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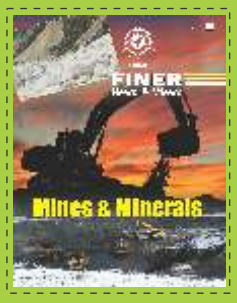

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MESSAGE

It gives me Immense pleasure to know that the Federation of Industry & Commerce of North Eastern Region (FINER) in its endeavour for economic and infrastructure development of the NE Region has specified and decide to focus on Mines and Minerals based Industries through their monthly Bulletin called "FINER News & Views" with the appreciable theme of Mineral based industries scenario of the region.

I take this opportunity to compliment FINER for their endeavour in promoting Mines and Mineral industries and allied activities amongst entrepreneur.

I hope the articles in the magazine will help in throwing light on new and emerging aspects of mineral based industries.

I wish the magazine is well read and well appreciated by all.

25/11/16

(Pramila Rani Brahma)

President Desk

North East India is fairly rich in mineral resources. The main strength of the region for industrial development comes from its natural resource base. Minerals like oil, gas and limestone have long been used to feed various industries and there is scope for further use of such resources for industrial use. The potentials of other minerals including uranium are yet to be fully investigated and established. Apart from petroleum, coal, limestone and sillimanite, which have been regularly extracted since long, the region also has a number of other valuable minerals.

North East Region has crude oil and natural Gas reserves. Superior quality natural gas is available at an attractive price. The well at Digboi, Duliajan, Sivsagar etc also produce Natural Gas accounting to about 50% of India's total off shore production which may be used for production of fertilizers, electricity, petrochemicals and fuel in the industrial sector. Limestone is another mineral available in different grades. The China clay from Karbi-Anglong district is vital for the ceramic industry. Deposits of decorative stones like granite are available in various shades and colours and has a huge domestic as well as export market. Coal reserves are also found in abundance.

Against the advantage of natural resource base, the major hindrances for industrial development of the region appear like dearth of local capital and entrepreneurship, and marketing and transport bottlenecks. In this age of globally mobile capital flows, non-availability of local capital of course need not be a binding constraint. Capital can flow in from outside the region if the business environment can be made conducive to industrial investment.

Of let, responding to the growing public discontentment in the region, the Central and State Government is paying greater attention to the problems of industrial and overall economic backwardness of the region

North East is a big market for mineral resources, as metals and power demand is expected to have robust growth in future.

Pabitra Buragohain

President

One day National Workshop on

Lean Manufacturing under LMCP (Up-scale) Scheme

on 12th Dec, 2016 at NEDFI Convention Centre, Guwahati.

Federation of Industry & Commerce of North Eastern Region (FINER), in association with MSME- Development Institute, Guwahati is organizing a One day National Workshop on Lean Manufacturing under LMCP (Up-scale) Scheme on 12th Dec, 2016 at NEDFI Convention Centre, Guwahati. Shri Chandramohan Patowary, Hon'ble Minister, Industries & Commerce, Government of Assam, has consented to be the Chief Guest in this national event. Sri S. N Tripathy, IAS, Addl. Secretary & Development Commissioner (MSME), Government of India and Dr. K.K. Dwivedi, IAS, Commissioner, Industries & Commerce, Government of Assam, will grace the occasion as Guest of Honor.

The main objective of the workshop is to popularize the scheme for the formation of Lean Cluster as per the guideline of Lean Manufacturing Competitiveness Scheme (Up- Scale). The workshop will be enlighten on the procedure of implementation of the scheme, financial assistance from government and benefits which will be accrued to MSMEs from Lean Manufacturing Techniques. The workshop will also enhance the competitiveness of Micro, Small and Medium Enterprises through a numbers of techno-managerial interventions/Quality technology tools that help these enterprises to modernize and become competitive.

NER Dialogue –An Interactive Session between Union Ministers of NE, MP of NE and various stakeholders

The North-East MP Forum in association with Federation of Industry & Commerce of North Eastern Region (FINER) organised the 1st NER Dialogue on the theme - "Impact Analysis of NER Industrialisation enabled through various Central Government Policies" on 15th Dec, 2016, at New Delhi.

The key objective of the NER Dialogue is to revisit the challenges & opportunities of North-east Region and place it before the eminent guests and participants and partner the decision makers to conceptualize effective policies to promote and attract investments in NE Region in both manufacturing & services sector. There is no doubt that the last 10 years has seen a large outcome on attracting investments to NE Region. Individual States need to partner the Central Ministries in marketing such policies to investors on the potential areas of investments as well as create a positive image amongst larger society in the State to motivate the investors to come and prosper in the NE Region. Based on the discussions a memorandum was formalised by NEMP Forum to be presented to Smt Nirmala Sitharaman, Hon'ble Minister of Industry and Commerce and with copies to CEO, NITI Aayog and other relevant Departments and Ministers. The Interactive Meeting was chaired by Shri Bhubaneswar Kalita, Hon'ble MP, Rajya Sabha & Chairman NEMPs Forum along with presence of other key designates of NEMPs Forum. Dr Jitendra Singh , Hon'ble Minister DoNER, Shri Rajen Gohain, Hon'ble, MOS Railways and Shri Kiren Rijiju, Hon'ble MOS Home Affairs were the Guest of Honour for the Interactive Meet.

Senior Officials from the Central and NE State Governments like Shri Naveen Verma, IAS, Secretary, DoNER and Shri Ram Muivah, IAS Secretary, NEC alongwith the Captains of Industries & Commerce of the North East Region also graced the occasion.

Two key presentations- one on the "Socio-Economic Background of NE Region- Rapid industrialization in NE to catch up with Country's Rate of Urbanization & Per Capita Income " and another on the "Impact of Industrial Policies in last 20 years on NE Region" was presented during the meeting by Renowned Economist – Dr. Amiya Sharma, Executive Director, Rastriya Gramin Vikas Nidhi and Shri Swapnanil Barua, IAS (Retd) Former Commissioner, Industries & Commerce, Govt. of Assam ,respectively.

The presentation of Dr Sharma emphasized on the availability of human capital, social capital and also acknowledged the lack of equity capital and knowledge

capital in NE region, which shall need outside-in interventions. The presence of entrepreneurship skills is not adequate in various States to build sustainable operating assets and it will take the investments from private sector outside the region into the North east. This is possible by attracting them to invest and overtaking the various socio-economic and political, law and order issues existing in various parts of the region. Shri Baruah specially emphasized on the need of investments in the region for creating employment and skill development to reach the dreams of Sabka Saath Sabka Vikas, specially with data showing maximum presence of youth in the age group population residing in NE region. He brought out the research performed on the amount of units that could possibly come to invest as a direct outcome of the central investment policies existing currently.

During the interactive session Shri Pabitra Buragohain, President, FINER, expressed the need for whole-some and unstinted partnering between the Hon'ble MPs of NEMP Forum, Ministry of DoNER and FINER to bring the needed social upliftment and value entrepreneurship as one of the strongest tools to increase employment opportunities and increase in per capita income.

Shri Naveen Verma, IAS, Secretary, DoNER, expressed that the domestic investors are plenty and NER need not worry about the FDI. The industrial growth needs of NE required more review and inputs were desired by FINER.

Dr Jitendra Singh, Hon'ble Minister DoNER, expressed the passion of current team in Ministry of DoNER and that they are working with passion thinking every moment about NE region. He suggested more participation between FINER and Ministry of DoNER to keep having engagements in necessary areas. He further stated that it was after 40 years a Prime Minister visited for NEC plenary Council meeting held recently in Shillong. He discussed need to promote homestays as a good means to earn money by towns and villages to promote low-cost tourism and as well as encouraging the entrepreneurship.

Shri Kiren Rijiju, Honble MOS Home Affairs, expressed that the current investment policies were useful to few States and there is a need to look at balanced growth of NE States through addressing the grassroot level issues of every State in a holistic manner while designing policies. He felt a saturation has come in NE and we need to take the next step forward. He emphasised that now the gap between rural and urban has reduced rapidly with mobile phones, satellite TV, roads available in all locations.

Shri Rajeev Agarwal, Vice President, FINER intervened thanking all participants to hear the Guests and expressed his confidence in FINER's role to leverage the existing social capital of NE region for the benefit of industries and that NER Dialogue has been designed to bring the aspirations of the stakeholders of NE region infront of the Key dignitaries from respective Ministries. The aspirations are now an outcome of the strong push by Hon'ble. Prime Minister of India, Shri Narendra Modi himself who is keen to connect North-east through the Act East Policy, which was highlighted by Dr. Jitendra Singh. Mr Rajeev emphasized, "that NE investment policies need to attract all types of industries in a graded approach and suitable precautions can be undertaken to have safe and environment friendly manufacturing and service sector operations in all parts of NE States". Amongst present were eminent intellectuals like Shri Sanjoy Hazarika, Managing Trustee, Centre for North East Studies, who emphasised the need to recognize the big picture and understand the role of social entrepreneurs who are playing their role successfully in their respective States of Ne region and government need to build their capacity.

Development of Minerals in North Eastern Region

Dr. S.L. Marbaniang
Member
Meghalaya Mining Association

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. The North Eastern Region represents varied, geomorphological and geological setup which is ranging from Precambrian to Recent age. It is manifested by spectacular Himalayan Mountain Belt in the north; Shillong Massif Plateau in the south and mighty Brahmaputra forming the extensive Assam plain in between and Indo-Myanmar Range in the east.

Within these fascinating and fabulous environment of NER, it is said that rich potential wealth of mineral resources are lying untapped, ready to be exploited for the benefit of the people. Accordingly, Geological Survey of India (GSI), a Government of India establishment, has taken up the challenge of conducting survey in the scattered areas of the region. The findings are quite encouraging.

Parts of Mokokchung, Longleng and Tuensanj districts have rich deposits of petroleum oil. In the Barail range of lower Assam, there is a thick and well-bedded sandstone (80%) and thin band of shale (20%) with coal seam (1-2 metre thick). All along the foothills of Assam-Arunachal, scientists have found evidences of rich mineral deposits. These are concentrated in Sonitpur district of Assam and West Kameng district of Arunachal Pradesh. Quartzite deposits are detected in the eastern region of Shillong basin, in parts of East Khasi Hills and Jaintia Hills districts of Meghalaya. Sedimentary rocks of Mizoram state offer evidences of mineral presence. The areas which have substantive resources are Ngopa, Khazawl, Champhai and Serchhip districts.

Geochemmical mapping (GCM) was taken up in three areas of NER and these were Goalpara and Bongaigaon districts of Assam, parts of East Khasi Hills district of Meghalaya, parts of West and South districts of Sikkim. Similarly, geophysical mapping (GPM) was conducted in parts of East and West Meghalaya. Granite rocks which are of use in day-to-day use in households and industries are located in and around Shillong. Some of these rocks are found to possess magnetic values. There are potentialities of iron ore deposits in the northern part of East Garo Hills district of Meghalaya. To the east, and adjacent to it, bedrock samples of Athiabari, West Khasi Hills district contain iron. During survey, the scientists of GSI have found that iron ore bands occur not only within the deep bowels of the earth but also occur as floats.

Manipur has potential deposits of platinum group of elements (PGE) Massive chromite occurs in the state. Mentionably, platinum is a very costly mineral, more than gold in value. The metal is very useful in electrical industry and radio-active research. With regard to base metal like copper, Umphyrnai and Pomlakrai are taken up for investigation. Occurrence of secondary uranium-lead and thorium has also been reported.

Investigation for base metal and gold was taken up in Chakung-jugdum area, West district of Sikkim. Substantive amount of copper is also reported to be present in the same belt. Beyond these belts, traces of gold and copper are also reported to be quite sizable quantity. GSI has conducted survey in Assam on industrial minerals. Glass sand in Jiyajuri - Chapanala areas, Nagaon district of Assam is detected to be of substantive amount to meet the demand of glass industries in Assam. Quartzite occurs in Pulibagan to the West and in Parkup to the East. This friable quartzite appears to be suitable for glass sand industry. If properly exploited, the yield of quartzite from the region between Jiyajuri and Champawati is expected to be huge considering the width of only this particular deposit which varies between 0.5 km and 1.5 km, without taking into account the lay stretch land. Over and above, Meghalaya has been known to be gifted with various other minerals like phosphates, kaolin and china clay, dolomite, silimanite, carborundum etc. Rich deposit of high class value uranium are found in Domiasait, West Khasi Hills district and its neighbouring areas , as well as in certain locations near Sohra. However with regard to uranium exploration, because of its highly radioactive property which is detrimental to health, people in the State have frequently expressed their strong reservations.

Mining and People's Protest

Shri J.Bhattacharjee
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Introduction

Mining operation continues amidst the varieties of challenges to people's life, livelihood, and the ecological set up of the area of its operation. Because of its ill effect, mining project very often generates opposition from civil society. India's North East which has vast reserve of mineral resources also experiences the same. This is mainly observed in case of its three major mining operations in the region. These are: coal mining in Assam, Uranium and Limestone mining in Meghalaya. It is to be noted that the region has the potentiality to meet most of its energy requirement for the continuity of its growth centered path of development for the country as a whole. Though because of the communication barrier the region is a late addition in its different sorts of operation related to development and industrialization, the region has made lot of hue and cry for its mining operation in Meghalaya, mainly for Uranium and limestone, recently being the rat hole mining of coal. All these made it necessary to study the people's opposition to mining operation in the region in terms of the issues involved and strategies followed and the success it has made in its goal. The paper is based on three case studies: First: coal mining in Assam, second Uranium mining in Meghalaya and third being the Limestone mining in the same state. The paper is based on both secondary as well as primary sources of information. The secondary data are collected from different published works while the primary data are collected by the author from the field itself.

A case study method has been followed to understand the nature of activism in North East India. A general treatise on people's protest against mining Most of the mining operations are very often found to face opposition and protests from different corners mainly from the environmentalists and local people who are affected by mining. Mining has a multiple of affects starting from deforestation, air pollution, pollution of river etc. While environmental impact is one of the major reasons of rising protests against mining, displacement of indigenous people is a very common ground for which mining is opposed highly all over the world. This is true of all environmental movements over the world. As mining operations are increasing to cater the need of the growing economy, the sizes of the mines are also increasing. The size of coal mines has grown from an average of 150 acres in 1960s to an average of 800 acres in 1980s and to some 1500 acres today. The increasing size of mines mainly coal mines have more displacement effect in comparison to the past. Moreover the rehabilitation and resettlement of the displaces are also not done adequately. Very often the compensation given to the affected people is very meager. The compensation in terms of giving job to the diaplaces is also very unsatisfactory. This can be observed in case of Karanpura village of Jharkhand where 10.18 percent of the

6265 families are given jobs in the mining sector1 . The impact of mining and the reactions to it in India is wide and far. In their study on impact of coal mining in Damodar river basin R.K.Tiwary and B.B. Dhar2 maintained that exploitation of coal mine and related industries have exerted a great impact on the environment of the basin. Besides effecting the environment, mining also leads to displacement of people mainly indigenous people. According to T.E. Downig mining has displaced 2.55 million people between 1950-19903 in India. Because of these multiple causes mining very often face opposition from different groups. The recent report of protest by Green groups in Australia against its largest coalmine in Queensland4 is an example of activism against mining. Environmentalists claimed that the proposed mine will damage ground water supplies and contribute to climate change. It is estimated that the mine will have a carbon emission more than the total carbon emission by Denmark. The Green Groups thus threatening legal action to prevent the mine to go ahead. The non-ferrous metal mining in Guatemala5 is yet another exampleof people's protest against mining. Because of its negative impact on environment and poor people engaged in agriculture, the civil society of Guatemala has opposed vehemently against mining operation in Guatemala.

Mineral and Mining in North East India North East India, a geographical region comprising of eight states namely, Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Sikkim and Tripura holds a reserve of coal, natural gas, oil and limestone. Assam and Meghalaya has a large reserve of what is called 'Black Gold' i.e., coal. The region has a small fraction of its total area under lease for mines. It is reported that North East India has 395 millions of coal deposits apart from Uranium, petroleum, limestone and other minerals. According to the Indian Bureau of Mines 1991 and director of Economics and statistics, 2003, quoted in Fernandes7 , coal mining leases in Assam is 3126.98 acres while that of limestone is 2214.14 acres of Area. Mining in North East India started with the discovery of presence of coals in the Margherita hill ranges when it started.

A close examination of the people's protests over the mining projects show two major concerns: One, the effect of mining on the physical environment and health of local people which has been repeatedly spelt by the studies made by different researches, and two, the issue of compensation and relocation ofthe affected people which depicts the issue of human rights over land and livelihood. The mining operations in North East India thus go through similar experience as is found in case of the rest of the states of India as well as the world. The region being highly inhabited by tribal people further suffers for meeting the need of compensation for each tribal family as the land belong to community and the distribution of land is highly made on communal ownership basis. As a result estimating the loss incurred by the individual family is very difficult and compensation for such loss is more complex. Again since the tribal land cannot be given to any private body the tribal people feel the move for mining operation as a conspiracy to alienate the tribal people from their forest land. This needs to be further understood by keeping the very nature of the society and the institution associated in the entire process.

7 Effects of Mining and Processing of Mineral Resources on Environment

Puja Mondal
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Some of the major environmental effects of mining and processing of mineral resources are as follows: 1. Pollution 2. Destruction of Land 3. Subsidence 4. Noise 5. Energy 6. Impact on the Biological Environment 7. Long-term Supplies of Mineral Resources.

Mining and processing of mineral resources normally have a considerable impact on land, water, air, and biologic resources.Social impacts result from the increased demand for housing and other services in mining areas.

1. Pollution:

Mining operations often pollute the atmosphere, surface waters and ground water. Rainwater seeping through spoil heaps may become heavily contaminated, acidic or turbid, with potentially devastating effects on nearby streams and rivers.

Trace elements (cadmium, cobalt, copper and others) when leached from mining wastes and concentrated in water, soil or plants, may be toxic or may cause diseases in people and other animals who consume contaminated water or plants, or who use the soil. Specially constructed ponds to collect runoff can help but cannot eliminate all problems.

Huge volumes of dust generated by explosions, transportation and processing may lead to the death of surrounding vegetation. Chemicals used in the extraction processes, such as drilling muds, are often highly polluting substances.

2. Destruction of Land:

Mining activity can cause a considerable loss of land because of chemical contamination, destruction of productive layers of soil, and often permanent scarring of the land surface. Large mining operations disturb the land by directly removing material in some areas and by dumping waste in others. There can be a considerable loss of wildlife habitat.

3. Subsidence:

The presence of old, deep mines may cause the ground surface to subside in a vertical or horizontal direction. This may severely damage buildings, roads and farmland, as well as alter the surface drainage patterns.

4. Noise:

Blasting and transport cause noise disturbance to local residents and to wildlife.

5. Energy:

Extraction and transportation requires huge amounts of energy which adds to impacts such as acid rain and global warming.

6. Impact on the Biological Environment:

Physical changes in the land, soil, water and air associated with mining directly and indirectly affect the biological environment. Direct impacts include death of plants or animals caused by mining activity or contact with toxic soil or water from mines. Indirect impacts include changes in nutrient cycling, total biomass, species diversity, and ecosystem stability due to alterations in groundwater or surface water availability or quality.

7. Long-term Supplies of Mineral Resources:

The economies of industrialized countries require the extraction and processing of large amounts of minerals to make products. As other economies industrialize, their mineral demands increase rapidly. The mineral demands of countries in Asia, such as Malaysia, Thailand and South Korea have grown phenomenally in the last twenty years.

Since mineral resources are a non-renewable resource, it is important for all countries to take a low-waste sustainable earth approach to dealing with them. Developed countries need to change from a high-waste throw away approach and developing countries need to insure that they do not adopt such an approach. Low-waste approach requires emphasis on recycling, reusing and waste reduction and less emphasis on dumping, burying and burning.

Recycling and reuse benefit the environment because they:

1. Extend the supply of minerals by reducing the amount of materials that must be extracted

2. Require less energy than extraction

3. Cause less pollution and land disruption

4. Reduce waste disposal costs and prolong the life of landfills by reducing the volume of solid waste. Reducing unnecessary waste of non-renewable resources can extend supplies even more dramatically than recycling and reuse because it reduces the need to extract more resources, thereby reducing the impact of extraction and processing on the environment.

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COAL MINING
IN NORTH EAST STATES OF INDIA

Nedhi Baski, Human Resource
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Coal mining is carried out in the states of Arunachal Pradesh, Assam, Manipur, Mizoram, Nagaland and Tripura. The north east region of India holds reserves of coal, natural gas, oil and limestone; Assam and Meghalaya have large coal deposits.

The north east region of country accounts for a very small fraction of total area under mining leases (only 0.21% in Assam and 0.66% in Meghalaya. The reason is sheer fragility of the region's ecological profile makes it vulnerable to mining activity.

Coal mining is done in Assam's hill ranges-Patkai, Tirap and Tikok. In Meghalaya, large number of small mines exists where small quantity of coal is extracted manually. All the minerals are undercommunity control and done 100% manually. The Government open cast mines run by North-Eastern Coalfields Limited (NECL) also extract coal in this region.

In Meghalaya, mainly Tertiary Coal deposits are there which are at the upper part of the tertiary rocks. The total coal deposits in this State are estimated at about 600 million tons, and the largest coal deposit is at district of Jaintia Hills and at present large scale extraction is being carried out.

Nine important coal deposits locations are there in the state, out of which Bapung and Lakadong are the most important. The remaining are : Lumshnong, Malwar Musiang Lamare, Mutang, Sutnga, Jarain Tkentalang, Ioksi and Khliehriat. Roads from Jowai the Headquarter of Jaintia Hills District are almost connected to all mines, 64kms from Shillong. The NH-44 connecting Shillong, Jowai, Badarpur and Silchar leads access to Bapung, Malwar, Mutang, Lumshnong and Lakadong coalfields. Most of the Coal mining is controlled by private companies in the state.

Locally the mining of coal is known by making small pit holes commonly known as Rat Hole Mines, as the mouth opening of the pit is hardly 1mtrs opening through which the miners crawl and excavate coal. These pit holes are 50-100mts deep in length from the opening. The coal is loaded in small wooden barrows, brought outside the pit hole to be loaded onto trucks. Presently coal mining in the region is about 2 million tons per annum.

Potential of industrialization in MINING AND MINERALS : NORTH EASTERN

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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. Most of the accounted mining industries in the northeastern region are located in the states of Assam and Meghalaya. Assam is known for its petroleum and natural gas reserves, coal, limestone and minor minerals; Meghalaya has established coal and limestone mining industries.

Within these fascinating and fabulous environment of NER, it is said that rich potential wealth of mineral resources are lying untapped, ready to be exploited for the benefit of the people. The findings of Geological Survey of India (GSI)are quite encouraging.Parts of Mokokchung, Longleng and Tuensanj districts have rich deposits of petroleum oil. In the Barail range of lower Assam, there is a thick and well-bedded sandstone (80%) and thin band of shale (20%) with coal seam (1-2 metre thick). All along the foothills of Assam-Arunachal, scientists have found evidences of rich mineral deposits.

MINERAL RESOURCES

North East India is fairly rich in mineral resources. Apart from petroleum, coal, limestone and sillimanite, which have been regularly extracted since long, the region also has a number of other valuable minerals.

Fig 1: North -East India (Reservesof someMinerals) (in million tonnes)

Mineral	*Estimated Reserve*
1 Coal	893 000
2 Petroleum	876 000
3 Limestone	7133 000
4 Dolomite	380 000
5 Sillimanite	10 025
6 Iron Ore	48 380
7 Glass sand	5 267
8 Ceramic Clay (all varieties)	95 642
9 Uranium	D N A
10 Natural Gas	114 billion m^3

The iron ore deposits so far explored in the region are found to contain a low proportion (41% and below) of iron. The explorations have revealed that ironstone nodules and shale of the Tipam and Barail Series of sedimentary rocks containing from 22.1% to 40.1% of iron. The second area where iron ores are found lies in Dhubri district in an around the hills of Bilasipara, especially at Chandardinga hills (estd. reserve 17 million tonnes) and at Melajgarh (26°15' 20'N and 90 °

28'00'E) near Abhayapuri. The ores here contain 30% -40% iron. The third reserve is found in the Meghalaya foothills of Kamrup and Goalpara district at Nalanga Beel, Kumri hill, Langupara hill, Khardong and at Arandanga-Raochapra area near Hahim, In the Garo Hills district iron ore has been discovered at Athiabari and Nichangram. In the East Khasi Hills it has been found at a place 28 km north of Cherrapunji, where magnetite is present in the granite deposits. In Nagaland Laterite capping, rich in iron are found in the north western foothills of Wokha district. In Manipur bog iron is present in a wide area near Lauchipat. In Arunachal Pradesh iron ore has been detected in East Kameng and West Siang districts. It has, however, been found that iron content in the ores of the North East India is generally low, being less than 50%.

Copper deposit has so far not been found in North East India. Small deposits have so far been found in Assam, Meghalaya, Nagaland and Manipur.Copper is found in these hills in the form of pyrrhotite, chalcopyrite and pyrite in small proportions of 0.04% to 0.39%. In Meghalaya it is found at Umpirtha and Ranighat (25^{0}50' N, 91010'30" E). In Nagaland copper is present in the basic and chalcocite. In Manipur it has been reported from Nungon, Kongal, Thana and Ningthi (Maklong Khing) area.

Chromite is rarely found in our country and more so in this region. Small deposits of chromite have been found in Nagaland in the ultrabasic rocks situated near the Patkai Range. In Manipur it has been found at Siroi hill of Ukrul and Moreh of Chandel district. In Meghalaya chromite has been found in the Sizu basin and in Arunachal it is discovered at Tiding Valley.

Traces of nickel deposits have been found at Moreh, Vungon, Kongal, Thana and Ningthi areas of Manipur in association with the ultrabasic rocks and serpentine bodies. This mineral has also been traced in Subansiri district of Arunachal Pradesh. Traces of cobalt deposits have been found in the Lower Subansiri district of Arunachal and at Pulphur village in Kiphire sub-division of Tuensang district (Nagaland).

North East India has large reserves of coal, especially in Assam and Meghalaya. The quality of coal so far found is however, not very good in that its organic Sulphur content is high (upto3%) and carbon content is relatively low. Assam is said to contain about 1000 million tonnes of coal reserve, while Meghalaya also has about 1200 million tonnes. The first coal mining in the region was started in 1865 at the Makum coal-fields under the initiative of H.B. Medlicott.

Distribution of Coal Deposits:The geographical distribution of the coal reserves is as follows:

(A) Coalfields of Assam:

1. Upper Assam Region: In the Upper Assam region coal occurs from Miao Bum in Changlang district in the east to Nichuguard at the Nagaland foothills, south of Dimapur. The important coalfields of the region are as follows: (i) Makum Field in the Margherita area, (ii) Jaipur-Dili Fields and (iii) Naginimara Fields.

2. Karbi Anglong Coal Deposits:The coal deposits of Karbi Anglong are found in the following places.

• Longloi Deposit: This deposit is found at Longloi about 40 km west of Barpathar. However the quality of coal as such, is not very good with a high proportion of impurities present in it.

• Koilajan Deposit:This deposit is located at Kailajan about 28 km west-north-west of Dimapur. The quality of coal is fairly good and it is commercially exploited for local use.

• Silbheta Deposit : This deposit lies towards the western side of Karbi Anglong , to the north of Dimapur - Nagaon Road and covers an area of 1.4 km^2 .The coal is of fairly good quality and the total reserve is estimated at 15.7 million tonnes.

• Kharbhaman Deposit: This deposit occurs on the western side of Kharbhaman Hills (26^{0}02'N: 93^{0}24' E) in the south-western part of Diphu Sub-division. There is a single seam of coal extending over 0.5 km. The estimated reserve is 0.5 million- 06 million tonnes.

(B) Coal Fields of Meghalaya

There are rich coal deposits along the southern part of Meghalaya in the Garo, Khasi and Jaintia hills. A broad outline of the coal deposits of the state is given below:

• The Garo Hills Deposits: The Garo hills has a rich reserve of fairly good quality coal. The fields of this area were first explored by Bedford in 1842 and subsequently by H.B. Medlicott of the Geological Survey of India. The important fields so far found are located at (i) Darranggiri, (ii) Rongrengiri, (iii) Harigaon, (iv) Siju Simsang Valley and (vi) Nangalbibra (25'28: 90^{0}42').

• (ii) The Khasi Hills Deposits: In Khasi hills workable deposits of coal seams are found in several places, of which Langrin (Um Blay) located in the extreme south west corner of the West Khasi Hills district, Um Rileng, 8 km south west of Shillong, Mowbeh -Larkar, 32 km south of Shillong, Mowsynram, 19 km north west of Shella, Mowlong, Rangsanobo and Laitryngew near Cherrapunji, and Thangjinath and Lyngkerdem near Pynursla. Of all these deposits, coal is extensively mined at (i) Um Rileng mines, (ii) Mowbeh -Larkar mines and (iii) Mowlong, Rangsanobo and Laitnyngrew mines.

• The Jaintia Hills Deposits: The workable coal seams of the Jaintia Hills are located at Jarain, 16 km south of Jowai, Bapung, 11 km east of Jowai, Sutunga, and 24 km east -south -east of Jowai, and Lakadong, 16 km north - east of Jaintiapur. Coal is also reported to occur in the headstream region of the Kapili River.

(C) In Nagaland Tertiary coal is present in the basal argillaceous beds of the Tikak Parbat formation (Barail Group) of the Oligocene Period. Because of a high content of organic Sulphur and indifferent coking character, this coal has not been extensively used in the iron and steel industry of the country.

(D) Coal Deposits of Arunachal Pradesh: In Arunachal Pradesh both Gondwana and Tertiary coal

deposits occur. While the Gondwana coal deposits are found along the Himalayan foothills in the west and east Kameng districts. The Tertiary coal is present in the Namphuk and Namchik valleys of Changlang district almost in continuation to the Ledo-Borgolai fields.

(E) In Manipur high grade coal has not been struck so far. However Lignite deposits occur near Kongra-Waiphei Village (24° 26'35"N: 93° 42'32" E), about 32 km south-west of Imphal. Lignite is also found in the Tureloo Valley in the Churachandpur district of the state.

(F) In Tripura, coal has so far been found to occur in Kailashhar area near the Tripura-Bangladesh border in the North Tripura district. This coal is of Tertiary period and contains impurities like organic Sulphur. However, it is commercially exploited for local use.

Production of Coal in N.E India (million m tonnes)

Year	Assam	Meghalaya
1955-56	463	50
1960-61	550	60
1965-66	666	52
1970-71	522	61
1975-76	507	59
1980-81	575	521
1985-86	835	550
1990-91	612	346
1992-93	1101	----

Fig 2: Production of Coal in NE India

Petroleum: North East India is rich in petroleum deposits. In fact until the middle of the nineteen sixties Assam was the only state in India producing some amount of oil .The presence of oil in the forests and fields of Upper Assam was detected as back as in 1822. Up till 1920 the average annual production of petroleum was less than 20,000 tonnes annually. But after the takeover of the A.O.C. by the B.O.C. production started increasing. The B.O.C. explored oil in the Barak valley also during the first two decades of last century and found oil and natural gas in Masimpur-Badarpur area. The Oil India Limited constituted in 1958, subsequently developed and operated these fields. The oil bearing deposits of these fields belong to the Barail and Tipan sandstone beds and lie at a depth of 3000 metres. The crude yields paraffin wax, lubricating oil, bitumen and various other by-products. Apart from the Oil India Limited, the Oil and Natural Gas Commission reconstituted in 1959, also started exploring for oil and natural gas after and after 1950 many deposits of oil and natural gas were found. The areas where these two valuable resources were discovered during the three decades following 1950, are Tengakhat,Jurajan, Rudrasagar, and Geleki. Lakwa, Longsai (Dikhoumuk), Amguri and Barhola. In almost all these areas oil and natural gas have been found in the Barail and Tipam beds. Among all the oil fields of Assam theGeleki field is found to be the largest.

Arunachal was brought into the oil map of India by the Oil India Limited by discovering oil at Kharsang in 1976, where oil occurs in the Girujan beds of the Oligocene Period. Till the 31st March of 1988, the Corporation drilled 37 wells in Arunachal Pradesh and produced 2, 39,623 tonnes of crude oil. Petroleum has also been struck at Champang in Mokokchung district of Nagaland. It is said that gas and oil deposits may be also available in the Satukba-Chumukedima area of Kohima district. Oil and gas seepage is reported from the north-central part of Mizoram also. Drilling has been carried on near Dibuia, Lakhumi and Longsamtang villages of the region.

In North East India natural gas is mostly found in Assam and Tripura. In Assam, almost all the petroleum producing areas of the upper Brahmaputra Valley, especially Naharkatiya, Moran, Lakwa and Rudrasagar, contain 'associated natural gas' Barak Valley, on the other hand, contains 'free natural gas' in the Adamtila structure at a place 60 km away from Silchar. Tripura is the other state in the region where free natural gas has been found. Wells have been dug at a place 15 km west of Agartala, from where gas flows out at the rate of 1.12 lakh cubic metres per day. It is estimated that in an area of 77 km around Agartala, there is a reserve of 8 billion m^3 of natural gas. Free natural gas is said to be available in Turial area of Mizoram and Chumukedima area of Nagaland. The North East Indian region is said to contain now a total reserve of 240 billion m^3 of gas.

North East India has a vast reserve of limestone totaling about 6.684 million metric tonnes. The limestone found in the region is mostly organic, originated from nummulite shells in those areas which were under intermediated sea condition during the Mesozoic period. Of the seven states, the largest reserve of limestone line in Meghalaya (4665.36 million tonnes) followed by Arunachal Pradesh (1504 million tonnes), Nagaland (450 million tonnes), Assam (135 million tonnes) and Manipur (4.6 million tonnes). It is also found in small quantities in Mizoram and Tripura.

Limestone Reserves of N.E.India
(million tonnes)

1 Arunachal Pradesh	1503 00
2 Assam	135 02
3 Nagaland	150 00
4 Meghalaya	4665 00
5 Manipur	4 60

Fig 3: Limestone Reserves in N E India

Meghalaya, and Karbi Hills of Assam are the two areas where this mineral has been found. In Meghalaya sillimanite deposits occur as outcrops associated with older gneisses over a belt of 320 km^2 in the Sonapahar -lalmati area in the northwestern corner of West Khasi Hills, just south of Boko- Hahim region of Assam. The variety of sillimanite found here is of very good quality containing 61 % of alumina and 36% of silica. The mining of sillimanite in the early days, i.e. since 1950 was done by the Assam Sillimanite Ltd. In 1973 the lease of the mines was taken over by the Hindustan Steel Ltd. and this company has been mining the mineral ever since.

Dolomite deposits of the North East India are so far found in Arunachal Pradesh and Meghalaya. The reserves are estimated at 38 million tonnes in the former and 20 million tonnes has been identified at Cherrapunji. Although no large-scale commercial exploitation of this mineral has so far been taken up.

Marble: Although no good quality marble has so far been discovered in this region, there are deposits of green marble along with serpentine and gemstone in the Moreh region of Manipur. Marble along with limestone and graphite has also been discovered in the Lower Subansiri district of Arunachal Pradesh.

Corundum is ranked second only to diamond in hardness and is used in refractory crucibles, occurs in North East India in association with sillimanite as a locally segregated bodies in the sillimanite bearing rocks of the Sonapahar-Lalmati area of Meghalaya.

Gypsum, which is used in the chemical industries and to manufacture of the region. In Assam it is found in the Dimasa Reserve forest of Karbi Hills, near Badrapur of Cachar district and near Haflong and Mahur of North Cachar district. In Meghalaya gypsum deposits are confined to the Garo Hills area, especially near Mahendraganji, Garobadha, Mariangpara, Mongopara and Tarapara. In Nagaland it is discovered in Tuensang district.

Mica: In North East India mica is found mainly in the rocks of the Meghalaya-Karbi Plateaus. As white mica (muscovite) it is available in the Dholamara Hills of Goalpara district adjoining the Meghalaya Plateau and as lepidolite or lithium mica it is present at is present at the northern tip of the Dhir Beel (26°25'N, 93° 44E) and Mukjan areas of the Kaliani river valley.

Mercury: Deposit of mercury has been found at a small zone in Bangswar River in Tripura by the Geological Survey of India and Science &Technology Department of Tripura.

Graphite: Although no graphite has commercially been mined in North East India, the region is rich in this mineral. Almost all the deposits of graphite of the region are confined to Arunachal Pradesh. There are rich deposits of it at La Lamdak (23,777 tonnes of flaky variety and 3.3 million tonnes of amorphous variety) Lalpani (71 million tonnes of amorphous variety) and Lanchidhouri (10, 35million tonnes of amorphous type) of Subansiri, Siang and Lohit districts of the state.

Quartz and Feldspar: Quartz and feldspar commonly used in large quantities in the region. However, a good quantity of these minerals is found to occur at Hahim (25°50'52" N, 91° 0940''E) in Kamrup and Rangsali hill of Goalpara district.

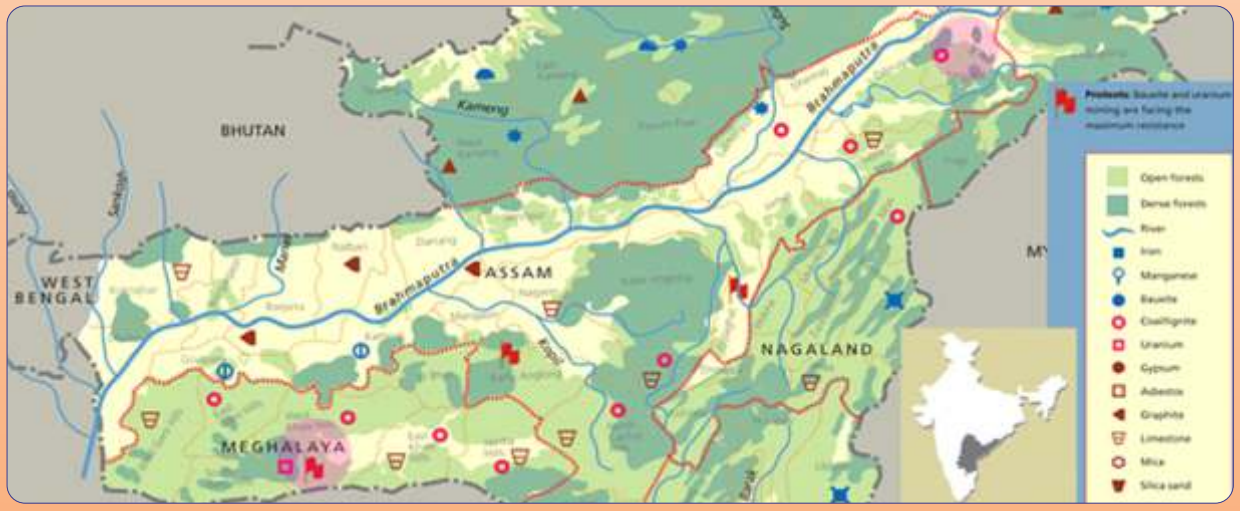

Fig 4: Mineral map of North East

OPPORTUNITIES

India's North East which has vast reserve of mineral resources also experiences the same. This is mainly observed in case of its three major mining operations in the region. These are: coal mining in Assam, Uranium and Limestone mining in Meghalaya. It is to be noted that the region has the potentiality to meet most of its energy requirement for the continuity of its growth centered path of development for the country as a whole.

According to the report by the Government of India, commissioned by the Ministry of Mines and Confederation of Indian Industry (CII), there is a great potentiality of job opportunities in mining sector in the North East region of India. A report on Human Resources and Skills has spelled out increase in mining production will lead to an increase in manpower from the present 0.9 million to 1.1 million in the year 2017 and 1.2 million in the year 2025. Recommendations, with stress and qualification for scientists and researchers, so that mining can be carried out successfully on a scientific manner have been prepared and submitted to the Planning Commission, GOI.Besides job opportunities, royalty and Cess will increase positively and the money can then be ploughed back for the welfare activities of the citizens. Schemes and projects for the upliftment of the people and development of infrastructures can be undertaken with least hitch and fund requirement. For example, royalty from major mineral, excluding coal and lignite, in Meghalaya for the year 2009-10, was about more than Rupees seven crores.

The region has a small fraction of its total area under lease for mines. It is reported that North East India has 395 millions of coal deposits apart from Uranium, petroleum, limestone and other minerals. According to the Indian Bureau of Mines 1991 and director of Economics and statistics, 2003, quoted in Fernandes, coal mining leases in Assam is 3126.98 acres while that of limestone is 2214.14 acres of Area. In Meghalaya, mainly Tertiary Coal deposits are there which are at the upper part of the tertiary rocks. The total coal deposits in this State are estimated at about 600 million tons, and the largest coal deposit is at district of Jaintia Hills and at present large scale extraction is being carried out.

CHALLENGES

There are presently six working coal mines in North Eastern Coal fields, Margherita and an exploratory mine at Simsang at Garo hills of Meghalaya. The six working mines of North Eastern Coal fields are Tipong Colliery, Baragoloi Colliery, Ledo Colliery, Jeypore colliery, Tikak Colliery and Tirap Colliery, out of which Tirap and Tikak are open cast mines and rests are underground mines.

The north east region of country accounts for a very small fraction of total area under mining leases (only 0.21% in Assamand 0.66% in Meghalaya.Most of the Coal mining is controlled by private companies in the state.

Assam is richly endowed with mineral resources. However, the contribution of the “Mining and Quarrying” sector towards State economy is graduallydeclining over the years. Thereason behind low production is due to existence of deposits in disadvantageous locations. During the year 2013-14, except production of Sulphur, the production of coal was 40.0 percent less compared to the production in 2010-11, production of Crude Oil was 6.1 percent less over 2011-12, Natural Gas production was 2.6 percent less over 2011-12, Lime Stone production was 28.8 percent less over 2012-13. The production of Sulphur, on the other hand, recorded 44.0 percent increase during the year 2013-14 over the previous year. The index of mineral production in Assam (Base 2004-2005=100) has been worked out at 102.48 in 2013-14 as against 105.15 in 2012-13.

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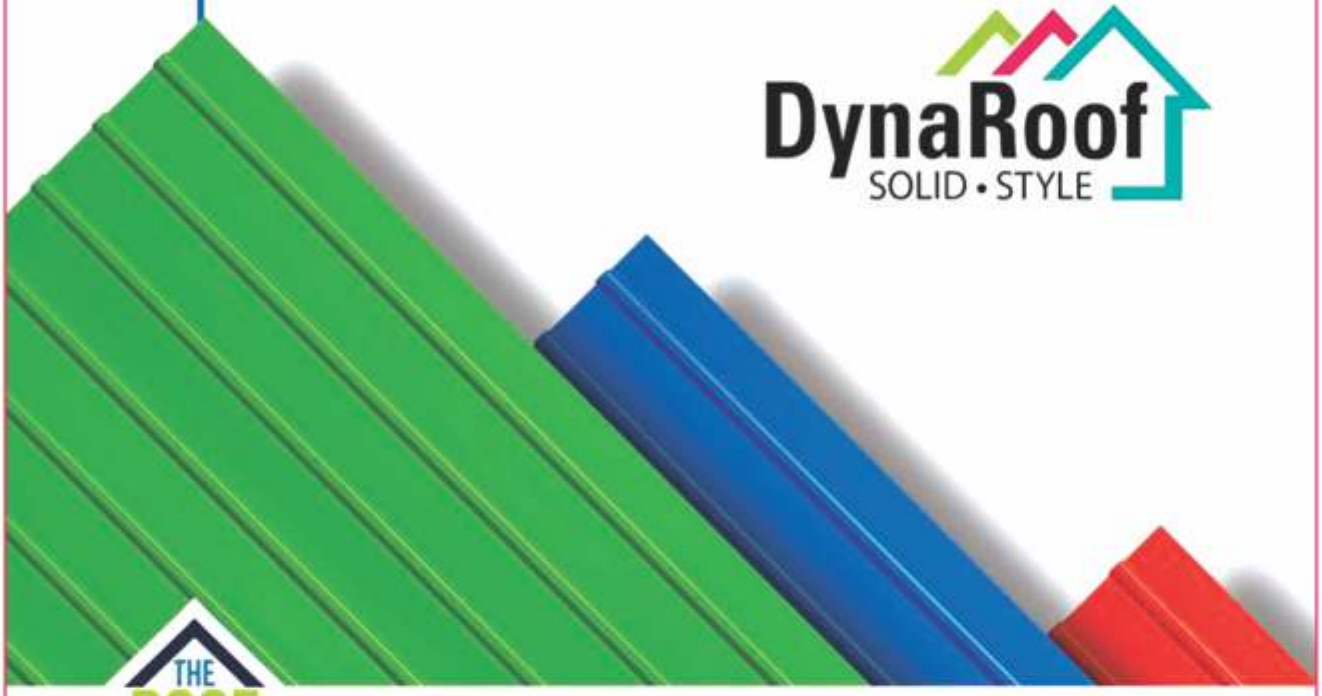

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