DOLOMITE, QUARTZ, SILICA, GLASS SAND, CLAY AND GRANITE BASED INDUSTRIES

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SUBMITTED BY:

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EXECUTIVE SUMMARY

TITLE OF THE STUDY

DOLOMITE, QUARTZ, SILICA, GLASS SAND, CLAY AND GRANITE BASED INDUSTRIES

Minerals form a major resource base for economic growth and have to be developed with pragmatic eco-friendly planning. Minerals are generally considered as the backbone of industries.In the present era of liberalized open economic scenario, the minerals endowed within the state/region which are having potential for economic development should be offered for adequate exploration and exploitation to enable setting up of commercially viable business enterprises. If properly exploited these minerals would boost the socio- economic status of the states under reference..

The N.E. Region of India including Sikkim is rich in mineral resources. It has substantial reserves of fire clay, feldspar, quartz/silica sand, granite for decorative/ construction purposes, brick earth and silt, fullers earth, lime stones of different grades, quartz pebbles,coal, petroleum and natural gas and moderate reserves of minerals like china clay and dolomite. Occurrences of iron ore, multi-metallic minerals, chromite, placer gold and phosphate have also been reported and investigated. It is observed that except for coal, petroleum & natural gas, limestone and multi-metallic minerals, adequate geological or techno-economic assessment is yet to take place regarding quantity, quality of other minerals, commercial viability of exploitation and possible viable value addition to these resources. Although sufficient work, both field and research, have been conducted on the energy group of minerals, not much progress has been made to exploit the aforesaid specific minerals. The region has seen the pioneering activities in the petroleum industry of the country and the same continues to be the main component of mineral based industry of the region. Development of other minerals continue to be poor or non-existent. To sum up, the mineral based industry is virtually in its infancy in the region.

It is in the above context that there is an immense need to undertake a pre-investment feasibility study with regard to assessment of availability, quality and quantity of these minerals and identification of commercially viable business prospects utilizing these specific minerals which would lead to overall socio-economic development of the region including Sikkim, and the country in general.

Realizing the significance and necessity of a comprehensive documentation of resource position of some selected minerals based on available data and assessing their commercial viability, North Eastern Development Finance Corporation Ltd. (NEDFi) decided to carry out a pre- investment study on dolomite, silica, quartz, glass sand, clay and granite based industries in the N.E. Region including Sikkim. Accordingly, NEDFi engaged North Eastern Industrial & Technical Consultancy Organization Ltd. (NEITCO), Guwahati to prepare the said study report vide its communication No. TEDF/43/861 dated January 24,2003.

The basic objective of the study is to assess the actual quality and quantity of exploitable mineral resources viz dolomite, quartz, silica, clay, granite and glass sand in the N.E. Region including Sikkim and the possible means to add value to these resources so that it can provide basic information to prospective entrepreneurs, investors, financial institutions, government agencies, etc, regarding business opportunities to set up business units based upon these mineral resources. The said study report should form the base for onward preparation of Detailed Project Report (DPR) giving due consideration to location and availability of the specified mineral, market demand, financial involvement etc.

Resources" as applied in this report encompasses minerals which have been investigated in substantial details and on basis of such investigation these minerals can be exploited for the next few decades.

The study involves a participatory approach aimed at achieving the set objectives for the assignment. NEITCO"s approach towards the assignment is based on extensive desk research, collection of relevant primary as well as secondary data from the related sources, interaction with resource persons connected with the mineral sector and analysis of the data so compiled under the prescribed guidelines provided by NEDFi for preparation of the study report.

The study covered the entire North-Eastern Region including Sikkim with special emphasis on the particular minerals viz dolomite, clay, glass sand, silica sand, quartz and granite, in accordance with the terms of reference. However, additional minerals were covered wherever considered desirable, in consideration of the fact that certain additives and availability of fuel including electricity would be desirable.

The study report provides readymade up-to-date information on the specific minerals and identified commercially viable business prospects based on these minerals. However, it is pertinent to record that most of the minerals specified require further detailed evaluation and should be mapped, sampled and assayed both through intensive surface and underground survey, which was not within the scope of work of NEITCO. Thus conclusions arrived at were solely based on reliable, updated available information from different relevant sources. The sources of information utilized for the study are as follows:

- Geological Survey of India, N.E.Region, Shillong/GSI, State Br. Office/ GSI,Kolkata.
- State Geology and Mining Departments of N.E.Region
- State Mineral Development Corporations of N.E.Region
- State Industry Departments of N.E.Region
- State Directorate of Economic & Statistics. Of N.E.Region
- State Forest/Environment/Pollution Deptts. of N.E. Region
- Regional Research Laboratory, Jorhat
- North Eastern Council, Shillong
- Indian Bureau of Mines, Nagpur
- National Small Industries Corporation, Guwahati
- National Mineral Laboratory, Nagpur
- Mineral Exploration Corporation, Nagpur
- Central Glass & Ceramics Research Institute, Jadavpur
- Council of Mineral Research Institute, Nagpur
- Electronic Media/National Informatics Centre (NIC)
- Relevant Study Reports (NEITCO & other agencies)
- Relevant Journals /Newspaper Articles
- District Library, Gauhati University Library, Guwahati
- Existing related mineral based units of N.E.Region
- Mineral based machinery suppliers
- Mineral based technology suppliers
- Mineral based raw materials suppliers
- Resource persons connected with mineral sector

North Eastern States including Sikkim are endowed with substantial deposits of minerals of economic importance which when properly explored and exploited will give a boost to the economy of the states. A major portion of these states are covered with forest. Almost all of these mineral deposits are located mainly in forest areas. The mandatory clearances related to forests and environment, pollution control etc. require considerable time which may lead to protracted implementation of the mining projects. The remoteness of mineral deposits from the consumption

centers is another hurdle, which causes high costs of transport. While exploitation of potential mineral deposits, even in a small scale, is capable of generating considerable revenue andemployment, mineral exploration is high a risk and capital-intensive venture; therefore, it is obvious that private investors may expect high returns if they are persuaded to put their money into it. The issue of development vis-à-vis environmental management will have to be addressed in the lightof priorities as fixed by the government. The problems and prospects of utilizing the stated minerals in the respective states of N.E. Region are provided below:

Arunachal Pradesh:

The dolomite deposit found in Kaspi near Dedza and Rupa areas in West Kameng district as explored by DGM, Assam at the request of the Govt. of Arunachal Pradesh is generally of SMS grade suitable for use in iron and steel industries. However by selective mining, parts of the deposit can be utilized in refractory and glass industry also. The main drawback of utilizing this deposits is that it lies near the main road leading to Rupa/Bomdila and mostly within an armybase area.

The ferro silicon grade quartzite deposit in the area 2 – 3 Km North of Kalaktang in West Kameng district is proved to be suitable for consideration in refractories because of high alumina. As per exploration works done by MECL there exist sustainable reserve of quartzite at Kalanktang area. Once the exploratory work is completed by MECL, mining of quartzite and establishment of silica refractory bricks can be thought of. The area has adequate infrastructure facilities to go for such type of mineral based industry. However, immediate setting up of mining projects may not be recommended, keeping in view the distance of available market and financialimplication thereof.

Assam:

The fireclay deposits of Sheelvetta and Koilajan of Karbi Anglong district and Namdang – Ledo coalfield as investigated by DGM, Assam and tested by CGCRI are found to be suitable for manufacture of fire bricks. A unit in Margherita had been manufacturing fire bricks and mechanized bricks since pre-independence period, recently the factory was closed as the requirement of internal consumption diminished drastically on account of transfer of mining methods from underground to open cast mining.

The Chinaclay deposits of Sheelvetta and Deopani of Karbi Anglong district as investigated by DGM, Assam and tested byCGCRI have been found suitable for whiteware and ceramic industries after blending with suitable plastic clay. Utilising clay of these two deposits a 4 TPD unit was set up at Sarihajan near Bokajan but had to be closed down due to external factors mainly insurgency problem in the district.

The silica sand deposits of Thanajuri and Jiajuri in Nagaon district as investigated by DGM, Assam have been found suitable for the manufacture of sheet glass and for soap grade sodium silicate. However, while utilizing these deposits beneficiation in terms of iron and titania is recommended. In the event, large scale exploitation is envisaged, detailed underground exploration shall be needed.

Clay and silt suitable for manufacture of mechanized bricks are available in plenty throughout the Brahmaputra and BarakValleys. Feldspar and quartz which are essential additives in manufacturing of ceramic and porcelain products are available at Sheelvatta, Koilajan and Rangchali in Karbi Anglong district as well as near Boko in Kamrupdistrict.

The promising granite deposits in Assam are at Agia in Goalpara district, Burapahar and Borjuri (North & South) in Nagaon district and Centre bazaar in Karbi Anglong district. In addition

substantial usuable deposits occur near Amingaon, Boko and in various placesin the Karbi Anglong District. As investigated by DGM, Assam and Rajasthan State Mineral Development Corporation most of these deposits are in highly fractured and fairly weathered conditions. These deposits may provide raw granite blocks suitable for medium sized slabs and all standard size tiles. However the crucial factor for utilizing these granite deposits appears to be the timely approval of permission by State Government. Forest Department for mining. In fact this is the reason why a joint venture granite processing unit set up at Khanapara, Guwahati could not come up, even after determining specific location of the raw materials and after incurring expenses on preparation of DPR, acquiring lands required for the plant and construction of basic facilities.

Meghalaya:

Umstew and Laitryngew silica sand deposits in Khashi hills district and Siju and Tura silica sand deposits in Garo Hills district of Meghalaya have been found suitable for manufacture of sheet glass as investigated by DMR, Meghalaya and prior to 1971 by DGM, Assam. At present some of these deposits have been exploited as source of building material and for manufacture of sodium silicate.

The fireclay deposits of Nangalbibra area of West Darranggiri coalfield in Garo Hills district of Meghalaya as investigated by DMR, Meghalaya and tested by CGCRI are promising for use as clay refractory. Refractory bricks are known to have been prepared from these clays and used in the thermal power plant at Nangalbibra.

As per investigation made by DGM, Assam, followed by DMR, Meghalaya, and tested by CGCRI, chinaclay deposits in Darrugiri, Nangalbibra and Mawpholong of Meghalaya are found suitable for whiteware ceramic products and moderate clay refractory materials.While chinaclay deposits in Songsak, Rongrenggrii of Meghalaya are found to be suitable for refractory and ceramic products where color of the finished product is not veryimportant.

Quartz and feldspar bearing pegmatite veins occur in south-east of Tura in Garo Hills districts in Meghalaya. Assay result from DGM, Assam indicate that the feldspar depositsare of ceramic grade, while the quartz deposits are suitable for glassware manufacturing and ferro-silicate industries. These minerals had been used in pottery industries in Meghalaya and Assam, for some time as additives. All these small-scale industries, set upby private entrepreneurs, became defunct mainly due to managerial and insurgency problems.
Deposits of multi-coloured granite occur in areas around Nongpoh, Myliem, Mawkgrawat, Mendipathar and Songsak as investigated by DMR, Meghalaya have been found suitable for use as dimensional and decorative stones. Promising deposits of black granite in Senjal and Mallidagunj of eastern and northern part of West Garo Hills district are considered suitable for making polished blocks and slabs. However important parameters relating to maximum size, uniformity of colour, texture, fracture, etc, have notyet been investigated in details to sustain a medium/large scale plant. But these deposit may, for some years, help tiles manufacturing industries in Assam, pending additional detailed studies.

Nearer to Guwahati the main commercial centre of N.E. Region, improved infrastructure facilities are an added advantage for setting up mineral based industries. However, the procedures to make Govt. forest land available for mining/processing plants to concerned investors must be made lesstime consuming and positive, giving rational consideration to the benefits accrued from such industry vis-a-vis forest and environmental issues.

Manipur/Mizoram/ Nagaland:

In all the above three states the occurrence of the stated minerals is almost nil or very insignificant

and hence cannot be exploited for commercial purposes. However the representative samples of some clay deposits of Manipur and Mizoram have already been sent to IBM, Nagpur for beneficiation. The Phek and Tuensang districts of Nagaland are rich in decorative stones based on which a unit manufacturing decorative stone and slabs has already come up at Dimapur. There seem to no reason to contemplate the setting upof a second plant before the existing plant shows reasonable success.

Tripura:

Glass sand/silica sand deposits in Tripura in the areas like Bishramganj, Purba Champamura and old Agartala, explored by GSI,are found to be suitable for manufacture of ordinary sheet glass, glass tumblers, lantern chimney, coloured glass and as foundry and moulding sand. A glass factory was set up at Arundhrutinagar in 1971-72 which has remained closed mainly due to management problem. There is still scope to revive the same with proper modification of approach and action, but on a small scale, considering the availability resources and market demand within reasonable economic transport distances.

As explored by GSI and tested by CGCRI, Hitkari potteries, Parsuhram pottery works & Modi Leggisted Kaotir Pvt. Ltd. the clay deposits of Tripura can be utilized for manufacture of LT insulators and medium quality potteries, stoneware pipes and some other mineral products. The medium grade ball clay deposits of Mohanpur can be utilized for the manufacture of sanitary ware, stoneware sewage pipes and can also be used as fillers and sizing materials in paper, rubber and paint industries. While Pagma clay deposit is suitable for white ware and store-ware articles the Shantibazar clay deposit is suitable for manufacture of roofing tiles, stoneware pipes etc.

For setting up clay based industries Agartala, Udaipur, Dharmanagar and Kalaisahar are the betterlocations from the point of view of availability of infrastructure facilities, nearer to raw material and market, availability of skilled/semi-skilled/un-skilled manpower, communication with proposed extension of railway to Agartala and particularly the possibility of border trade. It should however be emphasized that financial success ofsuch industries shall mainly depend on the volume of economic market demand.

Sikkim:

Dolomite deposit of Respi-Mangalband and Namgaon areas of West Sikkim district as explored by GSI & DMG, Sikkim are suitable for used as flux materials. But commercial utilization of dolomite deposit in the state is not found to be cost effective, competitive as compared to dolomite coming from Bhutan and Darjeeling and Jailpaiguri areas. Remoteness/difficult accessibility and high transport cost are the major hurdles.

Good quality granite (light colour) suitable for manufacture of granite slabs/blocks is available inparts of south and west Sikkim. However, most of these granite deposits run through the towns, villages and forest areas which make mining activities in these areas next to impossible. Over andabove another common problem is small size of individual deposits for which mining of these deposits is commercially not viable as individual deposits would exhaust within a short period of about 4 years or so.

It is pertinent to note that the status of exploration of some of the stated minerals in the region are almost in the initial stages. Therefore, necessary steps for intensive exploration, supported by required beneficiation, etc. in some selective locations from the point of view of commercial viability must precede the establishment of medium or small scale mineral based industries in theregion. Besides timely arrangement of required fund from Financial Institutions/International source, identification of skill/expertise development of prospective investors are some of the important steps that must be undertaken.

General Executive Summary:

After carefully analyzing the problems and prospects of utilizing stated minerals in the region identification of potential stated minerals based industries in the region has been worked out taking the following aspects into consideration against each identified project.

1. Market consideration stressing on adequate market potential in the local/regional/national/export level.

2. Easy and regular availability of raw materials in adequate quantity and qualityand alsoeasy availability of required consumables.

3. Nearness to the related mining sites/market from project location (distance andexistingroad/railway communication)

4. Availability of technology (preferably indigenous) through which related quality product/s could be manufactured as well as identification of reputed equipment suppliers.

5. Availability of infrastructure in terms of adequate availability of required utilities (power,water, fuel) and proper communication system, Road (PWD/NH)/Railwayand transport.

6. Due consideration to state and central incentives package for the N.E. Region for settingup of industrial units. Also considered are certain related WTO guidelines.
7. Availability of required skilled/unskilled manpower for the manufacturing project as wellas for necessary detailed exploration and exploitation of raw materials.

8. Potentiality of generating employment and sufficient profit margin by the identifiedprojects, which would lead to overall economic upliftment of the area/state/region.

The above considerations are duly incorporated in the project profiles prepared on each of the identified projects as shown in Chapter-7. Accordingly the identified stated mineralbased potential industries are as follows.

1. Dolomite Powder (Cap: 6600 Tonnes Per Annum)
2. Granite Tiles/Slabs/Blocks (Cap: 7200 Square Metre Per Annum)
3. Chinaclay Washery Project (Cap: 16500 Tonnes Per Annum)
4. Ceramic Glazed Tiles (Cap: 3600 Tonnes Per Annum)
5. Mechanised Bricks (Cap: 180 lakh Nos. Per Annum)
6. Ceramic L.T. insulators (Cap: 900 Tonnes Per Annum)
7. Soap Grade Sodium Silicate (Cap: 300 Tonnes Per Annum)
8. Refractory Bricks (Cap: 600 Tonnes Per Annum)
9. Glass manufacturing (sheet) (Cap: 3000 Tonnes Per Annum)
10. Ceramic Crockery (Cap: 650 Tonnes Per Annum)

The factors which area specifically relevant for setting up the stated mineral basedindustries in the region are as follows.

- Availability of land, power and water in adequate quantity.
- Availability of raw materials, fuel, additives in good quality andquantity with minimum expenditure in transportation.
- Availability of good road communication at close proximity for quicker and economic transportation of raw materials and finishedproducts.

- Availability of clustered industrial activities that exist nearby to facilitate timely repair and replacement of equipment, basic common facilities both from human and business angles
- Availability of skilled and unskilled manpower at reasonable rates.
- Proximity both to the related mining sites and market.

Giving due regard to the factors mentioned above the following proposed sites have been considered against the identified stated mineral based projects.

1	Dolomite Powder	:	Bongaigaon in Assam, in and around Siang district, Arunachal Pradesh
2.	Granite Tiles/Slabs/Blocks :		Boko, Amingaon, Jorabat in AssamByrnihat in Meghalaya
3.	Chinaclay Washery Project :		Deopani in Assam Darugiri in Meghalaya

4. Ceramic Glazed Tiles : Guwahati, Bokajan, Lanka, Dudhnoi orBoko in Assam. Byrnihat, Mendipathar, Cherrapunji inMeghalaya.

5. Mechanised Bricks : Amingaon, Mirza, Duliajan or Tinsukia, Dhubriin Assam.

6.Ceramic L.T. insulators : Guwahati, Bokajan, Matia in Assam. Byrnihat, Williamngar in Meghalaya.

6. Soap Grade Sodium Silicate : Guwahati, Amingaon, Nagaon in Assam Jowai, Laitryngew in Meghalaya Agartala in Tripura and Dimapur in Nagaland.

7. Refractory Bricks : Tinsukia, Guwahati Bokajan, Matia in Assam. Byrnihat, Mendipathar in Meghalaya

8. Glass manufacturing (sheet) : Nagaon, Greater Guwahati in Assam Jowai in Meghalaya, Agartala in Tripura,Dimapur in Nagaland.

9. Ceramic crokery : Greater Guwahati, Bokajan, Matia in Assam. Mendipathar in Meghalaya.

Before drawing up an action plan for development of stated mineral based industries in the region all related factors are to be carefully studied so that an integrated approach could be undertaken to achieve the goal. Accordingly the following action plan is suggested for the purpose.

- Determination of the extent of further exploration and exploitation of the stated minerals in the region in the context of increasing the manufacturing capacity of plants. Beneficiation to confirm the exact quality of the mineral and finalization of particular location where ultimate mining of the stated minerals could be undertaken, based on commercial viability in terms of transportation of various raw materials and major markets. Proper tie-up should be made with all concerned agencies to take up the activities of exploration/exploitation/ beneficiation/mining etc. List of such agencies, general activities required for exploration and common mining equipment are indicated in this report.

- Formulation of a suitable fiscal and legal regime conducive to the development of the stated mineral based industries with due regard to environmental factors and ecology of the region and ultimate socio-economic benefits.

  Intensive coordination of Geology and Mining Department with other related departments of (i) Industry, (ii) Roads & Bridges, (iii) Power, (iv) RuralDevelopment, (v) Forest, (vi) Pollution control/environment, (vii) Transport and communication, (viii) PHE, (ix) Planning & Development etc. so that the necessary infrastructure could be provided to facilitate exploitationof the stated mineral/establishment of stated mineral based industries in the region
- and also to derive a common strategy to tackle such requirements.

- Provide comprehensive information on stated minerals and on the stated mineral based industries to the potential investors by concerned Govt. departments without cumbersome formalities which

exists at present.

- Provide technical expertise including preparation of appropriate DPR for exploiting such minerals.
- Provide guidance for tie-up with other enterprises outside the State/ Region for marketing and collaborations for exploiting the stated minerals resources for future expansion
- Guide and provide avenues for funding, specially institutional finance, to the propective entrepreneurs. Assistance from external funding agencies like UNIDO, ADB, World Bank and National Organizations like NMDFC, for long-term low interest loans to be channeled to prospective entrepreneurs..
- Explore and lay down the framework for export of stated mineral produce specially through Bangladesh to South East Asian Countries and beyond.
- Train and equip technical personnel of the concerned department as well as strengthen its expertise base so as to enable proper guidance and training to prospective entrepreneurs on setting up of the stated mineral based industries.

List Of Agencies Involved in Exploration/Laboratory Tests

Agencies undertaking exploration activities for various mineral including fuel

- Geological Survey of India. (GSI).
- Mineral Exploration Corporation Ltd. (MECL).
- State Directorate of Geology and Mining. (DGM).
- State Directorate of Mineral Resources.(DMR).
- Central Mine Planning and Designing Institute.(CMPDI).
- National Mineral Development Corporation (NMDC).
- Oil & Natural Gas Commission.(ONGC).
- Oil India Limited.(OIL).

Agencies undertaking laboratory test:

- Indian Burea of Mines (IBM), Nagpur.
- Central Glass and Ceramic Research Institute (CGCRI),(Jadavpur),Kolkata
- Regional Research Laboratory (RRL), Jorhat.
- Dalmia Institute of Industrial Research (DIIR), Orissa.
- College of Ceramic Technology (CCT), Kolkata.
- Inspection Survey & Surveillance (India) Pvt. Ltd.,(ISSL), Kolkata.
- Central Building and Research Institute (CBRI), Roorkee

List Of General Activities Required for Exploration

The general activities required to be carried out exploration of mineraldeposits in order to transform them into the resource category are stated below:

- Detailed Topographic survey and geological mapping (preferably 1:2000 scale).
- Excavation of shallow pits to collect bulk samples for analysis.
- Exploratory drilling.
- Analysis:

a) Primary samples
b) Composite samples.

- Spectroscopic studies.
- Specific Gravity determination.
- Petrographic studies.
- Beneficiation studies (if required)
- Environmental studies.
- Specific data on behaviour of the deposit both in horizontal and verticalterms,Ratio of overburden to usable ore etc.
- Exploration report.

List of Common Mining Equipment

The common minimum essential mining equipment required are as follows:

- Compressor.
- Jack hammer drill with accessories/diamond core drilling machines.
- Diamond wire saw.
- Mobile crane
- Other Mining equipments/Accessories (Ropes, pulleys, tripod etc.)

Statutory and Regulatory Requirements:

It happens that all the minerals specified in this report [except for ordinaryclay and brick earth, occur within notified forest land, mining activity & extraction of these minerals shall be subject to provisions of the Forest Conservation Act 1980. In accordance with the aforesaid Act and Rules framed therein the following are the prerequisites that are essential before any mining lease applied for is granted. It is to be noted that forest land is either to be de-reserved or diverted for a specified period. [In case of mining activities diversion would be required for specific time periods].

To achieve these goal an entrepreneur has to collect various procedural information/format etc. from Directorate of Mines & Mineral of respective states, or in the absence of such a department, they should approach Industry & Commerce Department and the Forest Department. At present Assam, Meghalaya, Nagaland, Manipur & Sikkim have their Mines Directorates. As for Tripura and Mizoram the Mines Department is attached to IndustriesDepartment.

Application for grant of Mining lease shall be made in Form-I. As for setting up a manufacturing industry based on minerals (and for that matter – any raw material) the entrepreneur has to approach the Department of Industry, Pollution Control Board of respective states and for NOC from District Councils, in case the mineral occurs under administrative control of the district council.

Environmental Impacts:

To assess the adverse impact on the eco-system, it is necessary to precisely evaluate these impacts on the quality of existing environment, by generating baseline data of the area. The choice of impacts to be considered in performing an environmental impact assessment generally varies according to type of the project and action under evaluation. Hence, unlike other industries, in preparation of scheme of mining prior environmental management plan is mandatory and after this, it may be necessary to modify the scheme again, to incorporate necessary environment management programme.

Observations & Recommendations:

Based on the analyses of various aspects of the study a final conclusion has been derived hereunder to provide some comprehensive recommendations towards sustainable development of stated mineral based industries in the N.E. Region including Sikkim :-

- To transform some known important deposits to resource status – by conducting necessary detailed investigation. To carry out such works most of the N.E. States, particularly Assam and Meghalaya have necessary manpower expertise as also machinery and equipment. However, assistance from organizations like IBM, CGCRI, RRL, National Physical Laboratory etc. should be taken whenever considered necessary.

- Most of the stated mineral deposits in the N.E. Region are located either in reserved or unclassed forests and under difficult topographic conditions. Mining of mineralore reserves may become one of the strong alternatives in reducing the dependency of local people on forests, Jhum cultivation etc. Development of available known mineral resources will certainly reduce social pressure on forest and also pave the way for strengthening economy and infrastructure development in the states of the region. The states need to pay more serious attention for explorating, developing, and exploiting theknown mineral resources as early as possible with a rational approach by giving due regard to environmental factors and ecology of the region for requirement of the future generation. The state Governments may formulate a policy defining fiscal and legal regime, development of the mineral sector inclusive of single door policy for development of the already known mineral resources as well asthose likely to be discovered in the near future.

- Various inputs on mineral resource status, market demand, source of present supply, market price, Govt. incentive and other basic materials should be made available to interested entrepreneurs by related agencies. At present anybody who desires to set up a mineral based industry, and for that matter, even consultancy organizations have to make tremendous efforts in terms of time period, manpower and cost to collect basic information. There seem to bean element of negative and casual attitude shownby those who are supposed tohelp entrepreneurs in collecting data/information and necessary clearance to go ahead with any proposed mineral based industry in the region.

- All mining activities come under the purview of various Central & State Act and Rules inclusive of Mines & Mineral (Regulation & Developments) Act 1957, Mineral Concession Rules 1960, Forest Conservation Act 1980, and Minor Mineral Concession Rules of respective states. It is hell of a task for any prospective entrepreneur to pass through all these legal aspects to just geta lease/permission to mine and exploit any mineral deposit. The problems are many folds and difficult if the mineral happens to occur in forest areas and hills. Environmental Control legislation has become another serious problem. Under the circumstance it is essential that a rational and time bound decision is made by related deptts. to consider timely approval of any application for granting Mineral License and allowing setting up of mineral based plants. The respective state Govts may also create such centralized cells for easy access to basic details.

- Proper and active co-ordination between the respective Directorates of Geology and Mining with other related departments such as (i) Industry, (ii) Roads & Bridges, (iii) Power, (iv) Rural Development, (v) Transport & Communication, (vi) PHE, (vii) Planning and Development Deptt., (viii) Financial Institutions, (ix) Pollution Control Board/Environment etc. is essential. The North Eastern Council may create a resource-planning cell for mineral production and proper development which should have updated data/information on resource position and various facilities, subsidies, incentives and make such data/report easily available to any prospective entrepreneur. The respective state Govts. may also create such centralizedcells for easy access to basic details.

  The Government of India‟s effort towards the development of the North Eastern Region as the corridor for trade with Southeast Asia has been further vindicated by the recent investment survey report by Cooper and Lybrand declaring that North East India is likely to become “the commercial hub” of Southeast Asia within the next 20 years. The opening of border trade with neighbouring countries from this region may prove quite beneficial for export of mineral produce to Bangladesh and via- Bangladesh utilizing Chittagong Port to South East Asian countries. But again this is a policy matter of central/concerned state government and therefore one has to wait and study the facilities offered and the terms and conditions imposed before undertaking border trade.

Infrastructure facilities need a quantum boost if serious attempts are contemplated to achieve sustainable development of mineral produce in the region and their proper and economic uses. There is a great need for paving effective and all-weather linkage and railway network for the development of inter-state movement of raw minerals/mineral produce in the region. Further, as most of the stated mineral deposits in the region exist in the remote places, easy accessibility through proper development of road linkages should be made to these deposit sites to make it easier for transport and supply of raw materials and other essentials in time at mining/project sites as well as for disbursement of finished mineral produce to the market.

Utmost attempt should be made to link the North Eastern Region to the rest of the country cost effectively. Due to isolation of the region from the rest ofthe country the cost of transportation becomes prohibitive. The region needs links in the form ofcost effective roads, rails, airport and waterways.

The state governments should undertake effective steps to motivate and involve the people/private sector in the mineral sector. Progammes to facilitate/attract investments from outside, disinvestments/privatization, promotion of joint ventures wherever necessary, entrepreneurship development of local educated unemployed youth, training and capacity building of the officers of the department as well as the people, involvement of the landowners and the villagers for exploitation of themineral resources as well as contributing necessary R&D/consultancy works and establishing funding/marketing linkages with national/international organizations should be taken up by the state governments.

Unless the relevant support systems, particularly finance and allotment of government/private land for development of mineral based industries become dynamic, one cannot expect the much talked about promotion of stated mineral mining and processing plants. The financial markets in the North East are still immature and vulnerable and access to private capital is unreliable, limited and costlyand, as such, North East financial market is still capital shy. The financial institutions must ensure timely sanction and release of required fund for the mineral based projects. As an alternative possible source for International Fund in this direction may also be explored. And since most of the stated mineral deposits fall under concerned state forest departments the process of formally handing over of required land for the purpose of setting upeco-friendly stated minerals mining and processing plants should be executed without much procedural handicaps, delay on account of slow progress of filesand numerous steps of bureaucratic procedures.

Market intelligence on the mineral produce as well as marketing system should be developed by way of regular and continuous study of market behaviour of what happens inside the market and why it happens and should relates to features like price, arrivals, stocks, despatch, market reaction/sentiments etc. Market information enables one to know theeffectiveness of the marketing mechanism and to devise ways and means of making it more effective.

For the last one decade or so almost the entire N.E. Region has been experiencing insurgency activities, which, prove to be a major impediment to the process of development in the region. Besides, transport, communication and regular supply of electricity, which is frequently disrupted for prolonged periods for whatever reasons, are major handicaps for production. The present practice of collecting unauthorized tax, extortion are also badly affecting the costing of the produce of the region. A congenial work atmosphere must prevail in the region if sustainable development of any sector of the economy including the mineral sector has to be achieved. Therefore, urgent necessary efforts are to be undertaken by all concerned to ensure an improved law and order

situation and congenial work atmosphere in the region.

Finally, it is considered that, inspite of various existing constraints, problems and drawbacks, some of the mineral processing plants as stated in previous chapters may and should be set up on small or medium scales with provision for future expansion. The conclusion and recommendation have been made in consideration of location of raw materials, location of the processing plants, nearest suitable market.

The installed capacity, approximate project cost and likely generation of employmentagainst each of the identified projects are as follows:

Sl.No.	Identified Project	Capacity	Project Cost(Rs lakh)	Employment (Nos.)	
				General	Factory
1.	Dolomite Powder	6600 TPA	26.31	6	6
2.	Granite Tiles/Slabs/Blocks	7200 sq.m PA	30.12	10	26
3.	Chinaclay washery project	16500 TPA	179.34	15	54
4.	Ceramic glazed tiles	3600 TPA	448.66	10	40
5.	Mechanized bricks	180 lakh Nos. PA	401.04	20	54
6.	Ceramic L.T. Insulators	900 TPA	328.02	9	41
7.	Soap grade sodium silicate	300 TPA	47.17	4	6
8.	Refractory bricks	600 TPA	59.13	9	61
9.	Glass manufacturing (Sheet)	3000 TPA	111.38	14	20
10.	Ceramic crockery	650 TPA	340.92	9	75
