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 longitudes 70°15' to 80°10’ and latitudes 25°30’ to 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 concentrated 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 explored 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

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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.
(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 located between 82°30’ E to 83°30’E longitudes 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).

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. Handwares 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.Virendra 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 Muhchorwaghat.
(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 survey area is located between latitude 27°12' to 27°30' and longitude 82°6' to 83°01' in Siddharth 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 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, dev egetated 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, Uttarakhand.

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 30°35' and 30°45' N and between longitude 79°30' & 79°40' 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, Gehr 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:**

1. To outline the causes of landslides in Sikkim.

**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.

**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

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**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:

31.03.2005

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.


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, Rudrprayag-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, Rudrprayag-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, Rudrprayag-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


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 Scientists: 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 77°45' & 78°0'E longitudes and 27°12'30" & 27°20'N latitudes covering parts of Agra and Mathura districts (U.P.).

**Data Used:**

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:**

**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

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**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, Debragarh 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 channel 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
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.


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.

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

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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.


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 targeting 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 24°15’ & 25°15’N latitudes and 78°15’ & 78°40’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/dolomite 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 area 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 23°58’ & 31°25’N latitudes and 77°05’ & 84°45’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:**
(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.

**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 30°15'30" & 31°30'N latitudes and 78°30" & 79°30'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.


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' & 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

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**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 granite 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. Hydrogeomorphological maps of Tehri-Garhwal, Kheri and Jhansi district are enclosed.

**Sponsoring Agency:**

**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 28°0' & 29°0'N latitudes and 78°0' & 79°0'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.

Project 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’ & 84º25’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 have been 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

Dr. A. C. Mathew

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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