

15 | Development of North Eastern Region

NORTH EASTERN REGION

15.1 The North-Eastern Region (NER) of India comprise a unique agglomeration, with a diversified geological set-up. The spectacular physiographic set up includes the stunning Himalayan mountain belt in the North, the Indo-Myanmar Range in the east and the mighty Brahmaputra, forming the extensive Assam plains. The diverse lithologic and tectonic ensemble calls for integrated geoscientific studies to identify and outline target areas pertaining to mineral resource evaluation, mitigation of natural hazards, environmental issues and water resources development projects.

15.2 To encourage investment in exploration and exploitation of the minerals for the development of mineral based industry in Northeastern States, Ministry of Mines in association with Governments of Northeastern States and the Federation of Indian Mineral Industry and Federation of Industry & Commerce of Northeastern Region organized an



Shri B.K. Handique, Minister of Mines and DoNER addressing the "Investors' Meet & Conference" held at Guwahati (Assam) on 6-7 November, 2009

Investors' Meet and Conference at Guwahati (Assam) from 6th to 7th November, 2009. In the interest of capacity building in the exploration and exploitation of minerals, Ministry of Mines has set up a Training Institute exclusively for the NER States at the Regional Headquarters of GSI at Shillong with a Field Training Centre at Aizwal, Mizoram.

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

15.3 The budget and expenditure for the Northeast Region for the Financial Year 2009-10 is given in **Table 15.1**

A total of 32 investigations were carried out in NER (including Sikkim) during annual programme of 2008-2009. A brief summary of the highlights pertaining to that period is given below.

MISSION: I - BASELINE GEOSCIENCE DATA GENERATION (Regional Survey)

Systematic Geological Mapping (scale: 1:50,000)

15.4 Systematic geological Mapping in parts of Mokokchung, Longleng & Tuensang district, Nagaland. An area of 155 sq.km. was mapped on 1:50,000 scale. The lithounits mapped belong to Disang Group (splintery shale and sandstone) and Laisong Formation of Barail Group comprising hard, well bedded, compact flaggy sandstone with fine grained grey sandstones.

Specialised Thematic Studies (1:25000 Scale)

15.5 The following five programmes were taken up during the period:

Table 15.1
Budget and Expenditure for the Northeastern Region for the Financial Year 2009-10
(upto December, 2009)

S.No	Head	NER Approved BE	Exp. Till Dec. 09	% against B.E
1	Survey & Mapping	5.16	1.62	31.40
2	Mineral Exploration	3.00	0.60	20.00
3	Special Investigation (Investigation)	1.20	0.49	40.83
4	R&D other Exploration (Antarctica)	1.57	0.21	13.38
5	Information Dissemination	1.62	0.17	10.49
6	Human Resource Development	0.00	0.00	0.00
7	Modernisation & Replacement	3.45	0.06	1.74
	Total	16.00	3.15	19.69

- Detailed corridor mapping in parts of West Kameng district, Arunachal Pradesh.
- Detailed corridor mapping and section measurement in parts of Dibang valley and lower Dibang valley districts, Arunachal Pradesh.
- Specialised Thematic Mapping along Assam-Arunachal foothills in parts of toposheets no: 83 B/9 & 13 in Sonitpur district, Assam and West Kameng district, Arunachal Pradesh.
- Specialised Thematic mapping of Gabbroic Anorthosite and associated porphyritic granite around Nongkasen-Nongstoin area & also Myriaw-Synniah area along with petrographic studies of gabbroic anorthosite rock, West Khasi Hills district, Meghalaya.
- Specialised Thematic Mapping along Bungzung and Laisomual hill ranges, Champai district, Mizoram.
- Regional Geochemical Mapping in parts of West Khasi Hills district, Meghalaya.
- Geochemical mapping of the area falling in SOI in toposheet Nos. 78 A / 7 & 8 of West and South districts, Sikkim and Darjeeling district, West Bengal.

Geochemical Mapping (GCM)

15.6 The following three programmes were taken up during the period:

- Regional Geochemical Mapping in toposheets no 78 J/11 & 12 in Goalpara district, Assam.

Geophysical Mapping (GPM)

15.7 Gravity – Magnetic mapping in parts of Kamrup district, Assam and West Khasi Hills and Ri-Bhoi district, Meghalaya was taken up and 1100 sq km was covered with station density of one station per 2.5 sq.km. Magnetic contour map in parts of the toposheet 78 O/5 has been prepared.

MISSION II: NATURAL RESOURCE ASSESSMENT (Mineral exploration)

Basemetal

- In the item of investigation for basemetal in southeast of Umpyrtha, Ri-Bhoi district, Meghalaya (P-II), a total of 160 number of soil samples were collected on (100 × 25m) grid along and across the strike. The analytical results are awaited. Preliminary search for basemetal mineralization along the contact of granite gneiss and schist belt and appraisal of the probable

occurrence and disposition of quartz-sillimanite bands within schistose package, Jaintia Hills district, Meghalaya was also taken up.

Industrial Minerals

- Preliminary search for glass sand around Jiyajuri-Borhola-Chapanala areas, Nagoan district, Assam was to be carried out but due to law and order problems the camp was temporarily closed in December, 2008.
- In Sikkim investigation for potential band of limestone and dolomite was taken up in Chakung, Malbase, Mangalberia and Sigeng areas in West district during the F.S. 2008-09. Two limestone bands have been identified in the area, one of which is exposed along the Namchi road section near Jorethang, which is intercalated with bands of phyllite and limestone (28m thick) and the other band is exposed along Nayabazar-Sombaria which is also an intercalated sequence of phyllite & limestone (8m thick). Analytical results are awaited. The investigation has been completed.

MISSION: III GEOINFORMATICS (Dissemination of Information)

- A total of 169 maps on 1 : 50K scale have been uploaded in the portal till September, 2009.
- The metadata of about 467 nos. of reports of GSI have been uploaded.
- 34 nos. of full reports published pre and post 2004 have been accommodated in the GSIPORTAL for consultation and downloading as per the new dissemination policy of the Govt.

MISSION: IV FUNDAMENTAL & MULTIDISCIPLINARY GEOSCIENCES AND SPECIAL STUDIES (Specialized Investigations)

Geotechnical Investigations

15.8 Following investigations were taken up during FS-2008-09.

- Kameng H.E. Project, West Kameng district, Arunachal Pradesh.
- Tawang Basin Project, Tawang district, Arunachal Pradesh.
- Lower Kopili H.E. Project, North Cachher Hills district, Assam.
- Geotechnical Investigation along NH-54, (East-West Corridor), Maibong-Nrimbangla section, N.C.Hills district, Assam.
- Rubber Dam Project across the river Pagladiya, Subankhata, Nalbari district, Assam.
- Feasibility Stage Myntdu – Leshka H.E. Project, Stage-II, Jaintia Hills district, Meghalaya.
- Umngot H.E. Project, East Khasi & Jaintia Hills districts, Meghalaya.
- Selim H.E. Project, Jaintia Hills district, Meghalaya.
- Simsang Multipurpose Project, East Garo Hills district, Meghalaya.
- Killing Multipurpose Project, Karbi Anglong & Ri-Bhoi districts, Assam & Meghalaya.
- New Umtru H.E. Project, Ri Bhoi district, Meghalaya.
- Tuipui Hydroelectric Project, Champai and Serchhip districts, Mizoram.
- Tuichang H.E. Project, Lunglei district, Mizoram.
- Geotechnical investigation on the stability of the proposed Parking Plaza, Mangan, North Sikkim.
- Feasibility stage geotechnical investigation of Kalez Khola Hydroelectric Project, West Sikkim District.
- Geotechnical assessment of the proposed Army office-cum-Residential complex, Penangla, East Sikkim.

- Feasibility stage geotechnical investigation of Suntale khola Hydroelectric Project, West District, Sikkim.
- Kolezkhola Hydro electric Project, West Sikkim.

Landslide Hazard Studies

15.9 The investigations for landslide hazard studies were as follows (state-wise):

- Preparation of landslide inventory of North Eastern Region and updating of inventory with photographs and index maps: A total of 90 landslide incidences have been recorded as per the available database viz., Assam (4), Arunachal Pradesh (8), Meghalaya (29), Manipur (19), Mizoram (26) & Nagaland (4).
- **Meghalaya:** Landslide Hazard Zonation of a two km wide strip along NH-44 between Shillong & Khliehriat, East Khasi Hills and Jaintia Hills district, Meghalaya: On the basis of slope characteristics the entire area has been categorized into 430 numbers of facets. Landslide Hazard Zonation for an area of 80 sq. km has been completed till 31st Mar. 2009. It is revealed that the area around 5 km stretch from Tuper to Wapung and another stretch from north of Jowai Town towards Ummulong road section is very vulnerable to landslide due to slope cutting for road construction.
- Monitoring of Sonapur landslide, Jaintia Hills district, Meghalaya. The pre monsoon reading taken indicated minor movement in the slide zone.
- **Nagaland:** Site specific studies of Zibja landslide, Kohima district, Nagaland: Detailed mapping on 1:1000 scale covering 0.3 sq. km. reveals the presence of numerous incipient crowns towards the toe part of the landslide body. Large scale quarrying just below the main scarp and dump of the landslide activates new slide every monsoon.

- **Sikkim:** GIS based Landslide Hazard Zonation on macro scale (1:50,000) using revised BIS parameters covering urban agglomeration centres, major communication corridors and prominent hydel projects of Sikkim Himalaya in east, west, north and south divisions, Sikkim was carried out. Field checks were carried out in connection with the validation work of LHZ modelling (GIS based) along important communication corridors of East, West, North and South of Sikkim. Further, investigation:-

- i) Post disaster study of Lantakhola landslide, North Sikkim District;
- ii) Inventory of landslides along 110 km long Algara-Rishi-Kupup-Nathula Road sector. A total of 49 slides along 110 km long Algara-Rishi-Kupup-Nathula Road sector have been studied, out of which 32 are debris slides, 11 are rock-cum-debris slides and 6 are rock slides; and
- iii) Integration of expert know-how for instrument aided monitoring of the 9th Mile Slide zone in East District, Sikkim were taken up.

Seismic Studies (Earthquake Geology)

15.10 Study of Ultapani-Saralbhanga-Lalbhitia-Singimajli-Ripu-Penkhoa (USLSRP): Active Fault Studies along foot hills of Assam-Bhutan Himalaya, was continued in Kokrajhar District, Assam. Geological mapping confirmed presence of the E-W trending fault in this segment evidenced by the occurrence of linearly arranged depressions along its base.

- Seismic Hazard Assessment of Shillong town covering an area of 103.7 sq km was taken up and all available and relevant literatures as well as thematic maps on geology, geomorphology, geophysics and landuse pertaining to the Greater Shillong town were collected.

- With the objective of generating data for long term monitoring of ground motion in the NE Mishmi Himalaya by employing GPS technology in campaign mode, the project on Monitoring of Ground Motion across Mishmi Thrust and Lohit Thrust in parts of Upper and Lower Dibang Valley Districts and Lohit District, Arunachal Pradesh was continued in the Dibang Valley and Lohit Districts. A total of 19 stations were set up for recording of data in yearly campaign. Geologically, stations were planned in different thrust bounded lithologic packets extending from south to north.
- Broadband Seismological Observatory at GSI office, Agartala was inaugurated by His Excellency the Governor of Tripura, Shri Dinesh Nandan Sahaya on 26 March, 2009. Foundation Stone laying ceremony for Broadband Seismological Observatory at GSI office, Itanagar took place on 18 August 2009.
- Seismogenesis in the Sikkim-Darjeeling Himalayas and assimilation of dynamic snapshots of the region for future vulnerability of earthquake were studied. Seismic monitoring was carried out by installing a total of 18 seismograph stations (Broadband for short period) at strategic locations like, Rangpo, Mangan, Jorethang, Adampool, Lachung, Lachen, Chhangu etc. During seismological monitoring, a total of 5600 micro-tremors ($M < 4.0$) were detected between 26.2.2009 and 31.5.2009.
- At the request of NHPC Ltd., a sponsored item on studying the 3-D seismic structure beneath the Dibang River Multipurpose Project, Arunachal Pradesh was taken up. The work included local earthquake tomography (LET) to synthesize the 3-D seismic structure beneath the proposed dam axis at Munli village, Lower Dibang Valley District. A versatile seismic network of 9 stations with both short period and broadband three component seismographs was installed.
- The study of seismotectonics of western and north-eastern Himalayas in GIS platform was carried out correlating seismic events with active tectonic lineament/faults.
- Geohazard (Environmental Studies)
- Geoenvironmental appraisal of Imphal valley of Manipur for deciphering arsenic related pollution in ground water. The work was extended to cover the northern part of Imphal Valley, covering nearly 500 Square Km. Out of 163 samples (73 hand pump from rocky area, 62 hand pump from Quaternary, 2 springs, 5 wells and 21 surface water) analyzed by field kit, 65 samples contain Arsenic, which varies from <50 to 300 ppb, as compared to BIS and WHO permissible limits up to 50 & 10 ppb respectively.
- Climate Changes
- Geospeleological studies in Mizoram: Two caves of Mizoram were investigated. The caves are found to be formed due to differential weathering and erosion of interbedded shale and sand stone of Bhuban Formation by water seepage along fractures and rule out the possibility of containing any speleotherms.

Fundamental Geoscience

- Study of the tectonism, magmatism and crustal evolution of the Northeastern Himalaya in parts of Tawang and West Kameng Districts, Arunachal Pradesh, confirmed that four phases of deformations have affected the area with highly penetrative S2 being the regional planar feature, which affects the entire rock unit of the area during syn-Himalayan orogenic phase.

Work Done by Indian Bureau of Mines in North Eastern Region

15.11 The Sub-regional office of IBM at Guwahati continued to undertake inspection of mines and studies

on development of resources of the North-Eastern region. During the year 2009-10 (upto December 2009) 55 mines were inspected for enforcement of provisions of MCDR 1988 and for processing & disposal of mining plan / scheme of mining.

105 dolomite / rock samples were analyzed for the Directorates of Mining and Geology, Sikkim/ Nagaland.

15.12 Three training programmes viz (i) Workshop-cum-Meeting under North Eastern Special Assistance Programme at Aizwal (ii) Training Programme on Mineralogy and Chemical Analysis at Nagpur and (iii) Training Programme on UNFC for Reserve Estimation at Agartala were conducted, 34 personnel from North-Eastern region participated in training programmes.

Work done By MECL In North Eastern Region

15.13 MECL has been associated with mineral exploration activities and geo-technical studies for the development of mineral industry in the North Eastern Region in last 28 years. It has completed exploration for coal in 12 blocks in the states of Assam, Arunachal Pradesh, Nagaland, Meghalaya and Sikkim on behalf of Ministry of Coal, North Eastern Council and CMPDIL. Under its promotional programme funded by Ministry of Mines, it has completed seven schemes which include copper, sillimanite, glass sand, shell limestone, Ferro-Silicon grade quartzite and consultancy work for remote sensing studies (Tripura) in states of Assam, Meghalaya, Mizoram, Sikkim, Arunachal Pradesh and Tripura. In addition, it has carried out geo-technical studies on behalf of Brahmaputra Flood Control Board in the state of Assam and Arunachal Pradesh. Beside these it has also carried out exploration for atomic minerals on behalf of AMD

and for limestone on behalf of North Eastern Council both in the state of Meghalaya.

15.14 During 2009, MECL completed physical work for exploration of glass sand at Jiajuri (Phase-II) in Nagaon district of Assam on behalf of Ministry of Mines. The geological report is under progress. Further, MECL has taken up detailed exploration for limestone in Western part of Tongnub South East Sub Block, Litang River Valley in Jaintia hills dist of Meghalaya, involving 1310 m of drilling in 8 nos. of borehole at an estimated cost of Rs. 346.28 lakhs. The physical work has been commenced in January, 2010.

15.15 The exploration for dolomite in Rupa dolomite prospect in West Kameng district Arunachal Pradesh, involving 800 m of drilling in 8 boreholes, at an estimated cost of Rs. 295.96 Lakhs shall be taken up after obtaining forest clearance.

15.16 In addition to above, detailed exploration of limestone at Nimi-Pyakatsu block, district Kiphire, Nagaland at an estimated cost of Rs. 113.57 lakhs will also be taken up in which field work shall be carried out by DGM, Nagaland and laboratory & report writing work will be taken up by MECL.

15.17 Further to above, on behalf of Directorate General of Hydrocarbon, Govt. of India, MECL with BRGM France is continuing studies for resource estimation in respect of oil shale deposit in an area of 254 sq.km. of Assam & Arunachal Pradesh. This will help in revealing the oil potential in the shales of North Eastern Region of the country. The physical work involving 2818 m of drilling in 8 nos. of borehole along with associated geological activities have been completed.