Chapter-11

Development of North Eastern Region

Work done by Geological Survey of India (GSI) in North Eastern Region

11.1 A total of 33 nos. of investigations were carried out in North Eastern Region (including Sikkim) during 2004-2005 .

Specialized Thematic Mapping

11.2 Thematic studies in the Yinkiong-Boleng-Menchukha-Tuting area has revealed that the high grade metamorphics of the Sela Group comprising quartzite and marble are thrusted over the gneisses of the Bomdila/Zero Group towards west of Bame fault.

11.3 In view of establishing the tectonostratigraphic relation of the Proterozoic Yang-Sang-Chu Formation with the Cretaceous Tidding Formation, thematic mapping has been taken up in the area south of Annelin in the Dibang valley district. Two phases of deformations have been recorded in the area. The first deformation has given rise to the Ithun antiform and Myodia synform. The second deformation controls the topographic pattern in the area.

11.4 Thematic studies in the eastern Himalayan culmination zone in Sikkim have been continued to bring out inter-relationship of Precambrian suites of rocks. The programme has been completed.

Geochemical Mapping

11.5 Three items of Regional Geochemical Mapping one each in the states of Arunachal Pradesh, Assam and Meghalaya were taken up, the details of which are given in Table 11.1.

Table 11.1

S.No.	Item	Achievement	Highlights
1.	Regional Geochemical Mapping in parts of Kameng district, Arunachal Pradesh	GCM-244 sq .km Samples - 94 nos.	The area covered lies in West Kameng district (T.S. No. 83 A/1) samples were collected on 2km x 2km grid. A zone of sulphide mineralisation within Dirang Formation has been noted 5km from Mande. In on Nagagi Road. Mangniferous lenses and bands have also been recorded in the rocks of Dirang Formation near Mandela, Dirang, Pongma Khenda & Jeri.
2.	Regional Geochemical Mapping in Nagaon, Morign and Karbi Anglong district, Assam	GCM - 716sq.km Samples - 273 nos.	The area covered lies in Toposheet No. 83b/11 and comprises Quaternary sediments of Brahmaputra valley. sampleswere collected on 2km x 2km and 4km X 4km grid basis.
3.	Regional Geochemical Mapping in parts of West Khasi Hills district, Meghalaya.	GCM - 350sq.km Samples - 316nos.	The geochemical sampling was taken up in Toposheet No. 78 0/10. The stream sediment samples, mostly from 1st and 2nd order stream were collected from every 1km x 1km grid. A total of 5 samples composited from 20 cell samples were sent to the Chemical Laboratory, NER for analysis.

Mineral Investigation

11.6 A total of five investigations on basemetal and limestone were taken up, the brief highlights of which are given below: -

- Regional search for basemetal (Cu) mineralisation in the area between Pakyong-Phirphire to Dikchu, East district, Sikkim by large scale mapping, lithogeochemical sampling, pitting, trenching and ground geophysical input has been taken up.
- Investigation for basemetal (Cu) in Sodunglakha-Biring area, East district, Sikkim taken up. Four boreholes drilled did not intersect any sulphide mineralisation of significance.
- Preliminary investigation for base metals (Cu, Pb and Zn), and precious metal around Umphyrnai village, East Khashi hills district, Meghalaya.

11.7 In Meghalaya, two investigations for limestone were taken up in Lumsortoh Block and Um-Maju Block, both in Jaintia Hill district.

- In Larket and Jalaphet Blocks, spillover drilling continued. A reserve of (probable/indicated) of 395.86 million tonnes of limestone of SMS, cement and chemical grades in Larket Block and 11.59 million tonnes in Jalaphet Block have been added to the earlier reserves.

Geoenvironmental Studies

11.8 Geo-environmental appraisal and microzonation of Pakyong and Soreng area of Sikkim, have recorded incidences of landslides, rock falls, sinking spots, gully erosions etc. near the contact of the Gorubathan Formation and the Darjeeling gneiss. Soil erosion is more pronounced on the slopes of hills composed of the Darjeeling gneiss and the Gorubathan Formation. East of Soreng major part of the area comes under cultivation mostly along gentle and stabilised slopes with isolated houses.

11.9 Geo-environmental appraisal of Great Rangit Valley in parts of South and West districts, Sikkim, has recorded the Dalings and the Gondwana Group of rocks with tectonic contact. Geomorphologically the Gondwana shows structural hills while the Daling Group shows denudational and structural hills.

11.10 The geoenvironmental, geohydrological and geotechnical appraisal of the urban agglomeration of Agartala Town, Tripura, was taken up. The Agartala town forms a part of the Haora river basin. Five types of soil have been observed in the area under study. These are clayey loam soil, loamy sand soil, loam soil, sandy loam soil and lateritic soil. The water quality is potable except for the presence of excessive iron.

11.11 Geo-environmental appraisal of Sung Valley and surrounding areas, East Khasi Hills and Jaintia Hills Districts of Meghalaya revealed that in Maskut area apatite-magnetite rock rich in P2O5 content is conducive for lush green forest and good yield of crops. The analysis of surface water samples collected from streams flowing over pyroxenite and quartzite has exhibited two anomalies with respect to acid and basic radicals. The thematic maps on geology, geomorphology, slope morphometry, land use have been prepared on 1:50,000 scales.

Earthquake Geology

11.12 The first stage of seismic microzonation of Guwahati urban region covering 600 sq.km. has been incorporated in the report already submitted to the DST. Three microseismic zones have been inferred (based on surficial geological parameters)as (a) rocky upland with denuded / dissected hills containing six sets of discontinuities, (b) valley filled alluvial plain comprising three fluvial terraces, (c) swampy landmass with structurally controlled depression. With the aid of resistivity sounding, four zones have been

identified on the basis of depth to bedrock. The microlevel landslide hazard zonation on 1:25,000 scale could identify three zones in the area. The studies recommend that the extension of Guwahati town may be undertaken in the southern part instead of northeastern part. The newly planned industrial area of Guwahati falls in the part of comparatively low hazard. The maximum site amplification factor and peak frequency maps for Guwahati are also prepared as a tool for seismic microzonation of the area.

11.13 Site Response study was carried in Guwahati area using digital microearthquake recorders. A total of 80 stations were covered with a station spacing of about 1 km. Peak frequency contour map shows that the area between Kahelipara and Dispur within the Guwahati City has the peak frequency at 8-10 Hz for the estimated amplification of 2-3.

Geotechnical Investigations:

Water Resource Development Projects

11.14 Sikkim: At the Rangit Hydel Project, Stage-IV, on the basis of detailed geological mapping, the desilting basin site has been suitably shifted and orientations of both desilting basin and intake structure have been changed. Fresh dolomite intersected in a borehole at a depth of 9m from the riverbed level forms the foundation rock for the proposed concrete dam. At the Chakungchu Hydel Project, detailed geotechnical evaluation of cores of a borehole drilled at the suggested surge shaft site reveals that construction of an open to sky surge shaft and vertical/ inclined pressure shaft in this location appears to be feasible.

11.15 Arunachal Pradesh: At the Dikrong Hydro Electric Project, preliminary geotechnical appraisal around the proposed dam axis, Head Race Tunnel(HRT)/ Intake structure reveals that Siwalik Sandstone forms the foundation rock. subsurface exploration at Powerhouse site indicates depth of overburden varying between 6.10m to 15.63m from the ground surface. At the Kameng Hydro Electric Project, on the basis of detailed geological mapping around the proposed alternate dam axis site it has been suggested to shift the dam axis by about 20m downstream of the above axis on techno economical consideration, Five boreholes drilled at the proposed Kimi Power House site intersect sandstone below 12m to 15m thick overburden. Besides, it has been suggested to shift the proposed dam axis by about 50m downstream in the Bharali-II Hydel Project under the same scheme. At the Debang Multipurpose Project, on the basis of drift logging the stripping limit and rock condition have been evaluated.

11.16 Assam: At the Kopili Hydro Electric Project, it is revealed from the geotechnical appraisal around the proposed dam site and powerhouse site that fresh granite gneiss occurring almost from the surface forms the foundation rock for both the structures. On techno economical consideration both dam axis and HRT have been realigned.

11.17 Manipur: At the Thoubal Multipurpose Project, on the basis of detailed geotechnical evaluation of the distress slopes at several reaches of the Right Bank Main Canal it has been suggested to shift the canal alignment following suitable contours along the stable part of the hill slope. At the Dhulaithabi Barrage Project, foundation depth for the piers of the proposed Aqueducts along right main canal alignment has been finalised based on the geotechnical evaluation of subsurface exploration data.

11.18 Meghalaya: At the Myntdu-Leska Hydro Electric Project, the foundation depth of piers of the proposed bridge for facilitating dam construction has been finalized the basis of geotechnical evaluation of rocks. At the Umngot Stage-I & II combined Hydroelectric Project, on the basis of traverse mapping along the proposed HRT alignment it has been

tentatively established that hard and fresh granite gneiss will form the tunneling media. In view of inadequate rock cover above the crown of the proposed tunnel, minor changes of the alignment have been suggested to avoid tunnel collapse or chimney formation. At the Jadukata Multipurpose Project, Stage-I, on the basis drift logging, the stripping limit and nature of bedrock on the dam abutment have been established. Dam axis for the Jadukata Multipurpose Stage-II Project has been finalized.

11.19 Mizoram: At the Tuirial Hydro Electric Project, on the basis of detailed geotechnical evaluation of the spillway foundation, appropriate treatment has been suggested. Besides, appropriate support system has also been suggested for the collapsed portal of the power waterway and diversion tunnel on the basis of rock mass classification.

Communication Projects

11.20 Sikkim: On the basis of detailed geological appraisal of the Elachi slide,the entire slide affected area has been divided into four different zones viz. sinking zone, rockslide zone, shooting boulder zone and rock-cum-debris slide zone. Wiremesh shotcreting with drainage holes has been suggested. Detailed geotechnical investigation of the Sherwani slide reveals that detrimental pore water pressure is the main causative factor for the slide cum sinking zone. Besides, detailed geotechnical evaluation of the slope stability problem of Bhanugram area was also carried out to recommend suitable ameliorative measures.

11.21 Arunachal Pradesh: On the basis of geological mapping along the proposed Railway Line from Badetti to Itanagar, it has been tentatively established that the alignment between Badetti and Ramghat and around Itanagar passes through river deposits. From Ramghat and further upstream it runs over feldspathic soft sandstone with interbeds of carbonaceous clay, calcareous concretion and pebble and gravel beds.

Geophysical Surveys

11.22 The region conducted gravity-magnetic surveys in parts of Ri-Bhoi and East Khasi Hills districts, Meghalaya falling in topo sheet 78O/13. The results indicate prominent features, which will be interpreted by further processing of the data.

Landslide Hazard Zonation

11.23 The item of preliminary appraisal of landslide hazard zonation in parts of Mizoram was taken up. Besides, one additional item on studies on active landslide at Umtong village, East Khasi Hills district, Meghalaya, was taken up on request of Directorate of Soil Conservation, Meghalaya.

Research Investigation

11.24 Under research investigation, three items have been proposed, one each for Palaeontological, Petrological and PGRS studies. Brief highlights are given below:

- Fossilised dinosaurian bones were collected from Dirang along Ranikor-Nongnah section.
- In addition to earlier known occurrences of

- Arunachal Pradesh: Jaidhal Dam Project Dam Project.
- Assam: Kulsi Multipurpose Project.
- Meghalaya: Simsang Multipurpose Project, Somoswari Hydroelectric Project.
- Mizoram: Turini Hydroelectric Project, Tuichang Hydroelectric Project.

Lamprophyric rocks at Korstep, Umling, Pamjeri and Umtasor, three new bodies of similar rock types were located near Umsamjem, Mawkhab and Jadoh.

- Photogeological interpretation of Schuppen belt, has been completed. Three major thrusts, many lineament and a number of fractures / faults have been traced. Evidence of Neotectonism such as prominent lineaments in Alluvium, tilting and displacement of terrace etc. has also been picked up.

Work done by Mineral Exploration Corporation Limited (MECL) in North Eastern Region

11.25 MECL has been associated with mineral exploration activity and geo-technical studies in the North Eastern Region in last 25 years. So far, it has completed exploration for coal in the states of Assam, Arunachal Pradesh, Nagaland and Meghalaya on behalf of Ministry of Coal, North Eastern Council and CMPDIL.

11.26 During the year 2004-05 , MECL continued and concluded exploration activity for coal at Margherita, Assam and taken up exploration for coal at Namchi, Sikkim on behalf of Ministry of Coal and Exploration for Ferro-Silicon grade quartzite at Kalaktang Phase-II, Arunachal Pradesh on behalf of Ministry of Mines at an estimated cost of Rs. 197.46 lakhs was continued and completed during the year.

11.27 Exploration for glass sand, Jiajuri deposit, district Nagaon, Assam at an estimated cost of Rs. 214.61 lakhs has been taken up on behalf of Ministry of Mines.

Work done by Indian Bureau of Mines (IBM) in North-Eastern Region

11.28 Sub-regional office of IBM at Guwahati continued to undertake inspection of mines/studies on development of resources of the North-Eastern Region. During the period 15 mines were inspected for enforcement of provisions of MCDR, 1988 and for processing and disposal of mining plans.

11.29 During the period, the following four consultancy assignments namely (i) Topographic survey of Bhotang, Pancheykhani, Upper Pancheykhani and Dikchu Copper Mines for M/s Sikkim Mining Corporation, (ii)Generation of baseline data and preparation of EIA/EMP of Umrangso Limestone Mine for M/s Assam Mineral Development Corporation, (iii) Generation of baseline data and preparation of EMP of Upper Pancheykhani Copper Mine for M/s SMC , and (iv) Generation of baseline data and preparation of EMP of Lower Pancheykhani Copper Mine for M/s SMC, were completed.

11.30 In addition to the above, two technical consultancy assignments on preparation of scheme of mining were in progress.