BRIEF DETAILS OF COMPLETED PROJECTS IN EARTH RESOURCES DIVISION

Project Title	:	**Pilot project on identification and digital database creation of two selected mining leases of Sonbhadra district, U.P.**
Funding Agency		Department of Geology and Mining, Govt. of U.P.
Duration	:	May to July, 2017
Objectives	:	High resolution Cartosat 1 PAN and Google images
Study Area	:	The area under investigation covers two mining leases and surroundings in Billi Markundi area of Sonbhadra district in Uttar Pradesh.
Interim Findings	:	**Advantages:** (i) Computer based Geographical Information System (GIS) are noteworthy techniques for digitization of mining leases drawn on the cadastral maps. (ii) In hard rock area satellite image based information can be applied to some extent for mapping mining area on the basis of the difference in the spectral signature of the mined area from that of the surround rocky area (which is not witness mining) **Disadvantages:** (i) Difference in the area of mining lease as marked on cadastral map and as calculated in GIS from the digitized boundary. This error may increase if DGPS based coordinates are not taken into consideration. (ii) High cost of high resolution satellite images and non continuous coverage and no real time availability is a major limitation of satellite remote sensing based mining study. (iii) Small size of few acres of mining leases makes it difficult to identify them on low cost low or medium resolution satellite images. (iv) A number of sanctioned mining leases with common boundary/boundaries on one or other side make it cumbersome to ascertain from satellite image as if which particular area has been mined beyond the lease boundary by which particular lease holder . (v) Area estimates of mining area based on satellite image analysis might differ from those of the ground based area estimates.
Principal Investigator	:	Dr. Aniruddha Uniyal
Regular Manpower Involved		Sri S.Rao

Project Title	:	**High resolution satellite remote sensing and GIS based geomorphological mapping of upper and lower sub catchment of Rapti River**
Funding Agency		Department of Planning, Govt. of U.P.

Duration	:	One year (2015 –2016)
Objectives	:	High resolution Cartosat 1 and LISS IV satellite images
Study Area	:	The area under investigation covers upper and lower sub catchment of Rapti River in Uttar Pradesh.
Salient Results	:	The upper and lower sub catchment of Rapti covers parts of Shravasti, Balrampur, Siddharthnagar, Mahrajganj, Sant Kabirnagar, Gorakhpur and Deoria Districts of Uttar Pradesh. Older alluvial plain, Upper and Lower Piedmont and Active Flood Plain are the various geomorphic surfaces in the study area. The broad old flood plain of Rapti River with numerous relict channels including meander scars, oxbow lakes, old meanders and palaeochannels when analyzed in conjunction with the high sinuosity of Rapti channel and its active flood plain indicated the proneness of the active as well as old flood plain to frequent fluvial activity. This can be attributed to the frequent flooding during rainy season. Hence, active as well as old flood plains of Rapti River all through their length in Shravasti, Balrampur, Siddarth Nagar, Maharajganj, Gorakhpur and Deoria districts and active and old flood plains of tributaries of Rapti river viz. Rohini River in Maharajganj and Gorakhpur districts and Ami river in Sant Kabir Nagar and Gorakhpur districts should be avoided for colonization and construction of infrastructure facilities other than bridges, barrages and canals. In these districts even the civil engineering structures such as bridges and barrages should be constructed after remote sensing and GIS based detailed studies on channel dynamics, since, migratory behavior of Rapti River and its tributaries pose a great threat to the civil engineering projects across and in the close proximity of their flood plains and the relict channels (palaeo channels and old meanders etc).
Principal Investigator	:	Dr. Aniruddha Uniyal
Regular Manpower Involved		Sri S.Rao

Project Title	:	**Mapping of Seriously Polluting Industries of Uttar Pradesh**
Funding Agency		Uttar Pradesh Pollution Control Board
Duration	:	2015-16
Objectives	:	The main objective of the Project is creation of district wise maps showing locations of Seriously Polluting Industries (SIPs) for which latitudes and longitudes are to be provided by Uttar Pradesh Pollution Control Board.
Study Area	:	Districts of Uttar Pradesh having Seriously Polluting Industries (SIPs)

Salient Results	:	On the basis of the latitudes and longitudes of Seriously Polluting Industries as provided by U.P. Pollution Control Board the GIS maps showing locations of Seriously Polluting Industries have been created for 51 districts of U.P., namely for Agra, Aligarh, Allahabad, Amethi, Auriya, Azamgarh, Badaun, Baghpat, Barabanki, Basti, Bhimnagar, Bijnor, Bareily, Bulandsahar, Chandauli, Faizabad, Farrukhabad, Fatehpur, G.P. Nagar, Ghaziabad, Gorakhpur, Hamirpur, Hapur, Hardoi, Hathras, Jhansi, Jalaun, Jyotiba Phule Nagar, Jaunpur, Kanpur Dehat, Kushinagar, Lakhimpur, Lucknow, Mathura, Mau, Meerut, Mirzapur, Moradabad, Muzaffar Nagar, Pilibhit, Raebareily, Rampur, Saharanpur, Shahjahanpur, Shamli, Sitapur, St. Ravidas Nagar, Unnao, Varanasi and Sonbhadra. These maps have been provided to U.P. Pollution Control Board in hard copies as well as in soft copies.
Project Manager	:	Sri S. Rao

Project Title	:	**Space Based Information Support for Decentralized Planning (SIS-DP)**
Funding Agency		NRSC, Dept. of Space, Govt. of India
Duration	:	Three years and three months (From January, 2011 to May, 2016)
Objectives	:	i. Generation of ortho-rectified data products and DEM using Cartosat-1 stereo data & LISS-IV data. ii. Thematic mapping of landuse/lancover, infrastructure, drainage and slope etc. on 1:10,000 scale for creation of digital database for the entire state of Uttar Pradesh in a seamless mosaic. iii. Linkage of legacy data and spatial and non-spatial data of stake holding departments with the digital database for further use of such information for developmental activities at panchayats-level on scientific basis.
Study Area	:	Entire Uttar Pradesh.
Salient results	:	Under SISDP project seamless thematic layers of landuse, settlement, road, rail, canal and drainage lines have been created on 1:10,000 scale for the entire state of Uttar Pradesh and district wise as well. This GIS database has been created using high resolution orthorectified Cartosat 1 and LISS IV data. Further, the legacy data that was made available by stake holing departments was linked with the digital database. Aimed at assets mapping at the village level a GIS based pilot study for development block Mal in Lucknow district was taken up. Asset mapping of all the revenue villages of Mal Block of Lucknow district was completed and capacity building of PRIs in this block was also done. The thematic layers and spatial and non-spatial data under this project would be used by different stakeholding departments of Govt. of Uttar Pradesh for

		planning and implementation of different welfare schemes for the state of Uttar Pradesh.
Project Manager		Dr. V. Rajamani
Regular Manpower involved	:	Dr. V. Rajamani, Sri S. Rao and formerly Sri P. N. Shah

Project Title	:	**National Geomorphological and Lineament Mapping Project**
Funding Agency		National Remote Sensing Centre, Dept. of Space, Govt. of India
Duration	:	Three years (2011 to 2014)
Objectives	:	LISS-III satellite data and field based geomorphological and lineament mapping of entire Uttar Pradesh on 1:50,000 scale and creation of geodatabase of geomorphology and lineament themes along with their field information.
Study Area	:	The geomorphological and lineament mapping of entire country was carried out by different agencies under this project. Earth Resources Division of Remote Sensing Applications Centre-U.P., Lucknow was involved in the geomorphological and lineament mapping of entire Uttar Pradesh on 1:50,000 scale..
Salient Results	:	Geospatial database of geomorphology and lineament themes for entire Uttar Pradesh state covering 426 Topographical Map sheets (fully or partially) was created under this project. This geospatial database of geomorphology and lineaments is having level 3 classification indicating origin type and subtype of the feature. This database is crucial input for surface and ground water management and for suitable site selection for civil engineering projects such as road / rail alignments /bridges/ barrages and also for geotechnical investigation, geoenvironmental analysis and geo-hazard studies including seismo-tectonic investigations.\
Starting Date		Jan, 2011
Closing Date		May, 2014
Project Manager	:	Dr. Aniruddha Uniyal

Project Title	:	**Mineral Targeting in Lalitpur District**
Funding Agency		Dept. of Planning, Govt. of U.P.
Duration	:	One year (April 2012 to March, 2013)
Objectives	:	High resolution satellite remote sensing based investigations for demarcation of geomorphic and structural anomalies as probable

		indicators for economic deposits in Lalitpur district.
Study Area	:	The area under investigation lies in Lalitpur district of Uttar Pradesh, India and is bounded by Madhya Pradesh from east, west and south. However, Jhansi district lies in the immediate north of Lalitpur district.
Salient Results	:	During the course of present study detailed geomorphological and lineament maps of southern part of Lalitpur district were prepared using LISS-III and LISS-IV images and orthorectified Cartosat-1 and LISS-IV images. Further, the quartz reefs were also mapped in this study area. The major finding of this study was identification of geomorphic and structural anomalies in Pinsari, Sonrai, Berwar and Girar areas of southern part of Lalitpur district. The geomorphic and structural anomalies identified during the course of this study can be indicators of host rocks for economic deposits and are valuable inputs for different departments and researchers interested in detailed mineral investigations in this area.
Principal Investigator	:	Dr. Aniruddh Uniyal

Project Title	:	**Thematic Mapping and Hazard Zonation Study of Landslides along Rishikesh-Badrinath-Mana; Rishikesh-Gangotri and Dharasu-Yamunotri Route Corridors of Uttarakhand and Wangtu-Puh-Kaurik Corridor of Himanchal Pradesh**
Objectives	:	The objectives of the present study are given below :- (i) Thematic mapping of landslide parameters on 1:50,000 scale (ii) Generation of Landslide Hazard Zonation (LHZ) and Landslide Hazard Management (LHM) maps on 1:50,000 scale.
Study Area	:	The study area covers 3.0 km corridor on the either side of Rishikesh-Badrinath-Mana; Rishikesh-Gangotri and Dharasu-Yamunotri route of Uttarakhand and Wangtu-Puh-Kaurik route of Himanchal Pradesh
Data Used	:	The study has been carried out using Survey of India topographical mapsheets and IRS-LISS-III & LISS-IV satellite data of 2005-2009 period along with available geological maps and field information.
Salient Results	:	This Landslide Hazard Zonation & Landslide Hazard Management study was based on thematic mapping of 18 geoenvironmental parameters and base features through interpretation of IRS P6 LISS-III and LISS-IV satellite data and on screen digitization in ARC GIS software. This was followed by field reconnaissance, verifications of thematic maps, ground truth data collection and post field corrections in thematic maps. Thematic layers of geoenvironmental parameters were assigned weightages according to their importance in enhancing landslides. Finally, Landslide Hazard Zonation and Landslide Hazard Management maps were created through integration of thematic layers in Landslide Information System Software. Landslide Hazard Zonation

		maps were also created through integration in ArcGIS software version 10.0 Recommendations for management of landslide hazard zones include structural mitigation, soil conservation and biotechnical measures. minimization of anthropogenic intervention and need for immediate slope stabilization work in the recently widened stretches of Rishikesh-Badrinath-Mana; Rishikesh-Gangotri and Dharasu-Yamunotri routes in Uttarakhand and Wangtu-Puh-Kaurik route of Himanchal Pradesh
Starting date	:	October, 2009
Closing date	:	March, 2012
Project Manager		Dr. Aniruddha Uniyal
Regular Manpower involved	:	Sri P. N. Shah, Dr. Aniruddha Uniyal, Sri Sangharsh Rao & Sri P.P.S. Yadav

Project Title	:	**Remote Sensing and GIS Based Database Creation for Disaster Risk Reduction in and around Lucknow City**
Objectives	:	The objectives of the present study are listed below: (i) High resolution satellite data based landuse/ land cover, infrastructure and urban density mapping. (ii) Recording of geo-coordinates of critical facilities such as hospitals, fire brigade stations, veterinary hospitals, schools and creation of critical facility maps through conjunctive use of high resolution satellite images and GPS coordinates. (iii) Interaction with various line departments for supply of data pertaining to available resources and manpower. (iv) Linking the available resource data (supplied by different line departments) with the critical facility maps for creation of GIS based database.
Study Area	:	The area under investigations covers entire Lucknow city and its peripheral areas and is bounded between latitudes 25^0 40'N to 27^0 0'N and longitudes $80^0$49' E to $81^0$5' E. Lucknow city is the state capital of Uttar Pradesh and is witnessing urbanization at a fast pace.
Data Used	:	i. IRS-P6, LISS-IV data of February, April & May, 2009; Quickbird PAN & multispectral merged data of March,2006 and June/ September, 2008; Cartosat-1 PAN data of April, 2009 and Cartosat-2 PAN data of May & June, 2009 and Survey of India topographical mapsheet of 1:25,000 scale ii. Available resource data supplied by line departments such as Medical department, Animal husbandary, Higher Education, Police and Fire Brigade.
Salient Results	:	Examination of high resolution LISS-IV, IKONOS QUICKBIRD, Cartosat 1 & Cartosat 2 satellite data based landuse/landcover and infrastructure maps has revealed that even minor details of the terrain and landuse/landcover pattern

		can be depicted on these maps and these can certainly prove to be vital inputs for City Disaster Management Action Plan. In the event of an emergency and or disaster situation in Lucknow city, the decision makers can utilize the critical facility database and maps for timely mobilization of resources. The health facility database of Lucknow city can be utilized for knowing the location of government hospitals and available paramedical staff, number of ambulances and medicare facilities available in each of the hospital. Similarly, the maps and database pertaining to veterinary hospitals in Lucknow city and surrounding area can provide a detailed information about the location and available resources of each of the veterinary hospital. Location of critical facilities such as fire brigades stations, hospitals, veterinary hospital shown on the base map of Lucknow can help the decision makers and disaster managers of Lucknow to know about connectivity of these facilities to various localities of Lucknow. Fire Brigades station, Health facility and Veterinary Hospital location maps and database of their available resources can be utilized by disaster managers to rapidly mobilize the manpower and available resources in an emergency situation or even during disaster situation. The information on these critical facilities when combined with the urban density map of the city can certainly be used for setting up new facility and upgrading existing ones.
Sponsoring Agency	:	RSAC-UP Plan project
Starting date	:	April, 2009
Closing date	:	August, 2012
Regular Manpower involved	:	Sri P. N. Shah, Dr. Aniruddha Uniyal, Sri Sangharsh Rao

Project Title	:	**River Confluence Study**
Objectives	:	The objectives of the present study are listed below:- (i) To monitor the dynamics of confluence point of Ganga – Ramganga river confluence and bankline shift, bank erosion along the 10 km upstream stretch of the Ganga and Ramganga and 10 km downstream stretch of the Ganga river in parts of Hardoi, Kannauj and Farrukhabad districts of Uttar Pradesh. (ii) To monitor the dynamics of confluence point of Ganga – Yamuna river confluence and bankline shift, bank erosion along the 10 km upstream stretch of the Ganga and Yamuna and 10 km downstream stretch of the Ganga river in parts of Allahabad districts of Uttar Pradesh.
Study Area	:	Ganga-Ramganga river confluence lies in parts of Hardoi, Kannauj and Farrukhabad districts of Uttar Prades and is located between 27˚10´ N and 27˚30´ N latitude and between 79˚38´ E to 79˚55´ E longitudes. Ganga-Yamuna river confluence lies in Allahabad city of Uttar Pradesh and is bounded between longitudes $81^0$43’ E to $81^0$55’ E and latitudes $25^0$25’ N

		to $25^0$33' N
Data Used	:	Ganga-Yamuna river confluence was studied using Survey of India topographical maps available on 1:50,000 scale for preparing base maps surveyed in 1974-75 and IRS P6 PAN and LISS III data of 1999, 2002, 2006, 2007 and 2008. Ganga-Ramganga river confluence was studied using USGS Map no. NG4402 on 1:250,000 scale surveyed in 1922-23; Survey of India topographical maps surveyed in 1974-75 and LISS III data of 1998, 2002, 2006 and 2012 .
Salient Results	:	Ganga–Ramganga confluence has been very dynamic during past nine decades between 1923 and 2012. There was about 13 km upstream shift of the Ganga–Ramganga river confluence point between 1923 and 1975 and thereafter, there has been a downstream shift of the confluence point of the order of 1.96 km between 1975 and 1998**.** Presently, this river confluence is disposed about 10.76 km upstream from its position in 1923. The Ganga river is incised and has witnessed few changes. It is the dynamic nature of Ramganga that is causing migration of this confluence point. The peculiar oscillatory migration pattern of Ramganga river has effected a number of villages due to lateral erosion in Dahilia–Tera Parsauli stretch of the river in the immediate upstream of the confluence. Chandrampur on the right bank and Nandana village on the left bank are witnessing lateral erosion by Ramganga river and are highly prone to flooding particularly during rainy season. This study may prove to be useful in formulating a strategy to mitigate the impact of bankline shift, channel migration during monsoonal floods in the nearby villages in parts of Kannauj, Hardoi and Furrakhabad districts which witness loss of life and property in the event of this disaster. Multidate satellite data and Survey of India toposheets based study of Ganga -Yamuna river confluence at Allahabad has reveled that during the period of 1973-2008 this confluence witnessed an overall northwesterly migration of the order of 700 meters due to westerly sift of Ganga channel of about 700 meters. This westerly migration of Ganga further increases near Faizullahpur where from it has shifted about 2.5 km westward towards Allahabad during the period of 1973-2008. Yamuna channel at and near its confluence with Ganga has witnessed few changes and is more incised and entrenched and has witnessed bankline shift at a few places as compared to Ganga river during the period of 1973-2008. Contrary to this the Ganga channel has been very dynamic. Westerly shift in Ganga in the future may cause bank erosion and bankline shift of Ganga towards eastern part of Allahabad. Protection work is required in the north of Allahabad city as the northerly shift of Ganga channel near Phaphamau bridge may cause wear and tear to the abutments of the bridge. Further, downstream at the confluence of Ganga and Yamuna additional protection work is required along the western bank of Ganga river in the immediate upstream of Sangam. Further the results of this study can also be used for suitable location of civil engineering structures viz. bridges or barrages and gas pipelines etc, across Ganga and Ramganga and Ganga-Yamuna river stretches near their confluence and also for the Sangam area development of these two river confluences.

Sponsoring Agency	:	RSAC-UP Plan project
Starting date	:	April, 2008
Closing date	:	July, 2012
Principal Investigator		Dr. Aniruddha Uniyal
Project Team Scientist	:	Dr. Aniruddha Uniyal, Sri Sangharsh Rao & Sri P. N. Shah

Project Title	:	**Temporal Variations in Ganga River Configuration near Phaphamau Bridge, Allahabad based on Remote Sensing and GIS Techniques**
Objectives	:	(i) To monitor the Ganga river channel changes in the immediate upstream and downstream of rail and road bridges near Phaphamau, Allahabad using multi-date satellite data. (ii) To integrate Ganga river channel configuration of different years using GIS. (iii) To prepare geomorphological map of the study area.
Study Area	:	Stretch of the Ganga river i.e. 10 km upstream of Phaphamau and 10 km downstream of Phaphamau near Allahabad and surrounding area of 2.5 km on the either side (left and right banks of the Ganga river).

		The area under investigation lies in Allahabad city of Uttar Pradesh and is covered in Survey of India topographical map sheets no. 63G/14 and 63G/15 and is bounded between longitudes $81^0$43' E to $81^0$55' E and latitudes $25^0$25' N to $25^0$33' N
Data Used	:	Survey of India topographical maps available on 1:50,000/1:25,000 scale for preparing base maps. SOI topographical map sheet no. 54M/11, M/15 & N/16 on 1:50,000 scale surveyed in 1974-75 along with USGS Map no. NG4402 on 1:250,000 scale surveyed in 1922-23 have been used for delineating configuration of the Ganga, Ramganga, Kali, Gambhiri river and their tributaries Survey of India Digital topographical map sheet surveyed in 1972-73 and IRS P6 LISS-III digital data of March, 1999, February, 2002, February, 2006, October 2006, March 2007, October 2007, March 2008 and October 2008 have been used during the course of present study
Salient Results	:	Present study was aimed at assessing the dynamics of Ganga river channel in the immediate upstream and downstream of road, rail and bridges across Ganga river at Phaphamau, Allahabad using multidate satellite data sets (IRS P6 LISS-III data) of March 1999, Feb. 2002, Nov. 2004 and pre and post monsoon data of 2006, 2007 and 2008 period. Survey of India Topographical Map Sheets of 1973 period were also used to make a comparison in channel configuration over the past 35 years (1973 and 2008). Field investigations were also carried out in association with officials of Flood Works Division, Allahabad along the northern bank of Ganga river at Phaphamau. Comparative examination of SOI digital topographical map sheets of 1972-1973 and satellite data of 1999-2008 period has revealed that the Ganga river channel stretch 1.00 km upstream of the Phaphamau bridge has witnessed a northerly shift of more than 265 meters. The waterlogging in the immediate west (upstream) of Phaphamau bridge and associated oxbow lake are relict of the new pathway carved out by Ganga river during the recent years. These recent relict channels may again serve as easy pathways for flood waters of Ganga river during coming monsoon. To add worst to it are the small channels which are juxtaposing the main Ganga river channel on its northern bank in Tikari-Muhammadpur stretch. Channel avulsion near Chhapri or Muhammadpur in the upstream of Phaphamau bridge may lead to the flow of significant amount of flood water of Ganga river along its northern bank. The linear stretches of relict channels transforming into minor active channels during rainy season may serve as path ways for excessive flood water during rainy season and this may in turn increase wear and tear on the northern embankments of Phaphamau bridge and may also cause a northerly shift of Ganga river channel in the upstream of Phaphamau bridge. In view of this additional protection work is required in the immediate west of Phaphamau bridge. Multidate satellite data has been used to understand the dynamics of Ganga and Yamuna rivers at their confluence in Allahabad. During the period of 1973-2008 this river confluence at Allahabad has witnessed an overall northwesterly

		migration of the order of 700 meters due to westerly sift of Ganga of about 700 meters. This westerly migration of Ganga further increases near Faizullahpur where from it has shifted about 2.5 km westward towards Allahabad during the period of 1973-2008. Ganga channel in Phaphamau-Faizullahpur-Jhusi stretch has witnessed straightening and decrease in sinuosity. Here the NNW-SEE trending subsurface fault may be controlling the drastic westerly migration of Ganga. Yamuna channel at and near its confluence with Ganga has witnessed few changes and is more incised and entrenched and has witnessed bankline shift at a few places as compared to Ganga during the period of 1973-2008. Contrary to this the Ganga channel has been very dynamic. Westerly shift in Ganga in the future may cause bank erosion and bankline shift of Ganga towards eastern part of Allahabad. Protection work is required in the north of the city as the northerly shift of Ganga channel near Phaphamau bridge may cause wear and tear to the abutments of the bridge. Further downstream at the confluence of Ganga and Yamuna additional protection work is required along the western bank of Ganga at and in the immediate upstream of Sangam.
Sponsoring Agency	:	Superintending Engineer, Sinchai Karya Mandal, Allahabad
Starting date	:	2009
Closing date	:	January, 2010
Proj. Team Scientist	:	Dr. Aniruddh Uniyal, Sri Sangharsh Rao, Sri P. N. Shah

Project Title	:	**Lineament Mapping using IRS P6 LISS IV Data and GIS in the Vicinity of Proposed Meja Thermal Power Plant Site in Meja Tehsil of Allahabad District, Uttar Pradesh**
Objectives	:	The objective of the present study is to prepare the lineament map based on high resolution LISS-IV Satellite data of proposed project site and surrounding area of Meja Thermal Power Project in Allahabad district, U.P. Digital analysis of LISS-III and LISS-IV data has also been carried out for delineation of some of the structural lineaments.
Study Area	:	Meja Tehsil in Allahabad district of Uttar Pradesh, south west of Allahabad-Mirzapur highway.
Data Used	:	1. Survey of India Topographical map Sheets on 1:50,000 scale. 2. Indian Remote Sensing Satellite IRS 1C/1D, LISS-III data of January, 2006 of Path 101 and Row 55 (Plate No. 1 & 3). 3. Indian Remote Sensing Satellite IRS P6, LISS-IV Precision geocoded digital data of 17 April, 2005, 11 Dec., 2008 and 28 January 2009 (Plate No. 2 & 4). 4. Collateral Data and information provided by Meja Urja Nigam Private

		Limited.
Salient Results	:	Present study is based on visual interpretation and digital analysis of IRS 1C/1D LISS-III and IRS P6 LISS-IV images for identification of lineaments in Meja Thermal Power Plant site in Allahabad district. In spite of all limitations due to anthropogenic activities of stone quarrying and criss crossing unmetaled roads, almost non existent vegetation indicators and soil moisture, efforts were made to identify and map a number of lineaments in the study area and these were subsequently verified in the field. Most of the lineaments identified and mapped are not having any major displacement along them or are not displacing or truncating any major rock unit. Field investigations along with the geologist of GSI have revealed that there is no drastic change in the trend of rocks along the lineaments mapped in the study area. At certain places the displacement along a few lineaments are visible on satellite data due to the anthropogenic activities like stone quarrying particularly on one side of some lineament. On the basis of visual interpretation and digital analysis of IRS P6 LISS-IV data the lineaments of the area were grouped into two classes based on their trend. They are NE-SW and NW-SE trending lineaments. Some NNE and SSW trending lineaments have also been mapped in the study area. All the lineaments demarked in this area still need to be correlated with the digital elevation modal and seismic data of the area by superimposing the microseismicity data over lineaments and digital elevation model of the area.
Sponsoring Agency	:	Meja Urja Nigam Private Limited, Allahabad
Starting date	:	January 2009
Closing date	:	May 2009
Principal Investigator		Dr. Aniruddha Uniyal
Proj. Team Scientist	:	Sri P. N. Shah, Dr. Aniruddh Uniyal, Sri Sanghaursh Rao

Project Title	:	**Geoenvironmental studies in parts of Lalitpur district, Uttar Pradesh**
Objectives	:	(i) To prepare thematic maps of various geo-environmental parameters viz. geology,geomorphology, drainage, lineament, landuse/land cover etc. (ii) To apply Digital Image Processing and GIS techniques in order to ascertain the landuse changes and obliteration of landscape (if any) owing to anthropogenic activities of mining.
Study Area	:	The study area is bounded between longtitudes 78 15' & 79 0 and latitudes 24 15' 24 45' & and is covering major part of Lalitpur district of U.P
Data Used	:	SOI topographical map sheets No. 54L/6, 54L/7, 54L/10, 54L/11, 54L/14 and

		54L/15 on 1:50,000 scale. IRS 1C/1D geocoded FCCs of 1998 and 2000 and Cartosat 1 digital data of 2006 is also being used in the above said study.
Salient Results	:	Examination of satellite images and field investigations have illustrated that granite quarries and stone mills in Lalitpur district are mostly concentrated in Kalapahar area in the west of Lalitpur township. The anthropogenic activity of stone quarrying has resulted in the obliteration of the landscape of the area. This is evident by a number of quarry ponds and large heaps of mining waste in the area. In the southern part of the district around Madanpur abandoned quarries of sandstone are noticed. Abandoned Sandstone quarries of Madanpur indicate that stone quarrying activity has had an adverse affect on the nearby Madanpur Reserve Forest as a large heaps of mining waste were dumped in the peripheral area of Madanpur Reserve Forest. Abandoned phosphorite mines in the southern part of Lalitpur district have also obliterate the landscape and landuse of the area. Lineament intersections in Girar area in the southern extremity of Lalitpur can prove to potential sites of detailed investigations for economic minerals viz. gold and iron.
Output		Thematic maps of geoenvironmental parameters viz geology, lineament, geomorphology, drainage and water bodies etc. are being prepared through study of satellite images.
Sponsoring Agency	:	RSAC-UP Plan project
Duration of Study	:	01.04.2006 to 31.01.2008
Project Cost	:	Rs.10.00 Lakhs
Proj. Team Scientist	:	Sri P. N. Shah and Dr. Aniruddh Uniyal

Project Title	:	**Lucknow Industrial Development Authority (LIDA) Area Mapping Project**
Objectives	:	(i) To prepare detailed landuse/land cover maps on 1:12,5000 of the area acquired by Lucknow Industrial Development Authority (LIDA). (ii) To prepare existing infrastructure, drainage and body maps. (iii) To superimpose village boundary on (landuse), Landcover maps.
Study Area	:	The study area is bounded between longtitudes and latitudes and covers the route corridor between Gauri and Banthara in the southern part of Lucknow district parts of Unnao district will in the immediate south of Lucknow district will be taken up in the second phase.
Data Used	:	SoI topographical map sheets on 1:25,000 scale. PAN and LISS III merged digital data of dt :13-02-2006. Quickbird data (digital data) Pan (60cm resolution) and multispectral (2.44m resolution) merged of 21st March, 2006.
Salient Results/ Output	:	Large scale Landuse/Landcover maps of the area acquired by LIDA are being prepared (through digital analysis of Quickbird data) on 1:12,500 scale.
Sponsoring Agency	:	Lucknow Industrial Development Authority (LIDA)

Starting date	:	01.02.2006
Closing date		30.09.2006
Project Cost	:	Rs. 13.96 Lakhs (Received Rs. 8.50 Lakhs in Ist Phase)
Proj. Team Scientist	:	Sri P. N. Shah, Shri L.I. M. Rao, Dr. A. Uniyal and Ms. Manisha

BRIEF DETAILS OF COMPLETED PROJECTS IN EARTH RESOURCES DIVISION

Project Title : **Geoenvironmental studies in parts of Mahoba district, Uttar Pradesh**

Objectives :
(i) To prepare thematic maps of various geoenvironmental parameters viz. geomorphology drainage lineament landuse change etc..
(ii) To apply Digital Image Processing and GIS techniques in order to as certain the landuse changes and obliteration of landscape (if any) owing to anthropogenic at activities of mining.

Study Area : The study area is bounded between longtitudes 70˚15' to 80˚10' and latitudes 25˚30' and is covering major part of Mahoba district of U.P.

Data used: SOI topographical map sheets 540/7, 540/8, 540/11, 540/12, 540/15, 540/16 and 63C/3 on 1:50,000 scale IRS 1C/1D geocoded FCCs of 1997/98 and 2002/2003 and IRS P6 LISS IV digital data of 2004 is also being used in the above said study and ground truth data has been collected.

Results: Examination of satellite images and field investigations have illustrated that stone quarries and stone mills in Mahoba district are mostly concerntrated in Kabrai and nearby Gang area. Mainly granite mining is taking place and mining activity in Kabrai has almost obliterated the landscape of Sidhbaba, Ramgunda and Ghurghuru hills in the area. The stone mills in this area have come up on the agricultural land and have thus resulted in large scale land transformation from agricultural land to industrial area. During the interaction with the locals Kabrai area it was observed that the dust of stone mills is causing chest ailments among the local population. Possibilities of tourism and agriculture have also been explosed in the southern part of Mahoba district, particularly in Charkhari area.

Output : Thematic maps of geoenvironmental parameters viz geology, lineament, geomorphology, drainage and water bodies etc. have been prepared through study of satellite images.

Budget : Rs. 3.00 Lakhs

Sponsoring Agency: Plan project sponsored by Department of Science & Technology, Govt. of Uttar Pradesh.

Starting date : 01.04.2005

Closing date : 31.03.2006

Proj. Team Scientist : Sri P. N. Shah
Dr. A. Uniyal

Project Title : **Geoenvironmental studies in parts of Sonbhadra district, Uttar Pradesh**

Objectives :
(i) To prepare thematic maps of various geoenvironmental parameters viz. geomorphology drainage lineament landuse change etc..
(iii) To apply Digital Image Processing and GIS techniques in order to as certain the landuse changes and obliteration of landscape (if any) owing to anthropogenic at activities of mining.

Study Area : The study area is located between 82˚30' E to 83˚30'E longtitude and 23˚50' to 24˚45' N latitudes and covering major part of Sonbhadra district of U.P.

Data Used : SOI topographical maps sheets No.63P/2 63P/3, 63P/4, 63L/12, 63L/14, 63L/15. 63L/16, 64I/13 and 64M/1 (on 1:50,000 Scale).

IRS-1C/1D, LISS-III geocoded FCCs data of 1997/98 and 2002/2003 period IRS-1C LISS-III digital data of Oct.2003 Ground truth data and collateral data was collected during field work.

Results/Output: Obliteration of landscape and landuse changes have been noticed in the south western part of the study area. The changes are attributed to the large scale coal mining activity in this area. Land transformation has also been observed due to disposal of excavated overburden of coal mines and expansion of mining activity is also causing land transformation. Furthermore the cooling ponds/ash ponds of thermal power plants in the area are also contributing to the contamination of some of the surface water bodies and environs. Erosion and further transportation of debris material from large heaps of dumped over burden (excavated from over the coal quarries) and restritant deposition in Govind Ballabh Pant Sagar Reservoir of Rihand dam particularly during rainy season is also matter of environmental concern. The limestone quarries around Data and Khajrahat area are also causing landscape obliteration and landuse changes.
The disposal of industrial waste of the area also need to be addressed in environmental friendly way.

Output: Various thematic maps of geoenvironmental parameters viz. geomorphology, drainage, lineament & landuse changes etc. have been prepared through visual interpretation of satellite images and by using GIS techniques. Digital image analysis has been carried out and outputs have been created showing mining areas, dumped, overburden (excavated from over the mines). Ashponds and turbidity (base on qualitative assessment).

Sponsoring Agency : Department of Science & Technology, Govt. of Uttar Pradesh.

Starting date : 01.04.2004

Closing date : 31.03.2006

Budget: Rs. 3.00 Lakhs

Proj.Team Scientist : Sri P. N. Shah
Dr. A. Uniyal
Dr. Rohit Agarwal

Project Title: Natural Resources Information System (NRIS) Phase-II

Objectives: The prime objective of NRIS is to generate seamless data layers of all natural resources related themes oriented towards providing information on various planning scenarios to decision makers for the sustainable development of both land and water resources in the district/state. The detailed objectives are as follows:

1. To generate a digital district database of natural resources and socio-economic data generated on 1:50,000 scales.
2. To integrate thematic information in GIS environment to draw up locale-specific action plans related to land and water resources and as well as socio-economic development in the district.
3. To generate query shells and Decision Support System for decision making by planners and executives.

Salient Features: NRIS is a nationwide programme sponsored by Department of Space (DOS), Government of India. Under this programme, computerized district digital database of natural resources is being created using satellite remote sensing and

GIS techniques. Data bases would be comprising of both natural resources like soils, forests, hydrogeomorphology, water bodies, landuse/cover, drainage, lithology, slope, wells, groundwater prospects etc. and socio-economic data and infrastructure facilities including, demographic, amenities, road/rail network and administrative boundaries i.e. district, tehsil, block and villages. Satellite data pertaining to three seasons have been used to prepare the resource maps. Survey of India, digital toposheets and other collateral data have been used to generated administrative boundaries, transport network, forest boundaries etc., Hardwares have been provided by DOS for each district. Computers have been transferred in 45 districts under the custody to DSTOs and 17 Computers are in process of transfer to DSTOs. These systems will work as Client Machines. The databases of all the districts will be kept at RSAC-UP, Lucknow on main Server. These client machines will be linked with main server by UP State Wide Area Network (UPSWAN) being developed by the State Govt. through NIC.

Study Area: All districts of Uttar Pradesh

Achievements: The work of this project was looked after by Dr. T.S. Kachhwaha, Head, Forest Resources & Ecology Division till November 2006 and thereafter by Sri P.N.Shah, Head, Earth Resources Division. Mapping work for preparing hydro-geomorphological, geological, structural lineament, surface water bodies and river poly maps have already been completed. The work of preparing landuse / land cover maps of 56 districts have been completed. Analysis of soil samples are in progress. Soil maps of 24 districts are ready and soil mapping work of remaining districts is in progress. Village/block and district level database of all 70 districts are ready and linked with Census database. The work of updating road, railway, canal, drainage-L and watershed maps are in progress.

Project Personnal:

Dr. T.S.Kachhwaha, Project Manager (upto November 20, 2006),

Sri P.N.Shah, Project Manager from November 20, 2006 to March 31, 2009

Dr. A.K. Tangri, Shri Rajiva Mohan, Dr. V.Rajamani, Dr. A.L.Haldar, Sri A.K.Agrawal, Dr. P.Kunwar, Sri Sushil Chandra, Sri Banwari Lal, Dr. Anil Kumar, Dr. S.P.S.Jadaun, Dr.Viredra Kumar, Sri Ashwini Kumar Srivastava, Dr.R.K.Upadhyay, Dr.Uday Raj, Dr. A.Uniyal, Sri Ramchandra, Sri Amit Sinha, Sri Sudhakar Shukla, Dr.Arvind Mathur, Shri Alok Saini, Shri Arjun Singh, Shri P.P.S. Yadav, Shri C.B.Verma, Shri S.N. Srivastava, Shri Arvind Tripathi, Shri P.K. Dey and Project Scientists and Project Draftsman

Project Title : **Study of Burhi Rapti channel changes near Muhchorwaghat and natural waterlogged area in the vicinity of old Banganga river drain in Siddhartha Nagar district of Uttar Pradesh using remote sensing data.**

Objectives : (i) To understand dynamic changes of Burhi Rapti River in the vicinity of bridge near Muhchorwa ghat.

(ii) To study natural waterlogged area between Parigawan Tal & Kakrahi in the vicinity of old Banganga river channel for dewaterlogging through old Banganga river drain.

Study Area : The study area is located between latitude $27^0$12' to $27^0$30' and longitude $82^0$6' to $83^0$01 in Siddharath Nagar district of Uttar Pradesh covering in SOI topographical map No. 631/15. The bridge near Muhchorwa ghat constructed across Burhi Rapti river. The natural waterlogged area between Parigawan Tal and Kakrahi during monsoon period need to be drained through old Banganga drain.

Data Used : The Survey of India topographical maps sheet No. 631/15 Surveyed in 1959-60 on on 1:50,000 scale is used for carrying out field work and preparing base map showing permanent features such as road, canal, habitation etc. IRS-1C/P6, LISS-III, geocoded false colour composite of 631/15 of dt: 10.10.1997, 11.5.2005 and 13.2.2006 were used for carrying out visual interpretation.

Salient Results :

(i) Because of shifting of Burhi Rapti river channel from northward to southward direction over near Muhchorwa ghat in last two years. It is recommended that necessary civil engineering measures such as pitching of rubbles on the slope of right bank of the river from Muhchorwa ghat bridge site to 500 m upstream of bridge site, construction of spurs beyond 500 m upstream to 1 km. upstream of bridge site on the right bank of the river and diverting the flow of the river towards northern bank by activating old river channel.

(ii) Since large area between Parigawan tal and Kakrahi i.e. east of left bank embankment of Banganga and Burhi Rapti river are waterlogged in the monsoon period, it is therefore recommended that the old Banganga river needs to be desilted, devegetated and remodeling for smooth and easy dewaterlogging of the area. Such remedial measures would provided farmers an opportunity to cultivate their land during Kharif season and it will also improve the economy of the farmers of the region.

Sponsoring Agency : District Administration/Irrigation Department, Siddhartha Nagar

Duration of Study : Three months i.e. from 1.5.2006-31.7.2006

Project Team Scientist : Sri P.N. Shah and Sri A.K. Agrawal

Project Title : **Study of landslide near Lambagar Chatti on Joshimath-Badrinath National Highway No. 58, Chamoli district, Uttrakhand.**

Objectives : (i) Study of Lambagar landslide along Dahia nala

(ii) Study of landslides on Rushikesh-Joshimath National highway No.58.

Study Area : The Alaknanda River and its tributaries have witnessed repeated damming of channels due to huge landslides. The Dahia Nala landslide area is located near village Lambagar chatti on Joshimath-Badrinath National highway No. 58 and bounded between latitude 30º35' and 30º45' N and between longitude 79º30' & 79º40' E in the Chamoli district of Garhwal Himalaya. The National highway No. 58 connects Rishikesh to Badrinath which is about 275 Km. from Rishikesh.

Lambagar Chatti is 25 Km. away from Joshimath. The Alaknanda river is the major tributary of the Ganga river drained by its tributaries including Rishi Ganga, Khisho Ganga, Ghri Ganga, NIL Ganga, Laxman Ganga, Kagbhusand Ganga, Kalpa Ganga and Dhauli Ganga in the upstream of Joshimath. The Dahia Nala flows from NE to SW direction and meets Alaknanda river flowing from North to south direction. The area experiences torrential rainfall frequently and the average annual rainfall vary from 1000 mm to 2000 mm. Snow fall is common during winters in the area situated above 2000 m elevation above mean sea level. The area near Lambagar is generally covered the barren surfaces by shrubs/ grasses and scattered low to moderate vegetation of Deodar, Pine and mixed trees at places.

Data Used :

(i) Survey of India topographical map on 1:50,000 scale covering sheet No. 53 N/10 surveyed in 1962-1963
(ii) IRS-1D, LISS-III (23.5 m resolution) geocoded false colour composite covering sheet No. 53 N/10 (Plate No. 1) on 1:50,000 scale of September 30, 2000 (P 97- R49).
(iii) Collateral data and relevant literature.

Salient Results :

(i) The Dahia nala landslide activity near Lambagar Chatti needs to be studied in detail using high resolution satellite data and GIS techniques. The landslide debris materials still lying on the upper slope of Dahia nala can slide down during heavy rains in future which needs regular monitoring of this area using multidate satellite data.
(ii) The huge landslide debris materials lying on the river bed of the Alaknanda river can be removed by using light blastig material so that the flow of water of the Alaknanda river can carried away these debris materials futher downstream area. This can facilitate easy flow of water in the Alaknanda river.
(iii) Geotechnical investigations of unstable hill slopes on the pilgrim route needs to be carried out for taking suitable remedial measures to control the vulnerable landslide zones on National Highway No. 58.
(iv) In certain patches of the road where blasting is done to cut the rock formation for widening of road which has opened the spaces between joints and foliations, widened spaces has shattered the rock masses, the hanging rocks are vulnerable to fall on road side and prone to landslide. Unscientific high power blasting operation should be banned for road construction activity in hilly terrain areas. Scientifically controlled dynamic blasting norm needs to be followed for cutting of fragile hill slopes in the Himalaya to avoid hill slope failures.
(v) The undercutting of hill slopes for widening of road construction activity has left rocks hanging and keeps on falling and frequently threatening and endangering the traffic movement. Such hanging rock masses at several places needs to be removed by trimming the hill slopes for safe movement of vehicles.
(vi) Popular Chipco movement launched by Shri Chandi Prasad Bhatt in 1973 helped significantly in regenerating the denuded and deforested cover in Chamoli district. The NGO like Dasholi Gram Swaraj Mandal, Gopeshwar needs to be encouraged to launch rigorous afforestation drive in Garhwal Himalaya particularly in the Alaknanda valley region.
(vii) Study of seismic events and regular monitoring of rainfall by installing seismic and rainfall recording station in the area.
(viii) Proper instrumentation needs to be installed to monitor the movement of active landslides.

Sponsoring Agency : RSAC-UP/UVV

Duration of Study : Three months i.e. from 15.07.2004 to 31.10.2004.

Project Team Scientist : Sri P. N. Shah

Project Title : **Monitoring Geoenvironmental Parameters leading to landslides in Sikkim Area.**

Objectives : (i) To outline the causes of landslides in Sikkim.
(ii) To prepare landslides incidence, landuse changes, Land degradation, forest degradation and river Planform changes maps using IRS-1D, LISS III data of 1992 and IRS-1C, LISS III data of 1998/2000.

Study Area : The study area is located between Melli Bazar and Lachung/Lachen in parts of Sikkim state i.e. 7 km. either side of national highway have been selected.

Data Used : SOI topographical map sheet no. 78A/7, 78A/8, 78A/9, 78A/10, 78A/11, 78A/12, 78A/14 and 78A/15 on 1:50,000 scale.

IRS-1B, LISS-II geocoded FCCs of 1992 and IRS-1C, LISS III FCCs of 1998/2000.

Salient Results : Maps showing landslides areas, landuse changes, forest degradation and land degradation between Melli Bazar and Lacheng-Lachen area, Sikkim were prepared using IRS-1B, LISS-II geocoded FCCs of 1992 and IRS-1C, LISS III FCCs of 1998/2000. River channel planform changes were also monitored and thematic maps of above said parameters were also prepared.

Sponsoring Agency: Defence Terrain Research Laboratory, DRDO, New Delhi

Funds: Rs. 9.58272 Lakhs

Starting date: 01.01.2003

Closing data: 30.06.2004

Project Team Scientist : Sri P.N.Shah,
Sri. Phul Kunwar,
Dr. P.K.Goswami,
Dr. Anil Kumar
Sri Alok Saini

Project Title : **Mapping of Wetland on 1:50,000 scale in parts of Basti & Sant Kabir Nagar Districts.**

Objectives : To map the wetlands of Basti & Sant Kabir Nagar districts and to monitor their dynamic changes through the visual interpretation and digital analysis of pre and post monsoon satellite data on 1:50,000 scale.

Water quality study of the some important wetlands.

	Palynological study of Chando and Bhakhira Tal in association with BSIP.
Study Area :	Basti and Sant Kabir Nagar districts of Uttar Pradesh.
Data Used :	SOI topographical maps on 1:50,000 scale. IRS-1D, LISS-III geocoded FCCs data on 1:50,000 scale of post monsoon 2001 period. IRS-1C/1D digital data of post monsoon and pre monsoon.
Salient Results :	Base maps of the study area have been prepared on 1:50,000 scale. Visually interpreted categories of different types of wetlands using post monsoon 2001 IRS-1D, LISS-III data have been transferred on to the base maps. Field investigations have been carried out and water samples of some of the important wetland have been collected for water quality analysis. Digital image processing of 1999 & 2000 period data is to be now started for delineating different wetland categories. The work of this project is in progress.
Sponsoring Agency :	Department of Science & Technology, Govt. of Uttar Pradesh.
Project Cost:	Rs. 2.00 lakhs.
Starting date :	01.09.2001
Closing date :	31.08.2002
Project Team Scientist :	Sri P. N. Shah Dr. Chhaya Sharma, BSIP Dr. Virendra Kumar

Project Title :	**Mapping of Landslides in parts of Okhimath, Mussoorie, Malpa & Nainital area of Garhwal & Kumaun Himalayas.**
Objectives :	To prepare thematic maps of lithology, geomorphology, fault, lineament, landslide incidence, drainage, soil texture, soil depth, landuse/land cover, slope, slope aspect & slope morphology, base features and anthropogenic factor on 1:12,500 scale. To generate Land slide hazard zonation (LHZ) maps on 1:12,500 scale through the integration of various thematic maps. To generate landslide hazard management maps.
Study Area :	(i) Okhimath area, (ii) Malpa area, (iii) Nainital area and (iv) Mussoorie area.
Data Used :	SOI toposheets on 1:25,000 & 1:50,000 scale have been used for preparing base maps & carrying out field checking etc. IRS-1C, PAN point geocoded data on 1:12,500 scale (covering 5'x5' area) of Nov., 1998, April 1999 and June 1999. IRS-1C/1D, geocoded FCC data on 1:50,000 scale.
Salient Results/ Output	All the thematic maps of Okhimath and Malpa area have been prepared through the visual interpretation of point geocoded PAN data

supplemented by geocoded FCCs. Thematic maps were verified in the field and detailed field information has been collected about landslide type, activity, geology, structure, soil, landuse pattern and causative factors for landslides and existing stability measures have also been assessed. Landslides Hazard Zonation and Landslide Hazard Management maps of Okhimath and Malpa area have been generated through Decision Space Software Package. The interim report of Okhimath area has also been submitted to the than Uttaranchal Vikas Vibhag of Govt. of U.P. Thematic mapping work for Mussoorie and Nainital sites in order to generate LHZ maps is in progress. GIS layer generation of various thematic maps were done using ARC/INFO based GIS.

Funds : Rs. 50.00 Lakhs

Sponsoring Agency : The than Uttaranchal Vikas Vibhag, Govt. of U.P.

Starting Date: 01.04.1999

Closing Date : 31.3.2005

Project Team Scientist: Sri. P. N. Shah, Sri A. Uniyal, Sri K. Rajarajan, Sri Sudhakar Shukla, Sri Alok Saini, Dr. Virendra Kumar, Sri Ashwani Kumar Srivastava, Dr. S.P.S. Jadaun, Sri Milind Wadodkar, Dr. Vibhu Sarin, Dr. P. K. Goswami

Project Title : **Development of Soil and Terrain Information System in parts of Sikkim.**

Objectives : To develop soil and terrain information system in parts of Sikkim using Remote Sensing and GIS.

To prepare various thematic layers on 1:50,000 scale.

To integrate various thematic layers for generating landslide hazard zonation and landslide management maps.

Study Area : The study area is located between Melli Bazar and Lachung/Lachen in parts of Sikkim state i.e. 7 km. either side of national highway have been selected.

Data Used : SOI topographical map sheet no. 78A/7, 78A/8, 78A/9, 78A/10, 78A/11, 78A/12, 78A/14 and 78A/15 on 1:50,000 scale. IRS-1C, LISS-III geocoded FCCs of Sept., 2000 and Feb., 2001 period and IRS-1C, PAN data of Feb., 2001 for generating merged product of PAN & LISS-III for Chungthang area.

Salient Results : Detailed field information about, type, subtype of landslides, slope condition, mechanism of landslide failure, soil texture, soil depth and landuse/land cover has been collected. Various thematic layers of lithology, geomorphology, lineament, fault, landslide, rock weathering, dip-slope relation, soil texture, soil depth, slope, slope morphology, slope aspect, landuse/land cover, anthropogenic factor and base features have been prepared through the visual interpretation of satellite data in conjunction with SOI topographical maps. GIS database of different thematic layers has been generated by digitizing, vectorizing, editing and projecting various thematic layers. LHZ and landslide hazard

management maps have been generated on 1:50,000 scale using Decision Space Software Package. Fly of the Chungthang area and PAN merged LISS-III data showing Lentakhola, Manul, Miyang Chhu & Richhu landslides have been generated.

Sponsoring Agency : Defence Terrain Research Laboratory, DRDO, New Delhi

Project Cost: Rs. 14.50 lakhs.

Duration of Study : One year six months i.e. from 01.09.2000 to 28.02.2002.

Project Team Scientists : Dr. A.N.Singh, Sri P.N.Shah, Dr. A. Uniyal, Dr. Anil Kumar and Sri Alok Saini

Project Title : **Mapping of landslides along Pithoragarh-Malpa, Rudraprayag-Kedarnath and Gangnani-Gaumukh Pilgrimage Routes.**

Objectives : To prepare thematic maps of lithology, geomorphology, lineament, fault, slope, slope aspect, slope morphology, drainage, dip-slope relation, rock weathering, anthropogenic factor, landslide incidence, sol texture, soil depth, landuse/land cover and base features on 1:25,000 scale.

Study Area : Pilgrimage route of Pithoragarh-Malpa, Rudraprayag-Kedarnath and Gangnani-Gaumukh routes.

Data Used : SOI toposheets on 1:25,000 scale, PAN + LISS-III merged precision geocoded data on 1:25,000 scale.

Salient Results : All the thematic maps of three pilgrimage routes viz Pithoragarh-Malpa, Rudraprayag-Kedarnath and Gangnani-Gaumukh were prepared through the visual interpretation of PAN + LISS-III merged data supplemented by SOI topographical maps. Structural discontinuities like bedding planes, joints and foliation etc. were mapped in the field in order to understand the mechanism of landslide failure. Detailed field information about the type and subtype of landslides, mechanism failure, existing stability measures and vulnerability was also collected.

Starting date : 01.02.2000

Closing date: 31.01.2001

Sponsoring Agency : National Remote Sensing Agency, Hyderabad, Dept. of Space, GOI.

Funds Rs. 8.46 lakhs.

Special Achievements in the project :

All the geoenvironmental parameters responsible for triggering the landslides have been assessed and Atlas showing LHZ and landslide hazard management maps using GIS have been prepared by NRSA and RSAC-UP.

Project Team Scientist : Sri. P. N. Shah, Sri A. Uniyal, Sri Ramchandra, Sri K.Rajarajan, Sri Alok Saini, Dr. Anil Kumar, Dr. Virendra Kumar, Dr. SPS Jadaun, Sri Ashwini Kumar and Sri Milind Wadodkar.

Project Title : **Temporal monitoring of dynamics of the Yamuna river in the vicinity of Gas Pipeline near Sauri Village, Agra district.**

Objectives : To delineate the Yamuna river configuration and to understand the migratory trends of river for the last thirty years.

To map the associated fluvial geomorphic features.

To integrate different years Yamuna river configuration maps using GIS in order to understand the migratory behaviour of Yamuna which can cause a threat to the Gas Pipeline in the future.

Study Area : The study area is located between 77º45' & 78º0' E longitudes and 27º12'30" & 27º20'N latitudes covering parts of Agra and Mathura districts (U.P.)

Data Used : The Survey of India topographical map sheet No. 54E/15 & 16 of 1969-1970. Landsat-MSS data of 08:03 1977 (1:250,000 scale),

IRS-1A, LISS-II geocoded FCC of 21.10.1988; IRS-1C, LISS-III geocoded FCC of 29.01.1996; IRS-1C, LISS-III digital data of 24.01.2000 and IRS-1D, LISS-III geocoded FCC data of 25.10.2000. Ground truth data were collected during field work.

Salient Results : In parts of Agra and Mathura districts, the Yamuna river has mostly been confined within the almost same channel margins. The Gas Pipeline of GAIL, near village Sauri and Mander passes through the flood plain. The rate of bank scouring is alarming near Sauri village and preventive measures have been recommended in the form of protection structures for safeguarding the Gas Pipeline from any future threat of scouring. Moreover, diversion of a part of the flow of the Yamuna river has also been recommended so that the Gas Pipeline can be protected from threat of the Yamuna river.

Output : Yamuna river channel configuration maps of parts of Mathura and Agra districts) were prepared using RS & GIS techniques. These map show Yamuna channel configuration in 1970, 1977, 1988, 1996, Jan.,2000 and Oct.,2000.

Sponsoring Agency : Gas Authority of India Limited, Agra.

Starting date : 01.06.2000

Closing date: 28.02.2001

Project Team Scientist : Sri. P. N. Shah
Sri P. K. Goswami

Project Title : **Monitoring dynamics of the Brahmaputra River configuration in the vicinity of proposed road and rail bridge alignment site new Bogibilgaon, Assam.**

Objectives : To study the configuration of Brahmaputra river channel and braid bars at proposed rail and road bridge sit near Bogibilgaon, Dibrugarh district, Assam.

To prepare landuse/land cover maps on 1:25,000 scale in the vicinity of proposed rail and road alignment.

To study the extent of flood inundation of Brahmaputra river in the vicinity of proposed rail and bridge site near Bogibilgaon.

Data Used : The Brahmaputra river configuration, braid bars and channel dynamics were studied using SOI toposheets of 1916-19 and 1968-1970. IRS-1A, 1B & 1D geocoded data of Nov., 1988; Jan., 1990; Dec., 1990; Jun, 1992; Dec., 1992; Dec., 1993; Feb., 1995; Feb., 1996;, Feb., 1997; Oct., 1997 and Oct., 1998 period. Landuse/land cover mapping on 1:25,000 scale was carried out through the visual interpretation of IRS-1C PAN data of Feb., 1997. Field information along with the collateral data from Flood Control Dept. and Forest Dept. of Assam have been collected and also used during the study.

Salient Results : Following are the salient results of this study :

The Temporal variation in the cannel configuration and behavioural pattern of bars are very conspicuous during the period of 1919-1998. The bars are very dynamic in nature and cannot be relied upon as sound foundation for placing the piers of the proposed bridge.

The rail and road bridge site proposed by RITES near Bogibilgaon is vulnerable for floods and back flow of water during monsoons.

Two alternate bridge sites were proposed near Dignalagaon an Tinsukia villages.

Sponsoring Agency : Rail India Technical & Economic Services Ltd., Govt. of India.

Duration of Study : One year six months i.e. from 01.10.1997 to 31.03.1999.

Project Cost: Rs. 4,50,600/-

Project Team Scientist : Sri. P. N. Shah
Sri A. Uniyal
Sri P. K. Goswami
Sri N. K. Srivastava

Project Title : **Monitoring dynamics of the Ganga, Ramganga, Gambhiri & Kali River in the vicinity of Gas Pipeline in parts of Farrukhabad and Hardoi districts**.

Objectives : To Study the configuration of Ganga, Ramganga, Gambhiri and Kali river in the vicinity of Gas Pipeline of GAIL.

Study Area : Part of Hardoi and Farrukhabad districts of Uttar Pradesh.

Data Used : The Survey of India topographical map sheet No. 54M/11,12,15 and 16 of 1974-1975. IRS-1B, LISS-II geocoded FCCs of Nov., 6/7, 1990; Oct., 30/31, 1998. IRS-1D, LISS-III geocoded FCC of Nov., 1999. Field data and collateral data including rainfall and temperature.

Salient Results : The Ganga, Ramganga, Gambhiri and Kali rivers are dynamic in nature. The shortening of channel of these rivers as a result of high floods during the recent past has caused the channel migration. The successive migration of Ganga and Ramganga channels in the vicinity of Gas Pipeline in parts of Farrukhabad & Hardoi districts calls for the

additional safety measures for the protection of Gas Pipeline from the river bank cutting erosion or high floods in the near future.

Gas Authority of India Ltd., Dibiyapur, Auraiya district assigned the task of monitoring configurations of the Ganga, Ramganga, Gambhiri and Kali rivers in the vicinity of Gas Pipeline in parts of Farrukhabad and Hardoi districts. The Ganga, Ramganga, Gambhiri and Kali rivers have changed its configurations in the vicinity after laying Gas Pipeline which facing great threats due to above changes. IRS-1B, LISS-II geocoded false colour composite on 1:50,000 scale of November, 6/7, 1990, October 30/31, 1998 and IRS-1D, LISS-III geocoded false colour composite on 1:50,000 scale of November, 4, 1999 have been used for delineation of river channels and compared with channel delineated from Survey of India topographical maps surveyed in 1969-70. Different channel configurations layers were integrated using ARC/INFO based GIS system and changes in channels were measured. The Ganga, Ramganga, Gambhiri and Kali rivers have shown drastic changes in the vicinity of Gas Pipeline and these rivers are causing threat to gas pipeline. Based on above study, GAIL has prepared plan for safe guarding the Gas Pipeline.

Sponsoring Agency : Gas Authority of India Limited, Dibiyapur, Auraiya district.

Duration of Study : One year

Project Cost : Rs. 1,69,219/-

Project Team Scientist : Sri. P. N. Shah

Sri A. Uniyal

Project Title : **Temporal Monitoring of Dynamics of the Yamuna river Stretch between Vrindavan and Mathura for location of feasible site for Plantation.**

Objectives : Temporal monitoring of dynamics of Yamuna river configuration between Vrindavan and Mathura using multidate satellite data.

Mapping of fluvial geomorphic features in the vicinity of Yamuna river stretch.

Mapping and monitoring of forest cover and wastelands in the vicinity of Yamuna river.

Selection of feasible sites for plantation in the vicinity of Yamuna river stretch between Vrindavan and Mathura.

Study Area : The Yamuna river stretch between Vrindavan and Mathura (U.P.) is located between 27º29' & 27º38'N latitudes and 77º40' & 77º50'E longitudes.

Data Used : The Survey of India topographical map sheet No. 54E/10, 54E/11 on 1:50,000 scale of 1968-69; Landsat- MSS band 7 data; IRS-1A, LISS-II 1:125,000 scale FCC of January, 1989; IRS-1A, LISS-II 1:250,000 scale FCC of Oct., 1990; IRS-1B, LISS-II 1:125,000 scale FCC of Feb. 1992; IRS-1B, LISS-II geocoded FCC of Nov., 1994 and Nov., 1997 period.

Salient Results : The temporal monitoring of Yamuna stretch between Vrindavan and Mathura through examination of multidate satellite data and SOI

toposheets has demonstrated that the river channel is under going changes from meandering pattern to straightening in the stretch which is causing channel migration and bank erosion, therefore, banks of the Yamuna river are not stable and feasible for plantation.

The gullied/ravinuous land at the edge of Bangar and Khadar has been recommended as the suitable sites for plantation as the banks of Yamuna between Vrindavan and Mathura are susceptible to flooding and erosion.

Sponsoring Agency : Social Forestry Division, Forest Department, Mathura.

Project Cost: Rs. 34,650/-

Duration of Study : Three months i.e. from 01.05.1998 to 31.07.1998.

Project Team Scientist : Sri. P. N. Shah
Sri A. Uniyal
Sri P. K. Goswami

Project Title : **Mapping of lithological, structural and geomorphological features for targetting molybdenum deposits in the Jhararghat-Baunala area of Lalitpur District.**

Objectives : Mapping of major lithological units, geomorphic units & landforms and structural lineaments on 1:50,000 scale.To understand the interrelationship between lithology, structures, landform, drainage patterns in diverse geologic environs and to understand mineralization pattern in the study area.

Digital image processing of Landsat-TM and IRS, LISS-II data for enhancement of important geological features and identifications of hydrothermally altered zones.

Study Area : The study area Jhararghat-Baunala is located between 24º15' & 25º15'N latitudes and 78º15' & 78º40'E longitudes i.e. between south of Babina in the Jhansi district and north of Jakhaura-Bansi-Bar area in Lalitpur district and comprises rocks of Bundelkhand granitic massif.

Data Used : Survey of India topographical map sheet No. 54K/8,12; 54L/5 & 9 on 1:50,000 scale have been used for preparing base maps, carrying out field work and integrating training points from toposheet on to digital images. Landsat-TM seven bands digital data of 15.03.1994 and IRS, LISS-II four bands digital data of 23.04.1990 have been utilized for digital image processing. IRS, LISS-II geocoded false colour composites of 27.12.1992, 08.06.1994 and 12.04.1995 have been utilized for visual interpretation of geological structural and geomorphic features.

Salient Results : Band ratioing, principal component analysis, edge enhancement of Landsat-TM digital data and LISS-II data have been carried out for delineation of important structural lineaments, rhyolite/dolenite dykes, quartz reefs, lithological contacts of different rock types etc. Analysis of satellite data have highlighted circular shaped geomorphic anomalies criss-crossed by various structural lineaments which have possible source of molybdenum, gold and sulphide mineralization. Digital output data integrated with field information have also indicated hydrothermally altered zones of epidotization, pegmatitization, sericitization,

chloritization, silicification etc. Updated geological, geomorphological and structural lineament maps on 1:50,000 scale have been prepared after incorporating field information (Figure I & II).

Sponsoring Agency : Directorate of Geology and Mining, Uttar Pradesh

Duration of Study : Two years six months i.e. from 01.07.1995 to 31.12.1997.

Project Cost: Rs. 1.55 lakhs

Project Team Scientist : Sri P. N. Shah

Sri M. B. S. Rao

Project Title : **Mapping of Wetlands in Uttar Pradesh on 1:250,000 scale.**

Objectives : To map various types of natural and man made Wetlands on 1:250,000 scale.
To map aquatic vegetation and turbidity status of wetlands.
To estimate areal extent of each wetlands.
To prepare wetland information database for wetland directory of Uttar Pradesh.

Study Area : The study area comprises entire state of Uttar Pradesh located between 23º58' & 31º25'N latitudes and 77º05' & 84º45'E longitudes.

Data Used : The Survey of India topographical maps on 1:250,000 scale were used for preparing base maps, carrying out field work and accuracy assessment work.
Pre monsoon IRS-1A/1B, LISS-I, false colour composite diapositives of April/May, 1992 and post monsoon IRS-1A/1B, LISS-I, false colour composite diapositives of October/ November, 1991 periods have been enlarged to 1:250,000 scale using Plan-Variograph. Collateral data such as meteorological, notified birds sanctuaries and wildlife data have been collected from the State Planning and Forest Department.

Salient Results : Wetlands maps showing different categories of natural and man made wetlands in post and pre monsoon period on 1:250,000 scale covering entire state of Uttar Pradesh have been prepared. Districtwise wetland data base showing wetland type, wetland name, wetland categories, number, toposheet & quadrant number, nearest village name, distance and direction from nearest village, tehsil, post & pre monsoon areal extent of wetlands in hectares, turbidity level, vegetation, name of birds sanctuaries etc. have been prepared by developing special wetland database software package. Table shows districtwise areal extent of wetlands in pre and post monsoon periods in Uttar Pradesh.

Sponsoring Agency : (i) Ministry of Environment & Forests, New Delhi.
(ii) Space Applications Centre, Department of Space, Ahmedabad.

Duration of Study : Two years & six months i.e. from 01.10.1993 to 31.03.1996.

Project Cost: Rs. 3.00 lakhs

Special Achievements: A printed report on wetlands of Uttar Pradesh, 1991-92 status along with wetland database and wetland maps were supplied to all users Organizations. One day workshop on 'Wetlands of Uttar Pradesh' was organised at CST-UP on 15.05.1997 and about 150 delegates participated in the above workshop.

Project Team Scientist : Sri P. N. Shah
Sri S. K. Ambedkar
Sri S. Kanaujia & Sri A. Mandal

Project Title : **Monitoring dynamics of the Rapti river in the vicinity of proposed bridge site near Kondarighat, Balrampur district.**

Objectives : The aim of the study is :
To delineate the Rapti river channel in the 5 km. upstream and downstream of proposed bridge site near Kondarighat.
To map and monitor geomorphological changes and associated fluvial landforms.
Feasibility study of the proposed bridge site across the Rapti river and suggestion of alternate suitable sites.

Area of Study : The Rapti river stretch between village Bhutaha and Bhikhampur is located between 27º25' & 27º35'N latitudes and 82º0' & 82º15'E longitudes in Balrampur district. A bridge across the Rapti river near Kondarighat is proposed to join Hariharganj-Lalia marg.

Data Used : The Survey of India topographical map sheet No. 63I/2 and 63I/3 on 1:50,000 scale surveyed in 1913-14 and 1966-67 have been used for preparing base maps and delineating trends of the Rapti river.

Multidate satellite data including Landsat-MSS band-7 of 09.11.1981; Landsat-MSS false colour composite (FCC) of 24.12.1983; Landsat-MSS band-4 of 18.10.1985; Landsat-TM FCC of 21.10.1986; Landsat-TM FCC of 09.11.1987; IRS-1B, LISS-II FCC of 27.02.1989; 18.11.1989; 03.11.1991 and 11.11.1992 have been utilized for delineating the trends of the Rapti river channel and associated fluvial landforms.

Salient Results : Comparative study of the Rapti river channel delineated from Survey of India topographical maps of 1913-14, 1966-67 and multidate satellite data of the period 1981-92 on 1:50,000 scale have indicated that the maximum fluctuations in the Rapti river channel has occurred in the vicinity of bridge site near Kondarighat proposed by public Works Department of Uttar Pradesh. Therefore, it has been suggested that proposed site is not feasible for the construction of bridge across the Rapti river. Alternate feasible site in the upstream and downstream of the Kondarighat were suggested for construction of bridge. Rapti river channel changes during 1913-1992 period is shown in the enclosed maps.

Sponsoring Agency : Public Works Department of Uttar Pradesh.

Duration of Study : Six months i.e. from 01.09.1992 to 31.03.1993.

Project Cost: Rs. 33,000/-

Project Team Scientist : Sri P. N. Shah

Sri A. Mandal

Project Title : **Assessment of Land Erosion and Forest Degradation in the Tehri Dam Catchment Area.**

Objectives : To delineate critically eroded areas.
To delineate the present landuse pattern.
Mapping of forest type with different level of forest density.
Mapping of major lineament/fault/thrust etc.

Study Area : The large multi purpose Tehri dam is under construction across Bhagirathi river at about 1.5 km. downstream of its confluence with Bhilangana river near the present Tehri town. The Tehri dam catchment area lies between 30º15'30" & 31º30'N latitudes and 78º30" & 79º30'E longitudes in Himalayan region in Uttar Kashi and Tehri Garhwal districts. The total catchment area is about 6695 sq.km.

Data Used : The Survey of India topographical map sheet No. 53J/1,2,5,6,7,9,10,11,13,14,15; 53I/12,16; 53M/4 and 53N/1 on 1:50,000 scale were used for preparing base maps & slope maps etc.

IRS-1A, LISS-I data of November, 1988, Landsat-TM false colour composites of 08.03.1989 on 1:50,000 scale have been used for preparing various thematic layers.

Salient Results : The study have helped in delineation of different landuse categories, identification of forest types with different levels of forest density and mapping of major soil categories, geomorphic units and landforms, structural lineaments etc. The above thematic information have been integrated with the existing information of slope, lithology, drainage, aspect etc. for assessment of critically degraded and eroded areas in the Tehri dam catchment area. Enclosed figures shows status of land erosion and forest degradation in sheet No. 53J/7 covering part of Tehri dam catchment area.

Sponsoring Agency : Tehri Hydro Development Corporation Ltd.

Duration of Study : Two years nine months i.e. from 01.09.1989 to 31.05.1992.

Project Cost: Rs. 5.23 lakhs.

Project Team Scientist : Sri Rajiva Mohan
Sri P. N. Shah
Dr. V. Rajamani
Dr. V. Govardhan
Mrs. Sangita Gupta

Project Title : **Large Scale Hydrogeomorphological Mapping of Mirzapur district on 1:50,000 scale.**

Objectives : Preparation of hydrogeomorphological maps of Mirzapur district on 1:50,000 scale.
Delineation of geomorphic units & landforms.
Delineation of groundwater prospect zones.
Collection of pre and post monsoon ground water data.

Study Area : The Mirzapur district of Uttar Pradesh is located between 24º35' N latitudes and 82º05' & 83º12' E longitudes. The Mirzapur district comprises both soft Indogangetic alluvial plain and hard rocks of Vindhyan plateau.

Data Used : IRS-1B, LISS-II geocoded false colour composites on 1:50,000 scale have been used for delineating various geomorphic units & landforms. Survey of India topographical maps on 1:50,000 scale have been used for preparing base maps.

Salient Results : Large scale hydrogeomorphological maps prepared on 1:50,000 scale highlighted various geomorphic units and landforms in soft and hard rock areas and compared with litholog and ground water data collected from Jal Nigam and Ground Water Department. The ground water prospect zones delineated have been further studied by carrying out detailed geophysical investigations for pinpointing tube well and hand pump sites in Mirzapur district. Hydrogeomorphological map of sheet No. 63K/12 is enclosed.

Sponsoring Agency : National Remote Sensing Agency, Hyderabad.

Duration of Study : One year i.e. from 01.09.1991 to 31.08.1992

Special Achievements: Hydrogeomorphological maps prepared for Mirzapur district on 1:50,000 scale have been also utilized for project on Integrated Mission for Sustainable Development for Bhakhar Watershed in Mirzapur district.

Project Team Scientist : Shri P. N. Shah

Project Title : **Mapping of major lithological & structural linear features for mineral exploration in and around Sonrai and Girar areas of Lalitpur District.**

Objectives : Mapping of different lithological units, geomorphic units, structural lineament and drainage patterns etc.
Integration of bore hole and geophysical data on maps showing lineament pattern with mineralization.

Study Area : The Sonrai-Girar area of south Lalitpur is bounded by 78º45' & 78º56' E longitudes and 24º15' º & 24º27'N latitudes and drained by the Dhasan, Rohini & Bandai river which flow towards the north-east into the Yamuna river.

Data Used : The Survey of topographical map sheet No. 54L/15 on 1:50,000 scale were used to prepare base maps.

IRS-1A, LISS-I and LISS-II data of 16.01.1989 and 07.01.1990 were used for visual interpretation. IRS, LISS-II digital data of 11.11.1988 was used for digital image analysis. Bore hole & geophysical data were collected from Directorate of Geology & Mining, U.P.

Salient Results : Lithological, geomorphological, structural lineament and drainage pattern maps on 1:50,000 scale were prepared and bore hole data were integrated on to the structural lineament maps for identifications of possible gold, lead, zinc and copper mineralization in Sonrai-Girar

areas of south Lalitpur. Figure shows Geological and structural lineament maps of Sonrai and surrounding areas in south Lalitpur, Uttar Pradesh.

Sponsoring Agency : Directorate of Geology and Mining, Uttar Pradesh

Project Cost : Rs.0.75 Lakh

Duration of Study : One years i.e. from 01.04.1990 to 31.03.1991.

Project Team Scientist : Dr. P.K.Vinayan
Sri P. N. Shah

Project Title : **District wise Hydrogeomorphological Mapping on 1:250,000 scale.**

Objectives : Delineation of various geomorphic units and associated landform for preparing hydrogeomorphological maps of all districts of Uttar Pradesh on 1:250,000 scale.

Delineation of surface water bodies, drainage patterns, vegetation patterns, surface waterlogged and salt affected lands.

Identification of ground water prospect zones.

Study Area : The study area covers all districts of Uttar Pradesh located between 24º0' & 32º0'N latitudes and 76º0' & 84º0'E longitudes. The study area comprises high hilly mountainous terrain of Himalayas in the north, Bhabhar and Terai area in the foot hills of the Himalaya, flat, gently sloping vast Indogangetic alluvial plains and undulated Bundelkhand granitic massif and flat topped Vindhyan Plateau in the south.

Data Used : The Survey of India topographical maps on 1:250,000 scale have been used for preparing base maps & carrying out field checking. IRS-1A, LISS-II, false colour composites on 1:250,000 scale of February/March, 1989 have been used for delineating various geomorphic units and associated landforms.

Salient Results : Hydrogeomorphological maps of al the districts of Uttar Pradesh on 1:250,000 scale have been prepared which depicts geomorphic units & landforms showing corresponding ground water prospect zones in each district. Hydrogemorphological maps of Tehri-Garhwal, Kheri and Jhansi district are enclosed.

Sponsoring Agency : National Remote Sensing Agency, Hyderabad & Space Applications Centre, Department of Space, Ahmedabad.

Duration of Study : One year i.e. from 01.04.1989 to 31.03.1990.

Project Cost: Rs. 2.25 lakhs

Project Team Scientist : Sri. P. N. Shah
Sri Rajiva Mohan
Dr. P. K. Vinayan
Sri D. N. Rao
Sri M. B. S. Rao
Dr. S. Ravi Prakash
Sri N. K. Goswami
Dr. C. D. Murthy
Sri A. K. Agarwal

Sri S. Mukherjee

Project Title : **Assessment of Neotectonism around Narora Atomic Power Plant site, Bulandshahr district.**

Objectives : To assess the dynamic neotectonic status of the region in the vicinity of Atomic Power Plants.

Study Area : The study area in the vicinity of Narora Atomic Power Plants is located between 28º0' & 29º0'N latitudes and 78º0' & 79º0'E longitudes. Geologically, Narora and its environs is situated on the alluvium comprising near horizontal layers of silt, sand and clay overlaying the Siwalik and Paleozoic bed rocks.

Data Used : The Survey of topographical map sheet No. 54L/7 and 53L/8 have been used for preparing base maps.
Landsat-TM false colour composite on 1:50,000 scale of 31.10.1988, IRS-1B, LISS-I data of 12.11.1988 and geocoded LISS-II data of 15.04.1989 on 1:50,000 scale have been used for delineation of structural lineaments and river/stream courses. Earthquake epicentre data were also collected.

Salient Results : Tectonic lineament map of Narora and surrounding areas and map showing change in fluvial morphology within the lineament zone on 1:50,000 scale have been prepared. Bachchikhera lineament can be considered as WSW limb of the Moradabad fault. The Atomic Power Plant site lies close to the boundary of seismic zones-III and IV and has been considered to be part of seismic zones-IV. Khurja earthquake of 1956 and Delhi earthquake of 1960 are indicative of neotectonic activities in the area around NAPP site.

Sponsoring Agency : Department of Atomic Energy, Govt. of India

Project Cost: Rs. 0.50 Lakh

Duration of Study : Six months i.e. from 01.03.1989 to 31.08.1989.

Project Team Scientist : Dr. P. K. Vinayan.

Project Title : **Route Alignment location study for Padampuri-Hairakhan road in Nainital hill ranges.**

Objectives : To map lithology, geomorphic units and landforms, structural lineaments etc.

To map landslide incidences.

To prepare slope and drainage maps.

To suggest suitable route alignment.

Study Area : The study area lies between Padampuri and Hairakhan in Nainital district selected for feasibility study of road alignment in Kumaun Himalayas.

Data Used : The Survey of India topographical maps on 1:50,000 scale have been enlarged to 1:10,000 scale using plan-variograph.

Aerial photographs on 1:10,000 scale have been used for visual interpretation of various thematic information.

Salient Results : Aerial photographs on 1:10,000 scale have interpreted for preparing landslide incidence map, geomorphological map, lithological map, drainage map etc. Slope map was integrated with above thematic layers for studying the feasibility of Padampuri-Hairakhan road alignment and also suggested alternate alignment for construction of road.

Sponsoring Agency : Public Works Department, Uttar Pradesh.

Poject Cost: Rs. 0.50 lakh

Duration of Study : Six months i.e. from 01.09.1988 to 28.02.1989.

Project Team Scientist : Dr. P. K. Vinayan

Project Title : **Assessment of Surface Waterlogging in the Sarda Sahayak Command area of Uttar Pradesh through digital analysis of IRS-1A, LISS-I data of February, 1989.**

Objectives : To assess surface waterlogging and to discriminate the aquatic vegetation in waterlogged areas of the command.

To develop methodology to identify different levels of standing water above the surface in the waterlogged lands.

To detect changes in the status of waterlogging in space and time.

Study Area : The Sarda Sahayak Command areas lies between the Ghaghra and Ganga rivers extending upto their confluence and is located between 80º0' & 84&25'E longitudes and 25º19 and 28º0'N latitudes which covers 161 blocks of 14 central and eastern districts of Uttar Pradesh.

Data Used : The Survey of India topographical maps on 1:250,000 scale havebeen used for preparing base maps.
IRS-1A, LISS-I digital data of February, 1989 have been used for classifying waterlogged areas and surrounding Landuse/Land cover patterns in the Sarda Sahayak Command area. Comparative study with classified Landsat-TM data of December, 1983 have been made.

Salient Results : Field information on extensive waterlogged areas in the command have been marked on to the toposheet and transferred these details on to digital images for carrying out supervised classification for identification of surface waterlogged lands in the Sarda Sahayak Command area. It has been also possible to classify different categories of surface waterlogged and the different levels of standing water above the land surface after integrating ground truth data.

Sponsoring Agency : Irrigation Department, Govt. of Uttar Pradesh.

Project Cost: Rs. 1.00 lakh

Duration of Study : Nine months i.e. from 01-01-1989 to 30.09.1989.

Project Team Scientist : Sri P. N. Shah
Sri A. C. Mathew

Project Title : **Flood Inundation Mapping of Uttar Pradesh using IRS-1A, LISS-I data of September, 1988.**

Objectives : Mapping of the entire flood inundated areas of the Ganga river system in Uttar Pradesh.

Mapping of the river channel courses within the flood inundated areas.

Mapping of fluvial geomorphic features showing ponding of flood/rain water.

Study Area : The area vulnerable to flood inundation falls between 26º0' & 30º0'N latitudes and 78º15' & 84º30'E longitudes. The study area is drained by major river such as the Ganga, Yamuna, Sai, Ramganga, Sarda, Gomti, Ghaghra and Rapti rivers. These rivers forms a part of the Gangetic alluvial plains which comprise the extensive flood plains of these rivers.

Data Used : The Survey of India topographical maps on 1:250,000 scale have been used for preparing base maps. IRS-1A, LISS-I, false colour composites on 1:250,000 scale of early September, 1988 have been used for delineating flood inundated areas.

Landsat-TM false colour composite on 1:250,000 scale of 01-09.1988 and IRS, LISS-I FCC data of 02-09-1988 have been used for understanding suspended sediment concentration in flooded Ghaghara-Ami-Rapti river system.

Salient Results : Flood inundation map of central and eastern Uttar Pradesh have been prepared on 1:250,000 scale which shows completely inundated area including croplands, partially inundated area including croplands, land unaffected by floods within inundated area, surface waterlogged/high soil moisture area, Pond/Lakes, River channels etc. Comparative study of suspended sediment concentration in flooded Ghaghara-Ami-Rapti river Systems have been carried out using IRS, LISS-I FCC data of 02.09.1988 and Landsat-TM FCC data of 01.09.1988.

Sponsoring Agency : Irrigation Department, Uttar Pradesh.

Duration of Study : Three months i.e. from 01.10.1988 to 31.12.1988.

Project Team Scientist : Dr. A. K. Tangri, Sri P. N. Shah, S. S. Chauhan, Dr. C.D. Murthy & Sri A.C.Mathew