh Kumar	Dr. D. P. Shrestha
2.	Anupam Pandey	Mapping of 2006 Flood Extent in Birupa Basin, Orissa, India, Using Visual and Digital Classification Techniques on RADARSAT Image: A Comparative Analysis	Dr. V. Hari Prasad	Drs. Nanette C. Kingma Dr. Harald van der Werff
3.	Arun Mondal	Flood Risk Assessment on Meso scale, in a part of Birupa river basin using temporal RADARSAT data (2003, 2006 & 2008)	Dr. S. P. Aggarwal	Drs. Nanette Kingma
4.	Sashikant Sahoo	A Semi Quantitative Landslide Susceptibility Assessment using Logistic Regression Model and Rock Mass Classification System: Study in a Part of Uttarakhand Himalaya, India	Mr. I. C. Das Prof. R.C. Lakherra	Dr. Cees J. van Westen
5.	Dilip Kumar Maity	Hydrological and 1 D Hydrodynamic Modelling in Manali Sub-Basin of Beas River, Himachal Pradesh, India	Ir. Praveen K. Thakur	Ir. Gabriel Norberto Parodi

3.0 Research Activities

3.3 *International Collaborative Projects*

- IIRS-ITC ESA EO CAT-1 Project on SAR Interferometry for landslide displacement measurement and monitoring.
- Innovative Research Project on the Application of Radarsat-1 Interferometric Data for Subsidence Mapping (name as DELTA Project), jointly sponsored by Canadian Space Agency (CSA), United States Geological Survey (USGS) and National Aeronautics and Space Administration (NASA).
- RECLAIM Project: Regional Capacity Enhancement for Landslide Mitigation in Asia in collaboration with ADPC, Bangkok, NGI, Norway and South-Asian Countries.
- Strengthening Capacity on multi-hazard Risk Assessment in Tsunami affected Countries-SCRATCH

3.3 *ISRO/DOS Projects*

- Natural Resources Repository (NRR): LULC – 50K Project (Haryana & Punjab States and Western U. P.)
- Natural Resources Repository (NRR): Land Degradation Mapping – 50K Project (Uttarakhand; Western U. P. and Andaman & Nicobar Islands)
- Establishment and functioning of VRC (Village Resource Centre) in Uttarkhand and Himachal states
- National Level Land use/Land Cover Mapping using Multitemporal AWiFS Data
- Landslide Hazard Zonation of North Eastern Region along Shillong-Silchar-Aizwal Highway Corridor
- DMS Project: Rainfall Thresholds for Initiation of Landslides and Decoupling of Spatial Variations in Precipitation, Erosion, Tectonics in Garhwal Himalaya.
- Assimilation of Oceansat-II-scatterometer derived winds in mesoscale models using advance assimilation technique.
- Uses of Oceansat-II derived oceancolor data for ocean process studies.

3.3 *IGBP (ISRO Geosphere Biosphere Program)*

- National Soil and Vegetation Carbon Budget
- Land surface parameter support for PRWONAM Meso-scale Observational Program
- Marine Aerosol studies using IRS P4 OCM
- Ecosystem Dynamics in North East India; Land Use Land Cover Change *vis a vis* Climate Change”.

- Terrestrial Biomass and Productivity Assessment
- Land use / Land cover dynamics in Sutlej & Ghaghar River basins
- Monsoon variability studies with Regional Climate Models using satellite derived surface parameters- Land Surface Parameters – Land use, snow fraction and vegetation fraction using Earth observation data.
- Aerosol Radiative Forcing over India – Characteristics of spectral properties of aerosols over Dehradun environs
- Modeling the regional carbon cycle over the Indian subcontinent and surrounding oceans

3.3 EOAM (Earth Observation Application Mission Projects)

- GIS aided Land Evaluation based on Biophysical Characteristics using Temporal Satellite Data
- Hyper spectral signatures – field measurements, analysis and interpretation of satellite data . Field and laboratory spectral measurements of eroded and salt affected soils
- Evaluation of spectral and temporal characteristics of MODIS data for land surface characterization and geological applications
- Evaluation of approaches of Integrated use of of Spaceborne LIDAR with optical and microwave satellite datasets for terrain feature extraction and mapping.
- FAO-Global AEZ approach in Agricultural Land Use Planning in Rainfed Agro-ecosystem

3.3 RISAT JEP

- Geoenvironmental Mapping of Jharia and Raniganj Coalfields from Multi-look–Multi-polarization and Interferometric Synthetic Aperture Radar (SAR) Data.
- Potentials and limitations of InSAR for Landslide Hazard Assessment.
- Timber volume and biomass assessment using SAR data

3.3 TDP (Technology Development Project)

- Understanding and modeling the estuarine and coastal processes of the water around India
- Potential of SAR Interferometry for studying land degradation due to ravine development and propagation.
- Estimation of Snow Cover area and Snow/ice biophysical parameters estimation over Himalayan mountainous areas using Remote Sensing and GIS Techniques”,

- Modelling of Hydrological components using remote sensing and GIS in Beas basin
- Modelling Dynamics of Urban Spatial Growth”
- Soil Erosion Assessment at catchments scale using satellite data and GIS in Himalayan region – A case study in Stile Rao watershed
- Feasibility study on Potential use of Microwave SAR data in Land Degradation Assessment
- Extraction of information from high resolution satellite images with special emphasis on natural features
- Feasibility of Using High Resolution Remote Sensing To Estimate Biophysical Characteristics and Yield Potential of Agro-forestry Systems

3.3 User Projects

- Biodiversity Characterization at Landscape Level (DBT)
- Spatial Landscape modeling and Biodiversity Information System (DBT)
- Generation of Sustainable Development Plans for Pathri Rao Sub-Watershed using RS and GIS (DST).
- Forest and Land Degradation Study in Tons Watershed. (MoFE)
- Wildlife Habitat Modeling in Kaziranga NP, Assam (MoFE)
- Indian Bio-resource information network (IBIN)
- National Communication-II : Assessment of forest soil C pool and dynamics of India (1995-2007 MoEF Project:)

4.0 International Collaborations

4.1 IIRS-ITC Joint Collaboration Program

The collaboration between Indian Institute of Remote Sensing (IIRS/NRSA) and International Institute for Geoinformation Science and Earth Observation (ITC) spans over last 40 years. Based on the success of the earlier collaborations, infrastructural facility and regional concern, it was decided to start a new collaborative phase focusing on disaster management. As a result a new project was launched in collaboration with IIRS and other institutes from the Netherlands, namely International Institute for Geoinformation Science and Earth Observation (ITC), The Netherlands, International Institute for Infrastructural, Hydraulic and Environmental Engineering (IHE), and Wageningen University (WU) for capacity building in disaster management. The project started in July 2000, known as GEONEDIS and completed in July 2004. During this programme, two new programme M.Sc in Geoinformatics and M.Sc in Geo hazard has been introduced at IIRS as a joint course programme and degree is being given by ITC. These courses are successfully running till date. A new joint project on research collaboration has been started with IIRS, NRSC and other DOS centers where joint research work, publication, visiting scientists and data sharing will be taken up.

4.2 International Cooperation with DISAFRI, University of Tuscia, Italy for working on carbon exchange and CDM potential - reg.

Under the collaboration, the exchange of carbon between forests plantation and atmosphere will be investigated using eddy covariance technique. The site is in Haldwani Forest Division. DISAFRI is providing equipment, software and training on techniques to estimate model carbon exchange.

4.3 TWAS Fellowship

Mr. Md. Golam Mahboob of Bangladesh, underwent PG Diploma Course in Agriculture and Soils at IIRS under TWAS Fellowship for Research and Advanced Training, from March 3, 2008 to December 26, 2008.

4.4 RECLAIM

Regional Capacity Enhancement for Landslide Impact Mitigation in Asia in collaboration with Asian Disaster Preparedness Centre (ADPC), Bangkok, Norwegian Geotechnical Institute (NGI), Norway and South-Asian Countries namely, Bhutan, India, Indonesia, Nepal, Sri Lanka, and Thailand. The goal of the RECLAIM project is to reduce the landslide disaster vulnerability of human settlements, infrastructure, and critical facilities in the targeted countries of Bhutan, India, Indonesia, Nepal, Sri Lanka, and Thailand. An international workshop and training programme on "Landslide Inventory Hazard and Risk Management" for a period of 5-days has been conducted in January, 2008.

5.0 New Technical Facilities at IIRS

5.1 Carbon Flux Measurement and Modeling

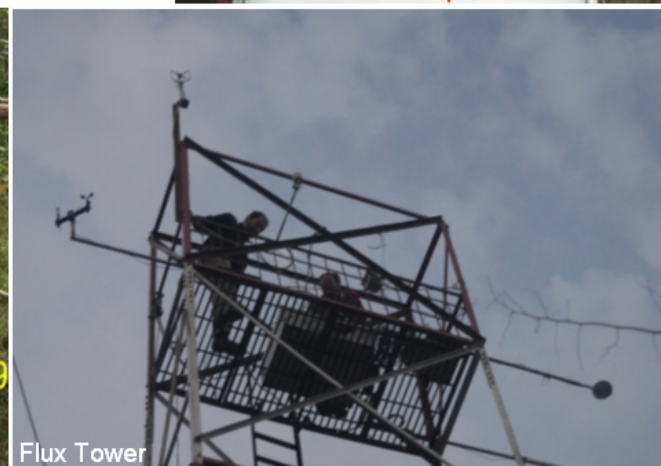
The Indian Institute of Remote Sensing (IIRS) has undertaken a National Carbon Project (NCP) under Geosphere Biosphere Programme of the Indian Space Research Organization (ISRO) to estimate the carbon pools and fluxes in different terrestrial ecosystems of India. The project envisages temporal inventory of the forest and soil carbon stocks as well as measurement and modeling of carbon exchange along atmosphere-vegetation boundary. The nationwide forest and soil carbon stocks inventory is currently in progress. Six carbon flux measurement towers using eddy covariance techniques are planned in five major forest types of the country at Haldwani (mixed forest plantation), Pauri (oak forest), Barkot (sal forest) in Uttarakhand, Betul (teak forest) in Madhya Pradesh, Dandeli (tea plantation) and Nagarhole (moist deciduous forest) in Karnataka. The first tower at Haldwani has benefit of the cooperation and expertise of the Department of Forest Science and Resources (DISAFRI) of the University of Tuscia, Italy while the tower at Pauri will benefit from the Asiaflux experience of the Department of Meteorological Environment of the Forestry and Forest Products Research Institute, Ibaraki, Japan.

The 20m tall Haldwani tower was erected few months ago. All eddy covariance equipment were installed between 14-17 January, 2009. The tower was commissioned and declared operational on 18th January, 2009 by a joint team of scientists from Italy- Dr. Dario Papale, Dr. Paolo Stefani and Mr. Federico Chiani from DISAFRI, University of Tuscia, Viterbo, Italy and India- Dr. S.P.S. Kushwaha, Dr. N.R. Patel, Dr. Yogesh Kant and Dr. Rabindra Nayak from IIRS/ISRO, Dehradun. The tower has 3D Sonic Anemometer, closed path Infrared Gas Analyzer, Automatic Weather Station, PAR Sensor (PAR \downarrow & PAR \uparrow), Radiation Sensor (R_N \uparrow , R_N \downarrow & R_S \downarrow) and Soil Sensor (temperature, moisture and heat flux). The Indian Council of Forestry Research and Education (ICFRE) and Forest departments of the respective states are collaborating in the study. The tower was visited by the Shri R.B.S. Rawat, Principal Chief Conservator of Forests, Government of Uttarakhand on 16th January for first hand information on the scientific objectives of the tower. Data collection and analysis has been utilized

India-Italy Collaborative Project on Measurement of CO₂ Flux over Forested Landscape

1. Sonic anemometer
2. Closed path gas analyzer
3. Radiation sensors
4. Automatic weather station
5. Soil sensor (moisture, heat flux & temperature)

(Measurement frequency: 10 MHz)



5.2 Ion Chromatograph

IIRS Data and Equipment Cell (IDEC) is further strengthened with the installation and operationalisation of Ion Chromatograph (Metrohm 861 Advanced Compact IC). The instrument provides precise results for analysis of cations and anions in water quality research. In addition to water sample, even soil samples when converted into liquid form using standard sample preparation techniques, can be used for chemical analysis. At present, different cations and anions which can be measured include – lithium, sodium, potassium, calcium, magnesium, barium, ammonium, strontium, zinc, cobalt, nickel, biogenic amines, fluoride, chloride, bromide, iodide, sulfate, sulfite, nitrate, nitrite, phosphate, acetate, formate, benzoate, selenite, succinate, arsenate, oxalate, fosetyl-aluminium, tetrafluoroborate. The instrument has many advantages, such as – (1) all the cations and anions present in sample can be analysed in a single run, (2) it is possible to detect trace amount of ions irrespective of the quantity of other ions, (3) low detection limit, and (4) low operational cost.



Metrohm 861 Advanced Compact Ion Chromatograph

5.3 PRSD Computer Lab

The Computer lab of the PRSD has been augmented with latest facilities of Digital Image Processing and GIS soft wares like Arc GIS, Envi, ERDAS etc. The lab is fully air conditioned with more than 50 numbers of computers.

5.4 PRSD Lecture and Practical Halls

The Lecture Hall and Practical Halls of the PRSD have recently been fully renovated. These are now fully air conditioned with modern tables with more space to use Lap Top etc. The lecture hall has two overhead projection systems and at a time 45 students can attend the lectures.

5.5 Lecture Theatre

A fully air conditioned Lecture Theatre with seating capacity of 90 persons has recently been added to IIRS. The lecture theatre has been constructed with the

international standards and has two overhead projection systems which can be integrated with ISRO net also.

5.6 Chemical Analysis Lab.

An air conditioned laboratory for analysis of soil and water samples having microprocessor based pH and conductivity meter, total organic carbon analyzer, ion chromatograph, high precision electronic balance, micropore filtration kit, muffle furnace and hot air oven. The samples are being analyzed for determination of pH, electrical conductivity, total carbon, inorganic carbon, total organic carbon, anions (carbonates, bicarbonates, sulphate, phosphate, acetate, fluoride, chloride and bromide) and cations (lithium, sodium, ammonium, potassium, calcium, magnesium). These estimates are quite useful for the students pursuing their studies in various national projects like carbon project, land degradation project, ISRO geo-sphere biosphere projects and several other projects sponsored by DBT, MOEF etc. This lab. has been operationalised at IIRS since April, 2007.

5.7 New Hostel Block 'E'

One new hostel (Named as 'E' block) building work on ground and first floors is near completion. The scope of ongoing work has full size basement floor and three floors. This block will accommodate 34 student rooms having attached toilets, also a VIP dining hall, Doctor room, Internet room and common areas.

Additional floor (ie. 3 rd floor) construction work has also started with 12 more rooms.

5.8 New residential quarters (under construction)

Following newly constructed residential quarters have been allotted to employees. Total no. of quarters have now become 76.

Type 'C'	-	1 No.	inside the campus
Type 'C'	-	2 Nos.	} outside the campus
Type 'D'	-	6 Nos.	
Type 'E'	-	6 nos.	

