MINERAL - BASED INDUSTRIES

A CASE STUDY OF THE POTENTIALS FOR THE DEVELOPMENT OF CEMENT INDUSTRIES IN MEGHALAYA

A DISSERTATION

SUBMITTED

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF

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in Economics

By

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To

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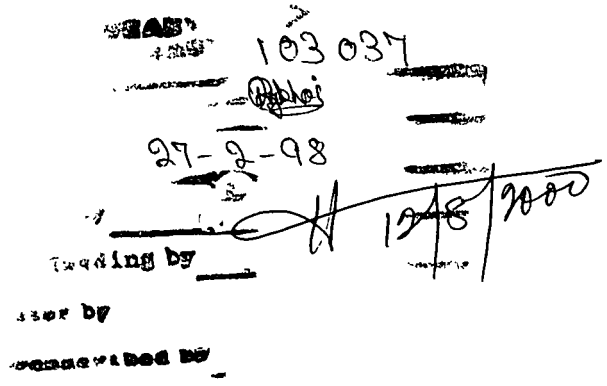

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CERTIFICATE

This is to certify that this dissertation entitled **Mineral-Based Industries - A Case Study of the Potentials for the Development of Cement Industries in Meghalaya** submitted by **Ms. Mukti Dolloi** for the award of the **Degree of Master of Philosophy** is an original piece of work carried out by her under my supervision. This work or part thereof has not been submitted for the award of the degree of any other University nor has it ever been published anywhere.

In habit and character, Ms. Dolloi is a fit and proper person for the degree of **Master of Philosophy.**

October 10 , 1992

(P.M. Passah)
Supervisor

DEDICATED

to

MEI, PA and MAMA

C O N T E N T S

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Chapter-1

INTRODUCTION

Statement of the Problem

Meghalaya is one of the seven States in North-Eastern Region of India. The other States are Arunachal Pradesh, Assam, Manipur, Mizoram, Nagaland and Tripura. Meghalaya ranks third in terms of area among all the seven States.

Meghalaya covering an area of 22,644 sq. kms. occupies the plateau of the same name which is lying between Assam in the north and the sovereign country of Bangladesh in the south. It extends between 25°-9' and 29°-10' north parallels of latitudes. The State has its opening to other parts of India through Assam which in turn is connected with the rest of the country by a narrow strip

of land corridor of about 50 kilometres wide lying below the foothills of Bhutan and Sikkim.

The favourable climate of the State provides good scope for the setting up of industries in the State. A number of package schemes of incentives and liberal financial assistance is being offered by the State Government and the Central Government while the central institutions are also providing other incentives which are helpful to the industrialists and businessmen. There are thus very good prospects for the establishment of several raw material-oriented industries for which adequate raw materials within the State in general and around the industrial location in particular are available. With the excellent availability of raw materials, a number of cement factories may be established in the State. The limestone of very good quality and in sufficient quantities is available locally. Moreover, the limestone fields occur near the coalfields. Thus both the raw materials (limestone and coal) and fuel (coal and hydro-electricity) are available in close proximity. The location of cement factories in the State will be more favourable than in the present manufacturing centres of Madhya Pradesh or Tamil Nadu where only one of the raw materials is available near the centre of production.

As the State has great potentiality like basic raw materials for more cement factories, the government has already planned to establish two major cement factories in the State - one in Garo Hills at Siju and another in Jaintia Hills at Lumshnong. The one at Garo Hills is under construction. When these two new cement factories are completed the economic position of the State will boost up to a large extent. The two cement factories when completed would be able to cater to the needs of the State and along with one existing medium factory and two mini-cement plants, Meghalaya would be able to export the surplus cement outside the State.

Industrially, Meghalaya is among the most underdeveloped States in India. The contribution of the State to the industrial output of the economy is insignificant. The number of workers engaged in public and private industries and mining is about 1,36,740 only against Meghalaya total population of 13,35,819 and against the whole country's population of 67,62,00,000 according to the Census of 1981. The number of industrial workers constitute only 2.9 per cent of the total working force in the State as against 11.20 per cent in India as a whole.

At the time of its formation in 1970, Meghalaya had no company enterprise worthy of note except the Assam Cement

Limited and the Assam Sillimanite Limited. The Assam Cement Limited was the only one large-sized Company enterprise in the region which now comprises Meghalaya. The cement manufacture started in 1966 by this Company which was formed in 1955 in the private sector. It took eleven years for this company to procure machinery and equipments from abroad and for erection. It was commissioned in the later part of 1966 with an annual capacity of 82,500 metric tonnes.

There is a great potentiality for starting mini-cement industries in the State with the large-scale availability of limestone and coal in the State. The establishment of one mini-cement plant in each of the five original districts would be very feasible. It would also be more profitable for the State to sell the finished cement product than exporting raw lime outside the State.

Manufacturing Process of Cement

Before giving the objectives of this attempt, it would be interesting to describe the manufacturing process of cement at this stage. The extracted limestone boulders of good quality is transported by hippo-damper to the crusher. The boulders are crushed at the primary and secondary stages to the required size of 1 or 2 square inches. The crushed limestone chips are

transported from the crusher to the central raw material deposit/gantry through belt conveyer. The limestone chips from the gantry are fed to the raw-mills hoppers with the help of electric overhead travelling cranes for grinding in the raw-mill with water. The product that comes out from the raw-mill is the liquid in creamy form. This liquid is technically called the slurry. It is transported from raw-mill basin to the slurry silos for the purpose of correction to the required proportion.

The corrected slurry is fed from the silos through the pipes to the Rotary Kiln from one end and the pulverised coal is pumped from the opposite end for burning purpose. Slurry is calcined inside the various burning zones of the kiln. The temperature required for burning the slurry is between 1,300°C and 1,600°C. The product that comes out after burning is technically called clinker, i.e. in marble form of different sizes. This clinker is then fed with the help of the same crane to the cement mill hopper for grinding purpose mixing with certain percentage of gypsum varying from .02% to .04%. The mixture is ground by striking the grinding media of different sizes at the different chambers inside the cement mill. The finished product that comes out of the cement mill is like dust. In the grinding process this dust is very hot and light and is blown through pipe by

compressor air to the cement silos. In course of blowing through pipe, the dust becomes cold and heavier and falls at the bottom of the cement silos for storage. This is cement. The stored cement is extracted from below the silos through screw conveyer and then up through elevator machine to the packers for filling in the packing bags. The packed cement is brought through belt conveyer to the trucks.

It is to be noted that limestone for cement manufacture must be the one containing calcium carbonate and having less or minus magnesia. Dolomite limestone is unsuitable for cement manufacture. In order to ensure the quality of cement, hourly testing and sampling is done and conducted at every stage of the process.

Objectives of the Study

Our first objective is the identification and survey of the resources endowment of the State of Meghalaya.

Secondly, we proceed with the identification of the problems of the existing cement industries in the State of Meghalaya. In fact, there are three cement factories in the State now. These include the Mawmluh-Cherra Cements Limited and the two mini-cement plants, namely, the Virgo

Cements Ltd. and the Jaintia Cements Ltd. But the two mini-cement plants have been established only recently and they might not have any production problems to experience so far. But whatever problems that are being faced by them during their preparatory and initial stage of production would be identified and analysed.

Next we have mainly analysed the problems faced by the Mawmluh-Cherra Cements Limited during the 25 years of its existence. We have at the same time examined the extent of surplus that it has been able to generate during the period.

Secondly, we have also made an attempt to study and analyse the prospects of establishing more cement factories in the State with a view to generate more employment opportunities to the people and surplus supplies need not only by the State but by the entire region of North-East India and for export to the neighbouring foreign countries of Bangladesh and Myanmar (i.e. Burma).

Scope of the Study

The scope of our survey is confined to the detailed study of the prospects of establishing more cement factories in Meghalaya and also to the problems of the three existing cement plants. The three existing cement

plants are the Mawmluh-Cherra Cement Limited, the Virgo Cements Ltd. and the Jaintia Cements Limited.

The Mawmluh-Cherra Cements Limited is the present name of the former Assam Cements Limited which was known as such before the creation of Meghalaya as a separate State. The employment opportunities offered are about 800 directly and about 5,000 indirectly. As one of the few premier and old public sector undertakings in Meghalaya, it is expected that a detailed study of the working of the factory and particularly an evaluation of its physical and financial aspects would reveal how far the enterprise has achieved the objectives for which it was set up and at the same time its various problems being faced by it. The Virgo Cements Ltd. and the Jaintia Cements Ltd. which have been started in recent years may not be due for much evaluation, but their problems faced so far would be brought to light.

Methodology and Collection of Materials

Since our attempt is the identification of the factors favourable for the promotion and development of cement industries in Meghalaya we have looked into the resource endowments of the State. For this purpose, the official reports published by the Geological Survey of India and by the Directorate of Mineral Resources of

Meghalaya have been the main primary sources of our data. Besides the Annual Reports of the Meghalaya Industrial Development Corporation and the various Project Reports submitted by experts and consultants of the Corporation have also been the sources of our data. Thus for the study of the prospects for establishing more cement factories in the State, the concerned departments and the Corporations of the Government of Meghalaya like the Industries Department (ID), the Meghalaya Industrial Development Corporation (MIDC), the Directorate of Mineral Development Corporation (DMR) and the Meghalaya Minerals Development Corporation (MMDC) were consulted. The annual and administrative reports of these departments and corporations were collected, studied and analysed. Besides, their officers, staff and directors were met and interviewed to extract more information in this regard.

For identification of the production problems of the three existing cement industries in the State, the Annual Reports of the three companies form the main sources of our information. The Annual Reports of the Mawmluh-Cherra Cements Limited during its 25 years of existence were collected and analysed. Besides, the management of the three industries were met formally and interviewed to know the various problems of the three industries.

Significance of the Study

The study is very significant in the sense that Meghalaya being rich in lime and coal deposits, has great potentials for developing cement industries in the State. Instead of exporting these minerals in raw form, it would be economically more profitable for the State to manufacture cement and export the finished product inside the country and abroad. The study would certainly bring to light the possibility of establishing a number of cement factories in different parts of the State.

Chapterization

The study has been divided into the following chapters :

Chapter-1 is the introductory chapter dealing with the statement of the problems, the scope, objectives and methodology of the study.

Chapter-2 discusses the socio-economic profile of the State of Meghalaya, particularly the resource endowments of the State. Besides, the infrastructural facilities that exist now would also be dealt with.

In chapter-3, the problems of the three existing cement factories in the State have been discussed. In fact, the production problems of the Mawmluh-Cherra

Cements Ltd. would be mainly focussed in this chapter, since the Jaintia Cements Limited and the Virgo Cements Ltd. have been still in their infant stage.

In chapter-4, the development potentials of cement industries in Meghalaya have been discussed and analysed along with the locational proposal for their establishment.

The concluding chapter gives the summary of the earlier chapters and records the conclusions that emerge from the study.

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Chapter-2

NATURAL RESOURCES ENDOWMENT OF MEGHALAYA

Meghalaya is one of the seven States in North-Eastern India. Meghalaya ranks third, in terms of area among all the seven States. Meghalaya was first formed into an autonomous State with the State of Assam in 1971 comprising the two erstwhile Districts of the United Khasi-Jaintia Hills and Garo Hills of the then composite State of Assam. But within two years of existence as autonomous State, it became necessary to give her the status of full statehood on 21 January 1972.

Immediately after the birth of the State of Meghalaya, a new District was formed on 22 February 1972 by upgrading the Jaintia Hills Sub-Division of the

then district of United Khasi and Jaintia Hills. In October 1976, two more districts namely the West Khasi Hills District and the East Garo Hills District were created. In 1992 again two more districts, namely, the Ri-Bhoi District and the South Garo Hills District were created. Thus the number of districts in Meghalaya now is seven.

Locationally, the State of Meghalaya has some significance in that it serves as an important link between the Brahmaputra Valley in the north and the Barak Valley of Assam, the State of Mizoram and the State of Tripura in the South. A National Highway (NH) runs through the State from Guwahati to Silchar and Badarpur and on to Aizawl, the capital of Mizoram, and to Agartala, the capital of Tripura. Further, it has common international borders with Bangladesh (formerly East Pakistan). As a result of the partition of 1947, there has been great economic disruption in and along the southern border of the State.

THE MEGHALAYA PLATEAU

The State of Meghalaya occupies almost the whole of the "main" plateau of the same name. The Meghalaya plateau, popularly known before as the Shillong Plateau,

forms part of what is usually termed "the Central Assam Range" and consists of the Garo-Khasi-Jaintia-North Cachar Hills (constituting the 'main' plateau) and the truncated Mikir Hills.[1] The new name Meghalaya (meaning 'the Abode of the Clouds') was given later on to the plateau on account of its high pluviousity. Indeed, many parts of Meghalaya receive heavy rainfalls every year. Cherrapunjee and Mawsynram situated in the southern part of Khasi Hills are two rainiest centres of the world.

The western part of the Meghalaya plateau, the Garo Hills, is an extensively dissected tract and is lower in elevation and rises more gently eastwards. This has enabled the river Brahmaputra to change its course from west to south along the western edge of the plateau. Towards the east, the plateau forms part of the North-Cachar Hills and thence joins the Naga Hills. Geologically, the two portions are quite distinct - the plateau being an area which has undergone very little tertiary folding while the eastern hills belonging to the area of very intricate faulted and folded structure. Near Haflong, the junction of the plateau country and the hill

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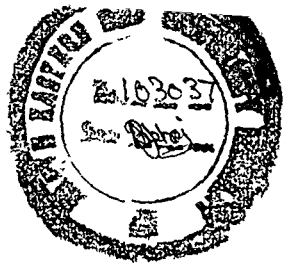
1. "Meghalaya-Mikir Region", in R.L. Singh (ed.), India - A Regional Geography (National Geographical Society of India, Varanasi, January, 1971), p.676 and p.682, see also D.N.D. Goswami, Geology of Assam (Gauhati, 1960), p.1.



country is very sharply marked, coinciding with the Haflong-Disang overthrust fault. In the words of Goswami, the plateau abuts upon the mountain ranges of the extra peninsular of the eastern Himalayas along the Haflong-Disang fault.[2] But administratively, the eastern and the north-eastern sections of the 'main' plateau do not form parts of the state of Meghalaya. The former section covering the Diyung Basin, was cut off from the Jaintia Hills Sub-Division, way back during the British rule of India on the formation of the North Cachar Hills Sub-Division. Prior to the formation of the latter Sub-division, the erstwhile district of the Khasi and Jaintia Hills used to have a common border on the east with the then Naga Hills District.[3]

The north-eastern section of the plateau, on the other hand, comprising an area of about 1543 sq. km. and falling under the Mynser Region, was carved out of the then Jaintia Hills Sub-division on the formation of the new district of the United Mikir and North Cachar Hills in the post-Independence period.

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2. D.N.D. Goswami, Geology of Assam (Gauhati, 1960), p.1.

3. W.W. Hunter, A Statistical Account of Assam (London, 1879, Reprinted New Delhi, 1975), p.173 and pp.203-4.

The Mikir Hills proper, though included under the material division of the Meghalaya plateau, are lying outside the 'main' plateau. They extend from the west-flowing Jamuna river almost upto the Brahmaputra river and stand as a dividing factor between the Upper Assam Valley and the Lower Assam Valley in the south bank of the Brahmaputra. They are a peninsula almost isolated from the Meghalaya plateau and surrounded by the plains on three sides. Their link with the 'main' plateau is towards the south through a patch of highly denuded and subdued senile terrain.[4]

The Geology of the Plateau

The Meghalaya plateau, though it now forms part of the north-eastern region, is really an eastward extension of the massive block of peninsular India. There is enough reason to believe that the Meghalaya plateau was once part and parcel of the peninsular shield. Stratigraphically, the Meghalaya plateau is occupuied by (a) Archaein gneisic complex with acid and basic intrusives, (b) Shillong group of rocks, (c) Lower Gondwana rocks, (d) Sylhet Traps, and (e) Cretaceous -

4. "Meghalaya-Mikir Region", op. cit., p.682; S.P. Chatterjee, "Physiography" in The Gazetteer of India, Vol.I (1975), p.29; N.C.A.E.R., Techno-Economic Survey of Assam (New Delhi, 1962), p.2; Report of the Commission on the Hill Areas of Assam, 1965-66 (1965), p.8.

Tertiary sediments.[5]

The Archaean gneissic complex is exposed in the central and northern parts of the Meghalaya plateau. The presence of these rocks proves beyond doubt that Meghalaya is the north-eastern extension of the Indian Peninsular Block which has been separated by the Garo-Rajmahal fault of the Malda gap as a result of denudational and tectonic forces. The Archaean basement of Meghalaya remained a landmass experiencing earth movements leading to complete folding and fracturing of the ancient rocks till the pre-cambrian times when parts of the plateau developed into a trough over which the sediments of the Shillong group of rocks were laid. These rocks are exposed in the central and eastern parts of Meghalaya. The granite intrusive along the axial region of the Shillong Group of rocks around Mylliem is termed as Mylliem Granite. This name as given by H.B. Medlicott (1869) was subsequently changed into Shillong Granite by H.C. Dass Gupta (1930).[6]

Lower Gondwana rocks are recognised in the western part of the plateau. They consist of pebble bed,

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5. Geological Survey of India, Miscellaneous Publication No.30, Geology and Mineral Resources of the States of India Part IV (Calcutta, 1974), pp.72-73.

6. S.P. Chatterjee, op. cit., p.27; G.S.I., op. cit., pp.74,79; and D.N.D. Goswami, op. cit., p.68.

sandstones and carbonaceous shale with streaks and lenses of coal and impressions of Verte-braria indica. The sandstone dips westwards and is intruded by dykes of dolesite.[7]

The post precambrian landmass experienced peneplanation till Jurassic times resulting into the formation of a flat levelled surface preserved over the plateau till today. By the end of the Jurassic period, the southern border of the plateau experienced eruption of basalts, the Sylhet Trap, through eastward fissures termed the Raibah fault. The Cretaceous-Tertiary Sediments are also found in the Meghalaya Plateau. The sediments occupy the southern part of the plateau and are considered to be physically continuous with the Cretaceous-Tertiary sediments of the Bengal Basin. Isolated patches of older Alluvium also overlie the tertiary rocks along the southern and western borders of the plateau. Such patches are also found along the north-western fringes of the Meghalaya plateau. Recent Alluvium is found in the river valleys on the northern foothill region, along the western border and along the southern foothill region of the plateau.[8]

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7. G.S.I., op. cit., p.74

8. Ibid., pp.75-79.

PHYSIOGRAPHIC DIVISIONS

Meghalaya covers an area of 22,643.6 sq. km. extending between 25°9' and 26°10' North parallels of Latitude and between 89°47' and 92°47' East meridians of Longitude.[9] It is bounded on the northwest, north, east and southeast by the State of Assam and on the south and southeast by Bangladesh (formerly East Pakistan). The State has its opening to other parts of India through Assam which, in turn, is connected with the rest of the country by a narrow strip of land corridor of 30 km. wide lying below the foothills of Bhutan and Sikkim.

The physiographic characteristics of the Meghalaya region are remarkable due to the highly dissected and irregular terrain in the northern faces in contrast to the regular and steep fall of the southern face, down to the Barak-Surma plain through a faulted face. Physiographically, Meghalaya can be divided into three distinct divisions, viz. (i) The Central Upland, (ii) The Northern Submontane Region and (iii) The Southern Belt of Hills.

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9. S.P. Chatterjee, op. cit., p.28. See also Statistical Handbook, Meghalaya 1971 and the District Census Handbooks of Garo and United Khasi-Jaintia Hills, 1961.

i) The Central Upland

The Central Upland zone running east-west consists of the plateau proper which, at its western end, attains a height of 1,515 metres in the peak of Nokrek situated 13 km south-east of Tura and, at its eastern end, attains 1961 metres in the Shillong peak located just south of Shillong.[10] In the west, the upland zone begins as the Tura Range and the Arbella Hills running parallel to each other; eastward across a deep gorge it continues in the Kylas Range and the Balpakram Hills which merge into the Khasi Hills and thence joins the Jowai upland in Jaintia Hills. The Tura Range is a typical horst bounded by two fault lines and it is along the northern fault that the Simsang, the biggest river in Garo Hills, flows eastwards for about 45 km. before turning south through the gorge separating the Tura Range from the Kylas Range.[11]

In the Khasi Hills, the outer limit of the Central Upland Zone is defined roughly by 1500 m contour line and the upland contains remnants of seven peneplaned surface in its middle region ranging in height from 1500 metres to 2080 metres. The Shillong Hills towering above Shillong contains the highest peneplaned surface over which streams

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10. N.C.A.E.R., op. cit., p.2.

11. "Meghalaya-Mikir Region", op. cit., p.681.

meander before plunging into the deep valleys of the Umiam and Mynkhen rivers. The presence of many rapids and waterfalls in the neighbourhood of Shillong indicates that this region has a youthful topography due perhaps to a recent uplift.[12]

In the Jowai Upland, the plateau character is not well-developed. The Jowai Upland is relatively lower than the other parts of the Central Plateau Upland zone having a general elevation of a little over 1200 metre.[13] 'Ri-Lum' is the local geographical term given in Khasi Hills to the Central Upland Zone of the plateau.

ii) The Northern-Submontane Region

The northern hills with accordant submits (170 metres to 820 metres) gradually slope down towards the Brahmaputra Valley and form, therefore, the submontane region of the plateau.[14] This region has an undulating topography. It consists of an extensive plateau with contiguous flat lands and open valleys particularly in its western portion where the hills are low and uninteresting.[15]

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12. S.P. Chatterjee, op. cit., pp.28-29.
13. "Meghalaya-Mikir Region", op. cit., p.682.
14. Ibid., p.681.
15. W.W. Hunter, op. cit., p.137.

In the middle part of this region the summit of these hills vary between 170 metres and 820 metres. Most of the hillocks are conspicuous by their flat-top character. In the east, the Jaintia Hills are rather irregular in form and broken in many places. Many embayments projects into the hills along the head stream of the Kupli river.[16] The interesting physiographic feature in this region is that the limit of the plateau is not very well-defined, there being broken ranges of low irregular hills stretching across lower and central Assam to the foothills of the Himalayas.[17]. "Ri-Bhoi" is the local geographical term applied to this region in Khasi and Jaintia Hills.

iii) The Southern Belt of Hills

This region begins where the Central Upland ends at about 900 metres elevation and stretches downward towards the plains of Bangladesh.[18] This is the region where the highest rainfall occurs. "Ri-War" is the local geographical name given to this region in Khasi and Jaintia Hills. In the west, the southern belt consists of

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16. M.C. Bhuyan, "Geographical Individuality of Meghalaya" in The Assam Tribune Supplement (April 2, 1970), p.III.

17. "Meghalaya-Mikir Region", op. cit., p.680.

18. In the Draft Fifth Five-Year Plan, Government of Meghalaya (Vol.I) p.2, this division is called "Border Areas".

low hills. But as we go eastwards, it consists of the steepest parts of the region. The low hills and valleys slope very abruptly and in many places there are deep gorges and precipices. The face of the escarpment has been attached by the fluvial erosion due to extremely heavy rainfall, and as a result, many structural platforms were formed like the Cherrapunjee, the Lyngkyrdem, and the Mawsynram platforms. But in its eastern part, the southern belt rises into a range of hills which attain a height of 1625 metres in the peak of Marangksih, the highest peak in Jaintia Hills.[19]

THE DRAINAGE PATTERN

The Meghalaya plateau standing as a watershed between the Surma valley of Bangladesh on the south and the Brahmaputra valley on the north, is dissected by several rivers and a network of their tributaries and lateral streams. Thus the rivers of Meghalaya make two distinct systems separated by the Central Upland Zone - one system flowing to the north towards the Brahmaputra and another to the south towards the Surma.

The important rivers of the northern system from west to east are the Kalu, Ringgi, Chagua, Ajagar, Didram Krishnai, Dudnai in Garo Hills, Tyrsung, Khri, Umtrew,

19. M.C. Bhuyan, op. cit.

Um-iam-Khwan, Umsiang, Mynkhen in Khasi Hills and Myntang, Umiurem, Waikhyrwi, Mynriang, and Kupli in Jaintia Hills. Of these rivers, only the Krishnai and the Kalu in Garo Hills are navigable within Meghalaya for a short distance.

The important rivers of the southern system from west to east are the Darong, Sanda, Bandra, Bhogai, Nitai, Simsang, Maheskholi in Garo Hills, Kynshi, Ummawpa, Umiam-Mawphlang, Rew in Khasi Hills; Mynngot, Myntdu, Prang and Lukha in Jaintia Hills. Of these, only the Simsang river in Garo Hills is navigable up to Siju, about 32 kilometres within Meghalaya. None of the rivers in Meghalaya form islands, nor do they anywhere expand into lakes. The Maheskholi river[20] in Garo Hills and the Myntang river in Jaintia Hills, each flows a subterraneous course for many miles under the limestone rocks which form their beds.

Most of the rivers in Meghalaya are unsuitable for navigation even by country boats. But these rivers provide excellent facility for generating hydro-electricity.

THE NATURAL REGIONS

The physiographic characteristics of Meghalaya are remarkable due to the hilly and dissected terrain in the

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20. W.W. Hunter, op. cit., p.139.

northern faces in contrast to the regular and steep fall of most of the southern faces. Thus, taking the ridge of the plateau as a demarcating line between the slopes facing to the north and the slopes facing to the south, the Meghalaya region may be divided into two 'first order', five 'second order', and ten 'third order' regions as follows:[21]

1. Meghalaya Northern Region
   1) Garo Region North :
      i) Rongmachokgiri - Rongchugiri Region
      ii) Krishnai-Dudhnai Basin.
   2) Khasi Region North :
      i) Patharkhmah-Rambrai Region
      ii) Loharghat-Nongpoh Region.
2. Meghalaya Southern Region
   3) Garo Region South :
      i) Tura-Dalu Region
      ii) Someswari Basin.
   4) Khasi Region South :
      i) Kynshi-Rilang Region
      ii) Shillong-Cherrapunjee Region.
   5) Jaintia Region :
      i) Jaintia Region West
      ii) Jaintia Region East.

21. "Meghalaya-Mikir Region", op. cit., p.695.

MINERAL RESOURCES

Meghalaya is endowed with some of the important non-metallic minerals of economic importance like limestone, coal, clay, glass, sand and sillimanite. Meghalaya has the largest single limestone deposit in the country and the world's largest deposit of sillimanite.[22] The limestone occurring along a belt over the southern scarp of the plateau, from the western end of the Garo Hills eastwards upto north-east Jaintia Hills, accounts for "an unsurpassable deposit of high grade limestone".[23]

In this section, our discussion on the occurrence of minerals in the State both of known economic importance and of little or unknown economic importance, is based on both the published and unpublished reports of the Geological Survey of India (G.S.I.) and of the Directorate of Mineral Resources (D.M.R.), Government of Meghalaya.[24] The estimates of both these organisations on the available deposits of any mineral have been taken.

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22. B.K. Barua, "Foreword" in D.N.D. Goswami, op. cit.

23. G.S.I., op. cit.

24. The published Report of the G.S.I., on Meghalaya is contained in Miscellaneous Publication No.30, Geology and Mineral Resources of the States of India (Calcutta, 5th November 1974) and that of the D.M.R., Government of Meghalaya in Minerals for Industrial Use (December, 1973) and Technical Data on the Various Mineral Deposits of Meghalaya (Latest Report dated Nil).

Limestone Deposits

The southern slopes of the State abound in limestone deposits of various grades and extent. A fairly continuous belt occurs right from the western end of the State in Garo Hills to the eastern end in Jaintia Hills, continuing further north-east into the Mikir Hills of Assam. The developed sections are found in Therriaghat and Mawlong-Ishamati areas of Khasi Hills where four beds of limestone occur. In the Lakadong and Lumshnong areas of Jaintia Hills only three beds of limestone have been seen, whereas in the Siju area of Garo Hills only one bed is found to have developed. The total reserve of limestone deposits of Meghalaya is of the order of more than 5,000 million tonnes according to the D.M.R. report. The D.M.R. has estimated the reserve in the Mawlong-Ishamati area in Khasi Hills alone at 2,166 tonnes excluding the reserves of the bottom-most band of the deposits.

In Khasi Hills, the various limestone deposits are given below :

(i) Therriaghat-Langrin Area

Large deposits of the limestone of the Shella Formation of the Jaintia Group (Eocene) occur in a belt following the southern border of the Khasi Hills through Therriaghat westward to Langrin. Between Therriaghat and

Shella river three beds of limestone with over 200 metre average thickness occur with two interbedded sandstone partings. A total inferred reserve for these occurrences is of the order of 900 million tonnes as estimated by the G.S.I. The Mawlong-Ishamati-Shella deposit covering 13.75 sq. kms. and falling under this area, has been investigated by the D.M.R. which has estimated the reserve of 2,166 million tonnes of limestone excluding the reserves of the bottom-most band of the deposit. According to the D.M.R., the deposit has five bands of limestones with the thickness of 60 m (with a maximum of 93 m at places), 12 m, 9 m, 21 m and 71 m, respectively.

ii) Shella-Bholaganj Area

The limestone deposit between Shella and Bholaganj includes three thick beds of Sylhet limestone proposed along an E-W running monoclical flexure plunging steeply against Dawki fault. The upper band is about 30 to 60 m and is overlain by the steeply dipping beds of the Kupli Formation along the southern margin. The upper band, being equally accessible, is being extensively quarried at Komorrah and exported to Bangladesh for cement manufacture although it is of superior grade. The G.S.I. has estimated the reserve at Komorrah only for the upper band to be 3.5 million tonnes approximately in a strike length

of 720 metres and a depth of 50 metres, while the D.M.R. has estimated a reserve of 180 million tonnes for the upper two bands in the same site covering 2.76 sq. km.

iii) Mawmluh-Mawsmai Hills Deposit

This corresponds with the Cherrapunjee Deposit of the D.M.R. report. The lower Sylhet (Lakadong) Limestone with 9.0 metre thick basal dolomite and an 18.0 metre thick upper limestone occurs in the Mawmluh-Mawsmai Hills. The Limestone is of cement grade and its inferred workable reserve has been placed at 40 million tonnes. The inferred reserves for the dolomite has been found to be 20 million tonnes. The limestone in the area is being extensively used for cement manufacture by the Mawmluh-Cherra Cement Company.

iv) Mawlong-Ishamati Area

Five limestone bands with varied thickness are seen in an area of 13.75 kms. An inferred reserve of 2,166 million tonnes was reported by the Directorate of Geology and Mining, Assam (D.G.M.) but only a reserve of 395 million tonnes has been proved by the G.S.I.

v) Komorrah Deposit

Two limestone bands were surveyed in an area of 0.36 sq. kms. Bedded deposits of limestone with sandstone

alternation occur in this deposit. The indicated reserve is 14.2 million tonnes as reported by the Directorate of Mineral Resources (D.M.R.).

vi) Borsora Deposit

The area lies around Borsora village and the limestone bearing area is about 1.00 sq. kms. The indicated reserve found here is 37 million tonnes as reported by the D.M.R.

Several scattered patches of Sylhet limestone occur in the Lyngkyrdem-Pynursla area. Isolated out-crops of high grade limestone are also found in the Laitryngew area with a 7.5 metre thick band and are traceable for about 150 metres with an overburden of sandstone and thick shale.

In Jaintia Hills, according to the G.S.I., the Sylhet limestone shows the thickest development within a 200 sq. km. area between Prang and Lukha rivers covering the Lakadong plateau, Lumshnong, Mynkre and Khaddum areas. These areas contain considerably large reserves of high-grade limestone. But the G.S.I. has not indicated any estimated reserve for all these occurrences. The following are the important deposits in Jaintia Hills:

i) Lumshnong-Mynkre Deposit

Three beds of limestone inter-bedded with sandstone belonging to Sylhet limestone stage of Jaintia series (Eocene) are found in the different localities of this area. A reserve of about 652 million tonnes of limestone has been estimated over an area of 480 sq. kms. with an average thickness of 80 metres. An area of 1.5 sq. km. has already been mapped in detail, where the reserve is estimated at 60 million tonnes.

ii) Sutnga Deposit

A narrow elongated outlier of the limestone resting over Therria sandstone is found exposed at Sutnga. The limestone extends about 1.6 km. with an estimated reserves of about 2 million tonnes and an average thickness of 15 metres.

iii) Nongkhlieh Deposit

Three beds of limestone are found in the area. The reserve of the lowest part with a thickness of 30 metres of high grade limestone has been estimated at 12 million tonnes. The middle part with a thickness of 30 metres is of blast-furnace and good cement quality and its reserve is estimated at 3.5 million tonnes. The topmost part of the limestone bed is 20 metres thick and is of cement

grade quality and has reserve of 0.5 million tonnes.

iv) Syndai Deposit

The deposit in the area forms a continuous narrow belt. The reserve is estimated at about one million tonne.

A huge deposit of limestone is found in the Lakadong area as an outlier. The deposit covers an area of 26 sq. km. but the reserve has not yet been estimated. An outlier of Sylhet limestone also occurs around Nongtalang covering an area of about 10 sq. kms. Here also the reserve has not yet been estimated.

In the Garo Hills, limestone deposits occur in the following areas where the reserves have been estimated only by D.M.R.:

i) Siju-Artheka Deposit

The upper Sylhet limestone of the Shella Formation (Jaintia Group) occurs in both banks of the Simsang river near Siju-Artheka. The limestone is generally of very good quality and some bands are of chemical grade. The total estimated reserve of limestone in the area is placed at 165 million tonnes over an area of 1.6 sq. km. with an average thickness of 60 metres though the maximum

thickness is found to be as much as 90 metres in some places.

ii) Darrang-Era-Aning Deposit

This deposit of limestone extends from Darrang-Era-Aning in the east to Pathargithin in the west and covers an area of 1.94 sq. km. There are two beds of limestone intervened by a sandstone bed. In the Pathargithin area, the average thickness of the upper band of limestone is 15 m and that of the lower band is 3 metres, and the reserves of both the beds have been estimated at 38.3 million tonnes in an area of 1.4 sq. km. In Darrang-Era-Aning, the limestone covers an area of 0.54 sq. km. and the reserve for both the beds is estimated at 8.8 million tonnes. The average thickness of the upper and lower beds is 10 metres and 2 metres, respectively.

The other deposits of limestone in Garo Hills occur in an area of 100 sq. kms. near Tura, in Rongrengiri, Dapri, Garugiri and east of Andogiri. The reserves in all these areas have not yet been estimated. The data on the available reserves of limestone in the State in various deposits are summarised in a tabular form as shown in Table 2.1.

Table 2.1

Limestone Deposits with their Inferred or Indicated Workable Reserves

Region	Area of Deposits	Inferred or indicated workable reserve (in million tonnes)	
		G.S.I. estimate	D.M.R. estimate
1. Khasi Hills	1. Therriaghat-Langrin area (D.M.R. estimate excludes the bottom-most band of the Deposit)	900.00	2,166.00
	2. Shella-Bholaganj area (G.S.I. estimate is for Komorrah area only for the upper band in a strike length of 720 m. and a depth of 50 m., while the D.M.R. estimate is for the upper two bands in the same area covering 2.76 sq. kms.)	3.50	180.00
	3. Mawmluh-Mawsmai Hills (the inferred reserves for the dolomite is not included which has been placed at 20 million tonnes by the G.S.I.)	40.00	40.00
	4. Mawlong-Ishamati area (the estimates were given by G.S.I. and Assam Directorate of Geology and Mining)	395.00	2,166.00
	5. Komorrah Deposit	-	14.20
	6. Borsora Deposit	-	37.00
2. Jaintia Hills	7. Lumshnong-Mynkre Deposit	652.00	291.21
	8. Sutnga Deposit	No estimate	2.00
	9. Nongkhlieh Deposit	400.00	16.00
	10. Syndari Deposit	No estimate	95.85
3. Garo Hills	11. Siju-Artheka Deposit	No estimate	291.00
	12. Darrang-Era-Aning Deposit	No estimate	47.70
	Total	2,390.50	5,346.96

Coal Fields

The next important mineral is coal. The earliest reference on the coalfields of Meghalaya was made by H.B. Medlicott (1869), F.R. Mallet (1975), T.H.D. La Touch (1882) and H.H. Hayden (1897). The coal deposits are confined to the Tertiary Formation of the Eocene Age and are to be found mostly on the southern slopes of the State. The main characteristics of coal are its low ash content, high volatile matter and also high calorific value. It, however, suffers badly from its comparatively high sulphur content. The coal is mostly sub-bituminous in character. The inferred workable reserve of coal in the State has been estimated by the G.S.I. at 512.5 million tonnes for a depth range between 100 and 300 metres. The reserves as estimated by the D.M.R. are also being indicated in this sub-section.

In the Khasi Hills, occurrences have been recorded from the Lower Sylhet, Middle Sylhet, and undifferentiated Sylhet sandstone members of the Shella Formation of the Jaintia Group (Eocene). The various coal-fields in the region with their estimated reserves are given below from west to east.

i) Langrin or Umblei Area

The eastward extension of the Pyndengru coal seams in the Garo Hills borders has been marked in the Langrin

field between the Maheshkhola stream and the Kynshi river. The inferred reserve in this field is of the order of 81 million tonnes to a depth of 150 metres in an area of 51.7 sq. kms. The D.M.R. has estimated the reserves at 60.1 million tonnes for four out of the seven seams.

ii) Um-Rilang Area

The area exposes a small outlier of the Sylhet sandstones (undifferentiated) including two seams of resinous coal manufacturing upto 3 metres in aggregate thickness near Umsohphie river. About one million tonnes of coal have been inferred for the lower 1.5 m thick seam within the area. A part of this reserve has already been exploited. The D.M.R. did not mention about the coal-fields.

iii) Cherrapunjee-Laitryngew Area

The middle Sylhet-Lakadong sandstone yields several coal seams varying from 0.3 to 1.0 metre. The top and the bottom seams are now being worked around Laitryngew. The probable reserve of coal in the entire area is about 18 million tonnes. The D.M.R. has investigated the Laitryngew coal-fields, the Cherrapunjee coal-fields, the Laitduh area and the Mawbehlarkar coal-fields separately and estimated the total reserve in the four fields at 2.7

million tonnes, 19 million tonnes, 0.1 million tonne and 0.1 million tonne respectively.

iv) Laitduh Coal Field

The area is west of Laitryngew. Coal is found in an area of 0.12 sq. km. The proved reserve is 0.12 million tonne as reported by D.M.R.

v) Mawbehlarkar Coal Field

The field covers an area of 0.1 sq. km. The indicated reserve is 0.12 million tonnes as reported by Directorate of Geology and Mining, Assam.

vi) Mawsynram Coal Field

Two coal seams occur in this field and the indicated reserve is 0.30 million tonnes as reported by the G.S.I.

vii) Lumdidom Coal Field

Coal occurs in an area of 0.2 sq. km. having only one coal seam. The indicated reserve in this field is 0.2 million tonnes as reported by the D.M.R.

viii) Shella-Mawlong Area

The Lakadong sandstone bed extending from Shella to Bairong exposes a 0.3 to 2.1 metre seams. The estimated

inferred reserve given by the G.S.I. is 3 million tonnes to a depth of 150 metres within the area covering 15 sq. kms. The D.M.R. has separately investigated the Mawlong Coal field and Bairong coal field and estimated the reserves for the two fields at 9 million tonnes and 0.8 million tonne of coal respectively.

ix) Pynursla Area

Two coal seams varying from 0.75 to 0.9 metre in thickness occur over the Pynursla plateau and produce good quality coal. Towards the south three coal seams of 1.0 m, 1.5 m and 2.5 m thick are exposed. The total inferred workable reserve is 1.7 million tonne. The D.M.R. did not report any available reserve of coal in the area.

x) East Darrangiri Coal Fields

This area lies on the Khasi-Garo border. Two coal seams of 1.0 m and 1.8 m thick extend consistently in the Asilgoan hill. The seams have an inferred reserve of 4 million tonnes around Balione. But according to the D.M.R., the total reserve of various patches having a total area of 2.1 sq. kms. is estimated at 31.5 million tonnes.

The occurrence of thin coal seams have been reported in the Mawsynram-Mawdon area which require

further investigation. One of the seams of this area was earlier worked locally for lime burning. The coal seams also occur near Tenglah but are crushed along the Raibah fault and hence they are not economically promising.

We will now give below the different coal fields in Garo Hills with their inferred workable reserves :

xi) Pyndengru-Balphakram Area

The area lies on the Garo-Khasi Hills border in the south-western Garo Hills. A few miles south of the area, a road parallel to the coal field runs from Baghmara in Garo Hills to Maheskhola and Balat in Khasi Hills. Eight coal seams are recorded, one of which, is up to 3.0 m thick. The recent investigation by the G.S.I. have revealed an inferred reserve of 166 million tonnes to a depth of 100 metres. But the D.M.R. has estimated the area of the coal field at 3.7 sq. kms. with the reserve of 9.1 million tonnes of coal.

xii) West Darrangiri Area

The area lies in the west of east Darrangiri coal field already mentioned above. This is the most important and easily accessible and exploitable coal deposit in Garo Hills. Of the three coal seams, the middle seam with 2.5 to 3.3 m thickness has been found consistently throughout

the area. The inferred reserve of coal for this seam to a depth of 300 metres is 127 million tonnes in an area of 50 sq. kms. of the field. Although the D.M.R. is still doing its investigation in the area, it has already indicated the G.S.I. estimate at 125 million tonnes of coal in its report. The coal from this field is now being mined for use by the Nangwalbibra Thermal Plant of the Meghalaya State Electricity Board.

xiii) Siju Coal Field

This field covers about 67.8 sq. kms. from Table nala towards south-east of Tura to Siju Songmong over the southern slope of the Tura Range. Along this extent, atleast two steep dipping seams of good quality coal are traceable along an anticlinal structure. The lower seams is up to 2.4 m thick. The latest inferred reserve of coal in this area is about 125 million tonnes. The D.M.R. has indicated the G.S.I. estimate in its report and mentioned C.S. Fox's estimate of 1000 million tonnes of the possible reserve of coal in this field.

Several other thin seams of coal occur in the Tura and Rongrengiri area but these are not of any economic value.

The various coal fields of Jaintia Hills with their estimated reserves are enumerated below :

xiv) Wapung Area

Two coal seams producing good quality coal occur within the undifferentiated Sylhet sandstone in and around Bapung. The lower seams varies from 0.3 to 1.0 metre in thickness and the probable reserve for it is about 6 million tonnes within an area of 15 sq. kms. But according to the D.M.R. the coal bearing area is 11.73 sq. kms. and the probable reserve of coal is estimated at 7.6 million tonnes.

xv) Lakadong Area

The Lakadong coal fields covering the Umlatdoh plateau between the Myntdu and Prang rivers in the southern part of Jaintia Hills exposes a very irregular and inconsistent coal seams varying from 0.3 to 3.0 metres in thickness. The reserve has been estimated by the G.S.I. at 5 million tonnes. The D.M.R. has located two coal fields in the area : (1) Umlatdoh coal fields and (2) Pamsaru coal field. While estimating the possible reserve of coal in this first field at 0.5 million tonnes no estimate was given by the D.M.R. for the second field.

xvi) Jarain-Shkentalang Area

A thin coal seam of 10 cms. to 45 cms. occur in the Jarain-Shkentalang area which has been investigated by the D.M.R. and which gives the probable reserve of coal at about 1.7 million tonnes in an area of 2.8 sq. kms. In Sutnga area also two coal seams occur which have been investigated by the D.M.R. The total reserve of coal has been estimated at 0.7 million tonne in the area.

An outlier of the Sylhet sandstone (undifferentiated) covering the Shyrmang area exposes two thin coal seams. The coal is similar to those in the Bapung area but the reserve is not yet fully assessed. A thin inconsistent coal seam, extremely variable in thickness from 0.3 to 1.6 metre occurs in the Lumshnong and Musiang-Lamare areas.

xvii) Musiang-Lamare Coal Area

The area is near Lumshnong and coal field covers an area of 2.31 sq. kms. The inferred reserve of coal is 1.1 million tonne as reported by the D.M.R.

xix) Ioksi Coal Area

The area is located in East Jaintia Hills. The inferred reserve is 1.24 million tonne as estimated by the D.M.R.

A summary of the reserve of coal in the State in various coalfields is given in Table 2.2.

Table 2.2

Occurrence of Coal in Meghalaya and their Inferred Workable Reserves

Region		Areas of Deposit	Inferred or indicated workable reserve (in million tonnes)	
			G.S.I. estimate	D.M.R. estimate
1. Khasi Hills	1.	Langrin or Umblei area (D.M.R. estimate is for 4 out of 7 coal seams only)	97.7	No estimate
	2.	Umrilang area	1.0	No estimate
	3.	Cherrapunjee-Laitryngew	21.7	No estimate
	4.	Laitduh field	No estimate	0.1
	5.	Mawbehlarkar	No estimate	0.1
	6.	Mawsynram	0.3	No estimate
	7.	Lumdidon	No estimate	0.2
	8.	Shella-Mawlong area	9.0	No estimate
	9.	Pynursla area	1.7	0.5
	10.	East Darrangiri Coalfield	31.5	No estimate
2. Garo Hills	11.	Pyndengru-Balphakram area (D.M.R. estimate is for an area of 3.9 sq. kms. only)	107.0	No estimate
	12.	West Darrangiri area	127.0	5.0
	13.	Siju area	125.0	No estimate
3. Jaintia Hills	14.	Wapung area (G.S.I. estimate is for the lower coal seams only in an area of 15 sq. kms. while D.M.R. estimate is for the deposit in an area of 11.73 sq. kms.)	7.0	33.6
	15.	Lakadong area (the estimate was reported by the Directorate of Geology and Mining, Assam)	5.0	1.5
	16.	Jarain-Shkentalang area (as reported by the Directorate of Geology & Mining, Assam)	No estimate	1.1
	17.	Sutnga area (the estimate was reported by the Directorate of Geology & Mining, Assam)	No estimate	0.7
	18.	Musiang-Lamare area	No estimate	1.1
	19.	Ioksi area	No estimate	1.2
		Total	533.8	45.1

Sillimanite

The next important mineral of the State is sillimanite. It occurs in two places :

i) Sillimanite Deposits of Sonapahar

The sillimanite deposit of Sonapahar in the Nongstoin area of Khasi Hills is well-known and is reputed to contain the best quality Sillimanite in the world. This deposit is also regarded as the World's biggest occurrence of massive sillimanite deposits. It is scattered in 27 major and minor deposits. It occurs at places in association with corundum. In fact the corundum deposit in the area was first examined by F.R. Mallet in 1879 and the associated sillimanite deposit was subsequently investigated by J.A. Dunn in 1922. There are seven lease-hold areas covering most of the deposits. The Hindustan Steel Ltd. has taken over all the leases from the Assam Sillimanite Ltd. in January 1973.

The high alumina and silica contents of this deposit makes this mineral a natural refractory mineral of great commercial value. Its accidental discovery in a London Warehouse in 1992 was when the corundum mined in

this area was found to be of not quite the hardness expected in an abrasive of that type. Although the sillimanite mines in Sonapahar have been worked for a long time by various companies and agencies, the actual potentiality of the known deposits has not yet been confirmed. Liberal estimates of these deposits put them at about 2 million tonnes, whereas conservative assessment has estimated at 10 per cent of this figure. The exploitation of the deposits for several decades has reduced the total reserve of about 0.05 million tonnes as estimated by the G.S.I.

ii) Sillimanite Deposit at Dapri-Tholegiri

Some minor occurrence of sillimanite have been detected at Dapri-Tholegiri area of Garo Hills. The strike extension of sillimanite-Quartschist is limited to within a few metres, with a maximum of 18 metres. No strike-wise extension or any new occurrence has been found in the vicinity. The reserve of the deposit is negligible as reported by the G.S.I.

Both the G.S.I. and the D.M.R. have reported the occurrence of Sillimanite at a place 5 kms. south-west of Nongstoin with an average strike length of 800 metres. But the amount of the deposit has not been calculated.

The D.M.R. has also reported the erratic occurrence of sillimanite at Mawpomblang and the reserve has been estimated at 1000 tonnes.

Clay and Koalin

The State of Meghalaya is endowed with a number of deposits of white clay, fire-clay, and koalin or china-clay. The total reserve of such clays all over the state amounts to a few hundred million tonnes. Various white clay deposits are known to occur all over the State but the deposits have not yet been examined in detail. The various deposits of clay and koalin and their inferred reserves as estimated by the D.M.R. are shown in this sub-division. The G.S.I. have given their estimates for the four fields only.

In the Khasi Hills, the various deposits with their estimated reserves are as follows :

i) Cherrapunjee Deposit

This clay deposit is found on a small ridge at a distance of half a Km east of the Circuit House at Cherrapunjee. The clay is sandy and plastic. Three colours of clay are found, namely, white, brownish-red and greyish-white. As reported by the Directorate of Geology and Mining, Assam the proved reserve of this deposit

taking an area of 146,667 sq. metres and an average thickness of 8.12 metres, comes to 0.2 million tonnes. It has been found that the clay is quite suitable for use in manufacture of cement. Another deposit is reported by D.M.R. at Kut Madan within an area of 0.37 sq. km. The indicated reserve of the deposit is estimated at 0.5 million tonnes.

ii) Mahadek Deposit

The deposit lies near Mahadek on the Cherrapunjee-Shella road. The clay beds belongs to Langpar stage of cretaceous age. The deposit is divided into two parts - the North Block and the South Block. The total reserves of both the Blocks covering a total area of 65,446 sq. metres with an average thickness of 3 metres, have been estimated at 0.3 million tonnes.

iii) Sohrarim Deposit

At several places in the vicinity of Sohrarim along the Shillong-Cherrapunjee road white clay is found as pockets and patches in the sandstone. Three deposits of clay are found. The total probable reserve in all the three deposits have been estimated by the D.M.R. at 7.1 million tonnes. The G.S.I. estimate is 6.5 million tonnes.

iv) Mawkriah-Mawphlang Deposit

The koalin rocks of this deposit occur as isolated outcrops in an area extending for nearly 6 kms. in length from Mawngap in the south to Laitjem in the north and about one kilometre in width from Mawreng in the east to Kreit in the West. The deposits are found as small as patches, scattered all over the area, individual outcrops varying from 175 sq. metres to 1,550 sq. metres in area. The proved reserve of this deposit has been estimated at 1.2 million tonnes. The koalin of this deposit compares favourably with the Cornwall koalin of Great Britain.

A clay bed of 1 metre thick is found inter-bedded with sandstone at Umstew on the Shillong-Cherrapunjee road. The clay deposit occupies an area of 37,625 sq. metres and the reserve is estimated at 61,722 tonnes. Some patches of clay deposits are also found around Laitlyngkot, Laitkseh, Nongryngkoh, Myntriang and Kharkor river section.

Koalin rocks occur as isolated patches over an area of 0.15 sq. kms. at Smit 14 kms from Shillong. The inferred reserve is estimated by the D.M.R. at 0.1 million tonne. The koalin deposit has also been reported by D.M.R. at Laitlyngkot with an indicated reserve of 0.5 million tonnes.

The Garo Hills contain the most extensive and enormous deposits of white clay which are of economic value. A very conservative estimate reveals that the probable reserves of crude clay from the deposits of Garo Hills are about 74 million tonnes. The various deposits with their inferred reserves are mentioned as follows :

i) Deposits around Tura

The Tura town rests on koalinised granite and gneisses and on the basal clayey Tura sandstones. Deposits of good clay occur in the northern part of the town. There are altogether a deposit in and around Tura with the total indicated reserves amounting to 0.8 million tonnes. Since many of the deposits are located within the limits of the town, mining and quarrying of the clay could be rendered difficult.

ii) Rongrengiri-Khera Deposit

This is an extensive deposit and perhaps the largest exposed deposit of clay in Garo Hills. An area of about 40 sq. kms. around Rongrengiri is occupied by the Tura sandstone. At the base of the Tura sandstone occurs a very thick bed of hard, white lithomergic clay ranging in thickness from 4 metres to 9 metres. The inferred reserve of clay taking an area of 24 sq. kms. and an

average thickness of 4 metres as reported by G.S.I. is 68 million tonnes while D.M.R. reported only 1.5 million tonnes.

iii) Nangwalbibra Deposit

Around Nangwalbibra, a thick sequence of the Tura sandstones has been observed over the weathered platform of older gneissic rock. The area reveals the presence of four beds of lithomergic clay ranging in thickness from 1.8 to 3.7 metres at the base of the Tura sandstone. All the four beds are present uniformly throughout the area. The three main bottom beds of good quality clay have an aggregate thickness of about 7.6 metres. The indicated reserve of the Nangwalbibra deposit was estimated by the Directorate of Geology and Mining, Assam, at 0.5 million tonnes. D.M.R. reported two more deposits at Mining Hills and Rongkhandi Hills with an indicated reserves of 3.7 million tonnes and 2.4 million tonnes respectively. Hence the total reserve in the three deposits comes to 6.6 million tonnes.

The grand total reserves of all the above first three deposits in Garo Hills thus come to 73.3 million tonnes as estimated by the D.M.R. while the G.S.I. gives an inferred total reserve of only 35 million tonnes for the three fields.

iv) Rongchugiri-Rajabala Road

Only one isolated deposit of good quality white clay has been located in this area, about 2 kms. from the Rongchugiri-Phulbari main road junction on the Rajabala road. Taking an area of (425x300) sq. metres and the average thickness of clay at 4 metres the probable reserve of clay would be 0.7 million tonnes.

v) Songsak Deposit

A detached deposit of lithomargic clay associated with small outliers of the Tura sandstone occurs within the Songsak Government Reserve Forest. The clay is white, hard well-bedded and has external ferruginous stains. The estimate reserve of clay taking an area of 410,850 sq. metres and an average thickness of 2 metres would be 0.9 million tonnes. The ceramic test of this clay gave promising results.

vi) Khobal Deposit

The deposit of clay lies on the east of Khobal village on the Darugiri-Nangwalbibra road. The lithomargic clay has an average thickness of about 3 metres. The indicated reserve taking an area of 50,000 sq. metres was reported by G.S.I. at 0.3 million tonne.

vii) Nengkhra and Dobu Deposit

The clay that occur around these two villages are massive, hard and white. The indicated reserve of clay in both areas as reported by D.M.R. is 2 million tonnes. But the inferred reserve of 0.1 million tonnes in Nengkhra and 0.3 million tonnes in Dobu was reported by the G.S.I.

viii) Jengrangiri Rewak and Damukgithim Deposit

D.M.R. reported the occurrence of clay in these three villages with the indicated reserves of 3.1 million tonnes, 1.8 million tonne and 1.2 million tonne respectively.

ix) Koalin Deposit of Darugiri

A deposit of koalin is found under Darugiri on the Darugiri-Nangwalbibra Road. Five blocks of koalinised granite were delineated. The proved reserve reported by D.M.R. in an area of 0.06 sq. kms. was 1.2 million tonnes.

In the Jaintia Hills there are two important deposits of clay and four deposits of koalin. These deposits with their estimated reserves are as follows :

i) Larnai Deposit

Larnai is situated at Sung Valley in Jaintia Hills. The deposits of clay covers an area of 3.88 sq. kms. The

indicated reserve as reported by the D.M.R. is 0.5 million tonne.

ii) Tongseng Deposit

Tongseng is 136 kms. from Jowai on the National Highway-44. Two bands of shade clay were noticed in an area of 100 sq. kms. The indicated reserve for both bands is 5.15 million tonnes as reported by the D.M.R.

iii) Thad-la-skein Koalin Deposit

Thad-la-skein is situated at 56 kms. from Shillong on Shillong-Jowai Road and Koalin deposits occur in the East Bank of the Myntang river at 4 kms. away. The deposit covers an area of 4.0 sq. kms. with the indicated reserve estimated at 0.3 million tonnes as reported by the D.M.R.

iv) Shangpung Koalin Deposit

Shangpung is 21 kms. from Jowai on the Jowai-Garampani Road. Several small outcrops of Koalin rocks occur in an area of 2.4 sq. kms. The inferred reserve as reported by the D.M.R. is 0.5 million tonne.

v) Mulieh Koalin Deposit

Near Raliang at 28 kms. from Jowai on the Jowai-Garampani Road, Mulieh is at 10 kms. away from Raliang. A

good deposit of Koalin rock occurs around Mulieh village, having 10-12 metres thickness. The inferred reserve as reported by the D.M.R. is 0.8 million tonne.

vi) Mynsngat Koalin Deposit

Mynsngat is 22 km. from Ummulong on the Jowai-Khanduli Road and is 51 km. on Shillong-Jowai Road from Shillong. Several small outcrops of Koalin rock occur in an area of 1.7 sq. kms. The inferred reserve as reported by the D.M.R. is 0.3 million tonnes.

The data on the available reserve of clay in the State in various deposits are summarised in the tabular form (Table 2.3).

MINERALS OF LITTLE OR UNKNOWN ECONOMIC IMPORTANCE

A number of occurrences of varied minerals in the State are recorded by the G.S.I. and the D.M.R., most of which are either of little economic importance or yet to be assessed. We give below an account of such minerals :

1. Glass Sand

The glass sand is found to occur at Umstew near Cherrapunjee. The deposits cover an area of 0.62 sq. kms. with an average thickness of 2 metres. These deposits contain an inferred reserve of 2.3 million tonnes of glass

Table 2.3

Deposits of Clay and Kaolin and their Inferred or Indicated Workable Reserves

Regions		Area of Deposits	Inferred or indicated workable reserve (in million tonnes)	
			G.S.I. estimate	D.M.R. estimate
1. Khasi Hills	1.	Cherrapunjee and Kut Madan Deposits	No estimate	0.7
	2.	Mahadek Deposit	No estimate	0.3
	3.	Sohrarim Deposit	6.5	7.1
	4.	Mawkriah-Mawphlang Deposit	No estimate	1.2
	5.	Smit and Laitlyngkot Kaolin Deposits	No estimate	0.7
2. Garo Hills	6.	Deposit around Tura	0.8	No estimate
	7.	Rongrengiri-Khera Deposit	68.0	1.5
	8.	Nangmalbibra Deposit	No estimate	6.6
	9.	Rongram Deposit	0.7	No estimate
	10.	Songsak Deposit	No estimate	0.9
	11.	Jengiangiri, Rewak and Damukgithim Deposits	No estimate	6.1
	12.	Khobal Deposit	0.3	No estimate
	13.	Nengkhara Dobu Deposit	0.4	2.0
	14.	Darugiri Kaolin Deposit	No estimate	1.2
3. Jaintia Hills	15.	Larnai Deposit	No estimate	0.5
	16.	Tongseng Deposit	No estimate	5.2
	17.	Thadlaskein Kaolin Deposit	No estimate	0.3
	18.	Shangpung Kaolin Deposit	No estimate	0.5
	19.	Mulieh Kaolin Deposit	No estimate	0.8
	20.	Mynsngat Kaolin Deposit	No estimate	0.3
		Total	76.7	35.9

as estimated by D.G.M., Assam. Another deposit of glass sand in Khasi Hills occurs at Kreit 17 kms. from Shillong on the Shillong-Mawphlang Road. The indicated reserve has been assessed at 0.1 million tonnes. Deposit is also found in Garo Hills near Tura with an indicated reserve of 0.14 million tonnes over an area of 0.1 sq. km.

2. Iron-Ore

In the Aradanga area of Khasi Hills, a small deposit of magnetite ore is found. The total reserve of iron ore has been estimated by the D.M.R. at 0.2 million tonnes in an area of 2,769 sq. metres and an average thickness of 16 metres. Two important occurrence of iron ore are found in Garo Hills at Nishangram and at Athiabari. The indicated reserves of magnetite quartz rock in the two deposits have been estimated by the D.M.R. at 2.85 million tonnes and 0.5 million tonnes respectively. Occurrences of magnetite ore have also been found near Dobu in Garo Hills.

3. Base Metal

A multi-metal mineralised zone is found at Umpyrtha on the northern fringe of Khasi Hills. A tentative inferred reserve of 0.2 million tonnes of zinc, copper and lead ores with their respective percentages at 2.85, 1.33

and 0.40, has been estimated by the G.S.I. But the economic importance of these indications is still being assessed. A similar mineralised zones along Tyrsad-Barapani in Khasi Hills and in and around Sung Valley in Jaintia Hills have been detected by the G.S.I. and drilling is done to prove the deposits.

4. Quartz-Felsper

In Garo Hills quartz-felspar bearing pegmatite veins are found to occur in and around Tura. The indicated reserves of the two minerals in this deposit are 907 tonnes quartz and 1714 tonnes felspar as estimated by the D.M.R. The D.M.R. also reported the occurrence of the minerals at three other places in Garo Hills namely, Bonsomgiri, Rombhagiri and Nengkhra. The total reserves of the three deposits are 56,463 tonnes Quartz and 66,267 tonnes Felspar.

Another deposit is located in Khasi Hills at Hahim and its adjacent area. In this deposit the estimated reserve of the two minerals are 19,570 tonnes quartz and 21,730 tonnes felspar as indicated by the D.M.R. The G.S.I. estimate is 22,000 tonnes of felspar and 20,000 tonnes of quartz in this area. G.S.I. also reported the occurrence of these minerals in the Mairang-Nongkhlaw area but the reserve has not been estimated.

5. Building Stones

Various types of building stones of good quality are found all over the State. Quartzites, granite gneisses and basic rock found in parts of the Shillong plateau can yield good building stones. The coarse granite are found around a number of places along the northern scarp of the plateau. The hard greenish to black Khasi greenstones found in the southern parts of the Shillong plateau as well as the Sylhet trap rocks are useful as high-grade metals. A ferruginous and friable stone referred to as laterite has also proved suitable for road dressing. Coloured sandstones of various quality and shade are found in plenty all over the State. They are used for masonry in the form of bricks, slabs and posts.

6. Gold

An occurrence of gold is found at Tyrsad near Mawphlang in the Khasi Hills. The reserve has not yet been estimated. More investigation by drilling is required to prove the economic significance of this deposit.

7. Gypsum

Some crystals of gypsum occur in lenticular veins or in small scattered patches in the south western corner

of Garo Hills particularly at Harigoan and near Mahendraganj in Tarapara, Garobadha, Messingipara and Mogopara. They do not appear to be of any economic significance.

8. Phosphate

Phosphate are found in the basal part of the Kopili Shale Formation around Sonapur in Jaintia Hills and around Siju in Garo Hills. No reserve has been estimated so far.

9. Corundum

Corundum is found as locally segregated bodies in the sillimanite bearing rocks at Sonapahar in the Nongstoin area of the Khasi Hills. It makes up about 20 to 50 per cent of the sillimanite ore.

10. Dumortierite

Two bands of quartz dumortierite-tourmaline schist were located by the G.S.I. near Mawshynrut south of Sonapahar. One of the bands is up to 60 metres in thickness and extends for a length of 0.8 kms. and the other is comparatively smaller. The reserve has not been estimated.

11. Uranium

Encouraging occurrences of uranium had been located in the State. An estimated amount of 9.22 million tonnes of this precious metal has been discovered at Domiasiat in West Khasi Hills within an area of about 4 sq. kms. Traces of this metal have also been located at Anek in Garo Hills, Wah Kaliar near Cherrapunjee in Khasi Hills and in the Tarangblang-Satpator area of Jaintia Hills. The extent of grades of these occurrences has not yet been determined.

The economic significance of the above eleven minerals are yet to be studied. Presently, the potentiality of initiation or expansion of mineral-based industries in the State mainly depends on the four principal mineral deposit, viz., Limestone, Coal, Sillimanite and Clay. But the reserves of these deposits cannot be properly exploited so far due to lack of transport. The Mining Industry of the State is currently facing two difficulties, first, the transport of minerals from the mine-heads to the plains is uneconomic due to inadequate motorable roads and the absence of railways, and secondly, the heavy rains during June-September cause frequent landslide and higher continuous mining operation.

Water and Wind Power

Because of the topography of the State, Meghalaya possesscs vast potentiality for the establishment of hydro-electric project of different capacities. The Umtrew and the Umiam-Khwan rivers have already been harnessed for power with a generating capacity of 11.2 megawatt and 54 megawatt respectively. The third project of Kyrdemkulai with an estimated generating capacity of 60 megawatt is under construction. Rs.38 crores project is being implemented to harness the Kupli river for hydro-electric power for the joint benefits of Meghalaya and other North-Eastern States.

The terrains through which most of the rivers and streams are flowing provide excellent facilities for the establishment of small dams at various places in the State. Hence, instead of going in for big dams it will prove economically profitable if many hydro-electric projects are scattered all over the State for the benefit of rural areas. This would not only save the huge expenditure required to be incurred in the implementation of big projects, but it would also facilitate the establishment of small scale and cottage industries all over the State. Local people will also be benefited because of employment potential arising out of such mini-projects.

Meghalaya being the mountainous state where the wind velocity is high has also the potentiality of generating power by exploiting the wind resources.

Soil Characteristics

Basically, the hill soil in the State can be classified into the following three types :

Table 2.4

Classification of Soil in Meghalaya

Types of Soils	Location
1. Red Loamy Soil	In most parts of the three regions of the State, namely, Garo Hills, Khasi Hills and Jaintia Hills.
2. Laterite Soil	Large parts of Khasi Hills and Jaintia Hills.
3. Alluvial Soil	Parts of Garo Hills and in the foot hills of Northern Khasi Hills and of southern Jaintia Hills.

Source : Partly adapted from P.C. Goswami, The Economic Development of Assam (1963), p.8, and partly computed from R.L. Singh (ed.), India - A Regional Geography (1971), pp.684-85.

Red loamy soil of Meghalaya is generally deficient in nitrogent, phosphoric acid, humus and lime. But it is suitable for cultivating fruit trees especially oranges,

grapes and mangoes. Other crops can also be grown if irrigation facilities are provided. Laterite soil is deficient in potash, phosphoric acid and lime. At lower levels, it has heavy loams and clays and food crops particularly rice is grown. Potatoes and sub-tropical fruits also grow well in such soil and thus these items become the important commercial products of the State. But at higher level of the hill slopes, the soils are thin and practically gravelly and stony.

Alluvial soil is the most fertile and is found in the north-western part of Garo Hills and in the foothills of Khasi Hills and Jaintia Hills. Wide varieties of crops like rice, sugarcane, cotton, bananas and jute are grown in the region.

AGRICULTURAL REGIONS

For lack of data, it is not possible to regionalise Meghalaya into agricultural regions satisfactorily. The following five regions have been recognised in a generalised manner :

i) <u>The Northern and the Western Peripheral Areas of Garo Hills Producing Predominantly Wet and Low Lying Crops Mainly Rice and Jute</u> :

The region lies below the 150 m contour and covers the major portion of old alluvial soil belt of Garo Hills.

It also produces cotton along the margin touching the forest region.

ii) The Northern Region lying along the Northern Slopes of Khasi Hills - Extending North of Khasi and Umtrew Rivers :

The region covers the old alluvial soil belt of Khasi Hills roughly following the 150 m contour. Wet but upland crops like rice and maize predominate. Rice is cultivated mainly in the inter-montane valleys and in the foothills. Double cropping of rice has been practised in limited areas in the foothills because of the warm climate throughout the year.

iii) The Southern Region which forms a Narrow Strip of the Khasi Hills and Jaintia Hills running along the Indo-Bangladesh Border :

It also roughly follows the 150 m contour. Adequate rainfall in summer, warm condition, fertile and hill slopes are the main physical conditions. Fruits predominate in the region from where more than half of the total output of average jack fruit, and betel leaf in the Khasi and in the Jaintia Hills are obtained. The Lakroh valley of Jaintia Hills falls in this region. Because of the warm climate in the region throughout the year, double cropping of rice in the valley is practicable.

iv) The Central Part of the Eastern Khasi Hills including the Shillong Area in the South and Nongpoh Area in the North :

A triangular belt with lose vegetation cover moderate climatic condition in the greater part of the year, and somewhat rocky soil - may be considered as predominantly livestock and miscellaneous crops region. Among the livestock animals, Ayrshire and Friesian cross-breeds predominate. Fish culture is also equally important in the region. Potatoes, sweet potatoes and fruits like pear, plum, etc. are important miscellaneous crops.

v) The Upland Region of Jaintia Hills which has more Flat Lands and Fairly Extensive River Valleys than Khasi Hills :

The important river valleys are the Sung Valley, the Jowai-North Valley, the Jowai South Valley, the Litang Valley, the Letein Valley, the Myntang Valley and the Umiurem Valley. Rice is the main crop grown in these valleys and other flat lands in the region.

CLIMATE AND RAINFALL

The climate of the State in general is very salubrious due to its high relief. Of course, the climate of western Meghalaya becomes oppressive from March to October as a result of high temperature which is slightly

moderated by a copious rainfall. A relatively low elevation of the western Meghalaya is responsible for fairly high temperature for most parts of the year. April is the warmest month of the year having the mean maximum and mean minimum as 34.9°C and 22.1°C respectively. The temperature of the coldest month of December and January records a mean maximum of 24.9°C and 24.8°C respectively with their mean minimum as low as 11.6°C and 11.1°C respectively.

The climate of the moddle part of the eastern Meghalaya is bracing due to the high altitude and consequent moderate temperature particularly in the central upland zone. But at the foothill of the southern slopes and the sub-montane region of the north, the climate is slightly humid and warm. During deep winter the plateau usually experiences frost although snowfall is unknown in the region.

The State receives the highest amount of rainfall in the world. But the heaviest rainfall occurs in the southern region of the plateau especially above cliffs and precipice like the Cherrapunjee area and Mawsynram about 16 kms. west of Cherrapunjee.

More than 90 per cent of rain occur during the monsoon and the rain water is immediately drained by the

deep gorges and quickly carried down. During the winter, there is practically no rain and drought manifests itself in many areas. Hence, there is need for conservation of rain water by way of constructing water reservoir or by means of weirs or check dams or by the use of techniques that would prevent evaporation and percolation.

Different parts of the State receives different quantities of rainfall. Mawsynram and Cherrapunjee records the highest rainfall in the world with 13,923 mm and 12,033 mm respectively. On the leeward side of the plateau over the crest, the rainfall decreases greatly. Shillong, though located only 52 kms. from Cherrapunjee and 57 kms. from Mawsynram gets only 2,296 mm of rainfall per annum. The average annual rainfall in western Meghalaya is 2,689 mm while Jowai in the eastern part of Meghalaya receives a greater amount of rainfall with 3,077 mm. The north sub-montane region lying on the leeward side of the plateau receives less rainfall with an average of 1,270 mm to 2,073 mm. The average annual rainfall at different centres in Meghalaya is given in Table 2.5.

Table 2.5

Rainfall in Selected Centres

(in millimetres)

District/Centres	1985	1986	1987
Jaintia Hills :			
Jowai	6,075	6,118	8,746
East Khasi Hills :			
Shillong	1,530	1,936	2,954
Cherrapunjee	11,590	7,882	13,137
Mawsynram	14,220	8,699	-
West Khasi Hills :			
Nongstoin	2,783	2,817	3,644
East Garo Hills :			
Williamnagar	1,780	-	-
West Garo Hills :			
Tura	4,047	4,196	4,421

Source : Statistical Handbook, Meghalaya, 1989 (Directorate of Economics and Statistics, Meghalaya, Shillong).

FORESTS

The areas under different categories of forests are given in Table 2.6.

It will be seen from the table that in Meghalaya, the area under forests extends to more than 7,898 sq. kms. or about 34.88 per cent of the geographic area of the State as against an all-India average of 22.7 per cent.

Table 2.6

Area under Different Categories of Forests in Meghalaya

(in sq. kms.)

Regions	Reserved Forests	Protected Forests	District Council Forests	National Parks	Unclassed Forests	Private or Leased Forests	Total
Khasi Hills (11,168.1)	228.37	6.76	77.86	)	925.57	361.23	1599.79
Jaintia Hills (3,295.5)	311.32	-	1039.00	) 267.48	n.a.	n.a.	1350.32
Garo Hills (8,180)	267.17	-	3881.42	)	532.43	n.a.	4681.02
Meghalaya	806.86	6.76	4998.28	267.48	1458.00	361.23	7898.61

Note : 1) n.a. = not available; 2) Figures within brackets indicate the geographic area of the three regions of the State.

Sources : 1) District Statistical Abstract, Khasi Hills, 1974

2) Industrial Potential of Jaintia Hills, Branch Small Industries Service Institute, Meghalaya (1976).

3) Statistical Handbook, Meghalaya, 1989.

But the area under Reserved Forests is only 806.86 sq. kms. The remaining forest area including the unclassed forests has no proper system of management. Jaintia Hills has got the biggest area under reserve forests among the three districts of Meghalaya. But the area under private forests in the district has not been assessed. Assuming that forests occupy two-third of Jaintia Hills where the sense of the people for preservation of forest resources is quite high, the proportion of the forest area to the total area of the State would increase by another 3.5 per cent. Thus the national minimum of 38.38 per cent prescribed by the Forest Policy of the Government of India, 1952 has been fulfilled in Meghalaya. But it has been stressed that forest cover in the hilly areas like Meghalaya should not be less than 60 per cent of the land surface.

The most important trees in Meghalaya are sal (Shorea robusta) and pine (Pinus kesiya). Extensive sal forest occur in western Meghalaya in former years, but the jhum system of agriculture has been the cause of a great destruction to this timber species. Sal grows well in the sub-montane region of Khasi Hills also. Rongrengiri reserve in Garo Hills has been considered to be the best sal reserve in India with numerous sal trees of ripe age and good girth. But owing to transport difficulties, it has not been possible to extract these trees. Again the loss

of market in Bangladesh has dwindled the demand for sal for railway sleepers. But sal being a very slow-growing tree, introduction of fast growing species is necessary.

Pine forests occur extensively in the higher elevation beyond 800 metres in the Khasi Hills as well as in Jaintia Hills. Shifting cultivation has brought about the secondary growth of abundant bamboo forests in Garo Hills and in the western parts of Khasi Hills.

There are many valuable medicinal plants and herbs growing wild in the State. The tezpat (Cinnamomum tamala) are extensively grown in the southern part of Khasi Hills and Jaintia Hills. Honey is another important forest product, particularly in Khasi Hills.

The out-turn of the forest products in the State is very negligible as can be seen from Table 2.7. From this table, it can be worked out that during the three years from 1988-89 to 1990-91, the average gross revenue per hectare from the State forests was Rs. 19.92, Rs. 169.73 and Rs. 26.63 respectively. Of course, even the revenue from India's forests has been also very negligible so far. The national average gross revenue per hectare from India's productive forests as calculated by the National Commission on Agriculture is only Rs. 21.50. This income when contrasted with that in other countries of the world

Table 2.7

Out-turn of Forest Produce in Meghalaya 1988-89 to 1990-91

Forest Products	Quantity (in cubic metres)			Value (in Rs.'000)		
	1988-89	1989-90	1990-91	1988-89	1989-90	1990-91
State Government						
Industrial wood	1,598	4,251	6,204	1,998.2	3,953.2	4,546.9
Fuel wood	800	279	100	106.5	2,796.5	765.7
Total	2,398	4,530	6,304	2,104.7	6,749.7	5,312.6
District Councils						
Industrial wood	93,200	98,545	1,14,010	8,380.0	84,008.1	5,312.6
Fuel wood	1,600	17,200	18,300	192.0	206.4	254.3
Total	94,800	1,15,745	1,32,310	8,572.0	84,214.5	8,960.8
TOTAL	97,198	1,20,275	1,38,614	10,676.7	90,964.2	14,273.4

Sources : 1) Office of the Principal Chief Conservator of Forests, Meghalaya, Shillong.

2) Statistical Handbook, Meghalaya, 1989 (Directorate of Economics and Statistics, Meghalaya, Shillong).

will appear to be dismally low. The statistics in the above table do not, of course, depict the real picture. The out-turn of forest produce under the three District Councils does not appear to have been taken into account. In fact, forests are the main source of revenue of all the three District Councils since the bulk of the forests in the State is under their control. But these council authorities have not been maintaining any scientific records to readily show the annual out-turn of the forests under their control as well as the amount of their annual revenue derived therefrom. Charcoal, round wood and bamboos are important items of supply to the urban areas of Shillong and Jowai. But since the items are taxi-free their annual out-turn has not been accounted for by the District Councils.

FAUNA

Wild animals in Meghalaya comprises elephants, bison, deer, tiger, wild cats, hoolock or gibbon, wild goats, hog, bears and monkeys. Wild elephants roam about in herds of varying strength in the tropical forest of the State. Elephants are fond of bamboos and hence they are more plentiful in Garo Hills where bamboos occur in abundant throughout the district which is regarded as the natural home of Indian Elephants. An elephant census is

being undertaken by the State Forest Department in collaboration with the Zoological Survey of India. Presently, a rough estimate has put the number of elephants in Meghalaya at about 3,500.

The deer population of Meghalaya consist of two varieties, namely, sambhar and barking deer. Spotted deer also occur in limited number. The population of all the three types of deer has suffered decimation due to uncontrolled shooting. Hence the State Government has prohibited the killing of deer during ten months in the year, that is, from February to November under the Meghalaya Wild Animals and Birds Protection Act, 1971.

Tiger population has also come down considerably in Meghalaya. An all-India census conducted on tiger population in 1972 put the figure at 1,872 against which, Meghalaya has only 32 tigers. The world at large is now very greatly concerned about the future of the tiger. The Government of India, in association with the World Wild Life Fund, established a Tiger Task Force and recommended all measures needed to ensure that this animal is securely rehabilitated. The State Government of Meghalaya has also declared tiger and panther as protected species in co-operation with the Task Force of the Government of India to save this magnificent animal from extinction.

The forests of Meghalaya are also the home of various types of wild cats like the leopard, civet cat, golden cat and clouded leopard. Wild cats are very much prized as zoological exhibits.

The other interesting small animal of Meghalaya's forests is the hoolock or gibbon. It is the smallest ape found in the hill forests of North-East India and the South-East Asia. Serows or wild goats are found throughout the State. Monkeys found in Meghalaya are of various types such as common langur, capped langur, golded langur and stamptail monkey.

The bird life or Meghalaya is also various. The wild birds commonly found are hill mynah, jungle fowl, black pheasant, peacock pheasant, hornbills, wild ducks, partridges, green pigeons, imperial pigeons, parrot and parakeet. Mynah of Meghalaya is well-known for its easy immitation of human voice and is in great demand in the market. So also is the peacock pheasant which is a rare bird of exquisite beauty. But the number of all these birds has considerably dwindled due to indiscriminate shooting. The State is also well known for the variety of rare orchids and rare species of butterflies attracting research scholars from different countries of the world.

There is a tremendous scope for the promotion of tourism in the State through wild life preservation. A 200-square kilometre wild life sanctuary surrounded by rivers on all sides has been selected at Balphakram on the Garo-Khasi Hills border. This will be the home for wild elephants and other interesting and rare animals of Meghalaya's forests like clouded leopard, hoolock, tiger bison and other animals. Wild life tourism is a source of potential revenue for the State which has not yet been properly tapped.

CONCLUSION

The foregoing has clearly shown that the State is endowed by nature with copious rainfall, rich deposits of minerals, valuable forest resources, abundant water power potential and scenic spots. But the uneven topography and difficult terrains are the great inhabiting factors that stand in the way of proper exploitation of these resources thus resulting in the present under-development of the State.

The exploitation of the rich resources of the State and their proper utilization in the development of agro-based, forest-based, and mineral-based industries as well as tourism, would greatly accelerate the tempo of

economic development of the State. Similarly, the development of hydro-electricity in selected sites would also facilitate industrialisation. For this purpose adequate attention needs to be first given to the need to overcome the inhabiting factors through the proper development of infrastructure in the State.

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Chapter-3

PROBLEMS OF THE EXISTING CEMENT PLANTS

There are at present three Cement Industrial Enterprises in Meghalaya, namely, the Mawmluh-Cherra Cements Limited, Mawmluh, East Khasi Hills District; the Jaintia Cements Limited, Sutnga, Jaintia Hills District and the Virgo Cements Limited, Damas, East Garo Hills District.

PROBLEMS OF MAWMLUH-CHERRA CEMENTS LIMITED

Introduction

We shall first of all look at the problem of the Mawmluh-Cherra Cements factory. At the time of the formation of Meghalaya State in 1972, the Assam Cements Limited was the only one large-sized company enterprise in

the State. It was established in 1955 in Cherrapunjee by some industrialists, but was taken over by the Government of Assam in January 1964. The Company started production in the year 1966. Its name has been changed into Mawmluh-Cherra Cements Limited after the formation of Meghalaya. Cherrapunjee is an ideal place for the cement factory, because the basic raw-materials like limestone, clay and coal are available nearby and only gypsym is imported from Rajasthan.

Thus from 1st January, 1964, Assam Cements Limited became a Government of Assam undertaking. As soon as the enterprise was taken over by the Government, the construction work began which was completed in 1966, and it was commissioned in the month of November 1966, with an annual capacity of 82,500 metric tonnes of cement per annum. With the reorganisation of the composite State of Assam resulting in the creation of Meghalaya, the control and management of the enterprise formally passed over to the latter. The Assam Cements Limited was accordingly renamed as the Mawmluh-Cherra Cements Limited (MCCL) on 7th May, 1974, and became a Government of Meghalaya undertaking.

To discuss the problem of this undertaking we propose to look first at its financial performance:

Financial Performance

The success or failure of any enterprise, public or private, depends very much on the ability of an enterprise to reap a profit or a positive return to the capital invested. Information necessary to ascertain whether an enterprise succeeds or fails in reaping a return or a surplus can be obtained from its financial performance. The financial performance of the enterprise reveals the true picture regarding its liquidity, solvency, bankruptcy, profit and loss.

For the study of its financial performance of the period of twenty-five years from 1966-67 to 1990-91. We have drawn our information and data mainly from its Annual Reports for the entire period of 25 years. The MCCL, a member enterprise of the cement industry in India established in the public sector is still today the main cement producing enterprise in Meghalaya. Therefore, it has acquired a monopoly in cement production in the State. The company has made, as was expected, a significant contribution towards the general improvement in the economic conditions of the people and to the creation of an industrial culture within the State. It has also fulfilled its social responsibility by bringing about a change in the socio-economic life of the society through the provision of basic infrastructural facilities like

transport, health, education, recreation and entrepreneurial facilities. Some of these are to be provided by the State through planning, but a public enterprise is expected to contribute to the state exchequer to enable the State to undertake some of these activities.

But ever since the MCCL started its production in 1966, the enterprise has not been able to contribute to the state exchequer. The enterprise has not only been incurring losses but has even resulted into a negative return over the capital employed in certain periods. To have a clearer picture of this phenomenon, it is relevant to analyse the capital structure of the enterprise. During the year 1966-67, the investment made in the enterprise was Rs. 91 lakhs. Of this amount, the government contributed Rs. 70 lakhs or 77 per cent of the total paid up capital. In the following year, that is, 1967-68, the Government's participation in the share capital of the enterprise increased to 96 per cent when it contributed Rs. 87 lakhs to the total paid up capital of Rs. 91 lakhs. In the subsequent years, the Government's participation by way of equity shares went on increasing. By the year 1985-86, Government's share was 98 per cent. The investment pattern made on the enterprise by way of both equity and preference shares is shown in table 3.1.

Table 3.1

Investment Pattern in MCCL, 1966-67 to 1990-91

(Rs. in lakhs)

Year	Equity share	Preference share	Total Value of shares	Government participation
1966-67	41	50	91	70(77)
1967-68	41	50	91	87(96)
1968-69	288	100	388	110(28)
1969-70	388	100	488	100(20)
1970-71	438	100	538	528(98)
1971-72	450	100	550	539(98)
1972-73	466	100	566	555(98)
1973-74	511	100	611	599(98)
1974-75	541	100	641	629(98)
1975-76	541	100	641	629(98)
1976-77	541	100	641	629(98)
1977-78	541	100	641	629(98)
1978-79	541	100	641	629(98)
1979-80	541	100	641	629(98)
1980-81	651	100	751	736(98)
1981-82	651	100	751	736(98)
1982-83	651	100	751	736(98)
1983-84	701	100	801	785(98)
1984-85	751	100	851	834(98)
1985-86	751	100	851	834(98)
1986-87	751	100	851	834(98)
1987-88	751	100	851	834(98)
1988-89	751	100	851	834(98)
1989-90	751	100	851	834(98)
1990-91	751	100	851	834(98)

Note : Figures within brackets indicate the percentage of shares held by the State Government.

Source: Annual Reports, Mawmluh-Cherra Cements Ltd., 1966-67 to 1990-91.

During the whole period from 1966-67 to 1990-91, the Government investment in the enterprise has increased to an enormous extent. It may be seen from the above table that during this period, government's participation in the share capital of the enterprise has increased a little about 12 times which works out to 98 per cent of the total investment of the enterprise.

In spite of this phenomenal increase of government investment, the enterprise continuously suffered a loss during its first 25 long years of its existence except in the year 1991-92 when it could clinch a very insignificant profit of Rs.0.17 lakhs as could be seen from table 3.2.

Thus the enterprise had placed a heavy burden on the tax-payers who indirectly financed the enterprise. It becomes apparent from the above table that the enterprise was continuously in the red for a period of two decades. Even the recorded profit of Rs.17,000/- appears to be doubtful, for according to the Auditor's Report for 1971-72, the actual profit was inflated due to the credit during the year of an excess provision of interest made in earlier years to the tune of Rs.4,24,542.27 p. The cumulative loss the enterprise was incurred from 1966-67 to 1988-89, stood at Rs.998 lakhs. The huge loss has raised many doubts regarding the efficiency of the enterprise especially after analysing the fact that during the same period, the Government had invested capital worth Rs.15,193 lakhs.

Table 3.2

Profit and Loss Position of MCCL, 1966 to 1991

(Rs. in lakhs)

Year	Government participation	Index (base 1966-67=100)	Profit(+)/ Loss(-)
1966-67	70	100	-18
1967-68	87	124	-50
1968-69	110	157	-19
1969-70	100	142	-0.75
1970-71	528	754	-12
1971-72	539	770	+0.17
1972-73	555	792	-22
1973-74	599	855	-19
1974-75	629	898	-23
1975-76	629	898	-22
1976-77	629	898	-46
1977-78	629	898	-30
1978-79	629	898	-47
1979-80	629	898	-46
1980-81	736	1051	-7
1981-82	736	1051	-6
1982-83	736	1051	-163
1983-84	785	1121	-138
1984-85	834	1191	-197
1985-86	834	1191	-133
1986-87	834	1192	-112
1987-88	834	1192	-103
1988-89	834	1192	-119
1989-90	834	1192	+72
1990-91	834	1192	+159

Source : Annual Reports, Mawmluh-Cherra Cements Ltd., 1966-67 to 1990-91.

Causes of Poor Performance

An attempt is made here to specify some of the factors responsible for the poor financial performance of the enterprise. The MCCL, a public sector enterprise has still a long way to go before reaching its optimum capacity utilisation as well as production. In this regard, a clearer picture of the situation can be drawn from table 3.3.

Table 3.3

Statewise Installed Capacity and Production of Cement Industry in India, 1986-87

(in lakh tonnes)

State	Installed capacity	Production	Production as percentage of installed capacity
Andhra Pradesh	64.65	53.64	82.97
Assam	2.00	1.64	82.00
Bihar	24.03	12.05	50.12
Gujarat	39.74	32.75	82.41
Haryana	5.80	5.48	94.48
Himachal Pradesh	7.60	7.61	100.00
Jammu & Kashmir	2.00	1.21	60.50
Karnataka	39.17	28.81	73.55
Kerala	4.20	2.76	65.71
Madhya Pradesh	87.27	78.43	89.87
Meghalaya	1.99	0.98	49.25
Maharashtra	22.02	13.66	62.03
Orissa	9.61	9.11	94.79
Tamil Nadu	42.34	38.03	89.82
Uttar Pradesh	25.87	10.10	39.04
West Bengal	6.00	3.95	65.83

Source : Data on Cement Industry in India, ACCL, Bombay, 1987.

A look at the above table shows that the capacity utilisation in Meghalaya was very low which was only 49.2 per cent in 1986-87. Obviously, this relates to the MCCL, the only cement plant in the State that was functioning during the period. Comparing this with the neighbouring State of Assam, the MCCL's capacity utilisation was too poor to need an explanation. With the exception of Uttar Pradesh, MCCL is at the lowest rank of the ladder in capacity utilisation. The situation looks even more distressing when we compare the extent of capacity utilisation with other cement units in the public sector as will be shown in Table 3.4.

Table 3.4

Performance of Some Cement Enterprises in the Public Sector in India, 1986-87

(in lakh tonnes)

Enterprises	Capacity	Production	Percentage capacity utilization
CCI	30.87	20.41	62.2
Orissa Cement	5.61	4.18	74.5
Jammu & Kashmir Cements Ltd.	2.00	1.21	60.5
MCCL	1.99	0.98	49.2
Malabar Cements	4.20	2.76	65.7
Tamil Nadu Cements Corpn.			
1. Alangalam	4.00	3.13	78.3
2. Ariyalur	5.00	3.53	70.6

Source : Data on Cement Industry in India, ACCL, Bombay, 1987.

From the table it is noticed that the MCCL was trailing well behind other cement producing units in capacity utilisation in 1986-87, while other units managed to utilise more than 50 per cent to 70 per cent, MCCL was yet to reach the percentage capacity utilisation of 50 per cent. The low capacity utilisation was also accompanied by excessive manpower. According to the specification of the National Productivity Council for Cement Industry, for a plant size upto 6 lakh-tonnes per annum capacity and having a wet process of production, the required norm for manpower exmployment should be in the range of 4 to 10 man-hours per tonne. Even if we take 10 man-hour as a norm, we find that for the MCCL, labour productivity was almost half of the norm. The MCCL which falls under this capacity is thus found to have an excessive manpower as shown in table 3.5.

Table 3.5 shows a deteriorating situation, thus specifying that in MCCL there was absence of proper manpower planning and unless steps in this regard are taken by the management, the enterprise is likely to be plunging headlong to total inefficiency in capacity utilisation as well as in production.

Table 3.5

Man-Hour Deployed in Producing One Tonne of Cement in Enterprises having a Wet Process in India, 1982 to 1986

(in lakh tonnes)

Enterprises	Capacity	Man-Hours/Tonne			
		1982-83	1983-84	1984-85	1985-86
Public Sector :					
1. MCCL	1.99	20.05	16.07	18.05	19.04
2. Tamil Nadu Corpn., Alangulam	4.00	13.39	15.70	11.39	12.12
Private Sector :					
1. ACC Bhupendra	4.06	8.63	10.24	9.20	9.03
2. Andhra Cement Co. Ltd., Vijayawada	2.40	7.05	8.75	7.87	8.29

Source : Data on Cement Industry in India, ACCL, Bombay, 1987.

From the perusal of the Annual Reports of the Company for the 25 year period from 1966-67 to 1990-91, we may broadly specify the following causes : .

1. Underutilisation of Capacity

As already shown in tables 3.3 and 3.4, the capacity utilisation of the enterprise has been relatively very low. This, in fact, reflects an indifferent attitude of the enterprise towards raising its performance

standard. The percentage capacity utilisation against an installed capacity of the plant throughout the twenty-five years under study is shown in table 3.6.

From table 3.6 it will be evident that during the initial year of production (1966-67) and even a year after (1967-68), the capacity utilization stood only at 28 per cent and 44 per cent respectively of the installed capacity of 82,500 metric tonnes per annum. During the periods 1968-69 and 1969-70, the average capacity utilization in India was 81 per cent and 86 per cent respectively of the installed capacity. As against this, it may be seen that the MCCL utilised during this period upto 87 per cent and 76 per cent respectiely, of the installed capacity. And untill the year 1976-77, the capacity utilisation of the enterprise fluctuated between 60 per cent and 80 per cent. It is significant to mention that the authority of the enterprise had in 1978 completed the first phase of the expansion project of the plant, whereby installed capacity was riased to 184,000 metric tonnes per annum as against 84,000 metric tonnes fixed during the year 1968-69. The table further showed that capacity utilisation during the period 1977-78 to 1985-86 has come down ironically enough with an increased installed capacity. In fact, after 1976-77, the capacity utilisation suddenly dipped down to 52 per cent in 1977-78

Table 3.6

Capacity Utilisation against Installed Capacity in MCCL, 1966 to 1991

(in .000 metric tonnes per annum)

Year	Installed capacity	Production	Percentage capacity utilization
1966-67	82	23	28
1967-68	82	36	44
1968-69	84	73	87
1969-70	84	64	76
1970-71	84	58	69
1971-72	84	67	80
1972-73	84	62	74
1973-74	84	54	64
1974-75	84	73	87
1975-76	84	63	75
1976-77	84	58	69
1977-78	184	95	52
1978-79	184	66	36
1979-80	184	54	29
1980-81	184	85	46
1981-82	184	95	52
1982-83	184	84	46
1983-84	184	96	52
1984-85	184	101	55
1985-86	184	91	49
1986-87	284	94	33
1987-88	213	76	36
1988-89	284	82	29
1989-90	284	99	35
1990-91	284	126	44

Source : Annual Report, MCCL, 1966-67 to 1990-91.

and 36 per cent in 1978-79. In 1985-86, the capacity utilisation in MCCL was only 49 per cent as against the All-India Cement Industry Capacity utilisation of 75 per cent.

It is relevant to mention that in 1969-70, the government had set 82 per cent as an ideal average norm for capacity utilisation. If we consider any percentage between 60 and 90 per cent capacity utilisation as good performance, we may say that during the period from 1968-69 to 1976-77, the enterprise had relatively high capacity utilisation. But in spite of this good performance, the enterpirse was incurring a cumulative loss of Rs.164 lakhs during the period as may be seen from table 3.2 above. Therefore, the argument that the enterprise was incurring losses due to inadequate capacity utilisation does not appear to hold true.

It is understandable that every enterprise has to experience a teething problem at the initial stages of its production for which optimum utilisation of the capacity may not be possible. But considering the fact that even after the enterprise had incorporated better facilities like commissioning in 1978 and 1985 of two additional kilns with the productive capacity of 340 tonnes each per day and with the targetted capacity of 1,84,000 metric

tonnes per annum, the performance of the enterprise continued to be grim. As can be seen from table 3.6 above, the capacity utilisation was 29 per cent in 1979-80, 46 per cent in 1980-81, 52 per cent in 1981-82, and 46 per cent in 1982-83. Thus from this fluctuating performances, one may infer that while poor utilisation of installed capacity may be an important factor responsible for the huge loss of the enterprise, yet we may seek for other reasons as well.

2. Frequent Mechanical Breakdowns

The Company has attributed the frequent mechanical breakdowns as one of the contributory factors for the persistent losses of MCCL. But this argument does not seem to be very strong unless the mechanical breakdown is of a major type which was not reported. However in 1979, the enterprise replaced a new saw mill motor for the old and obselete one. Thus the cause of the persistent losses may be elsewhere. In fact, the enterprise had involved itself in its expansion programme at three stages during its 25 years of existence. This might have rendered it impossible for the enterprise to succeed in improving its existing plant. Thus it is more relevant to attribute the losses of the Company to the problems connected with its frequent expansion programmes rather than with the frequent mechanical failures.

It was also indicated in various reports of the MCCL that late commissioning of the plant had resulted in a loss to the enterprise. In 1967-68 it was realised by the Board of Directors that a daily capacity of one kiln with 250 tonnes per day was not economically viable. Therefore, the management proposed to expand the plant project by installing two more kilns of 340 tonnes production per day each. The first of the two kilns was to be commissioned in June 1976 and the second in June 1977. But unfortunately, the two kilns were, in fact, commissioned in 1978 and 1985 respectively.

Thus there was a long lapse of time between the estimation and the completion of the expansion project. Ultimately, cost estimates had to be revised upwards resulting in an escalation in the cost of production. For instance, in 1966-67, the Works Manager had estimated the expansion programme at an amount of Rs. 452 lakhs which was approved by the Board of Directors in August 1967. But the work was undertaken only in March 1974. With price annually going upwards due to inflation, the Directors were forced to revise the estimate resulting to an increase of Rs.980 lakhs in 1975 at the instance of Development Consultants Private Limited (DCPL), Calcutta. Of this account, Rs.253 lakh was advanced by the State Government. But progress of the work has been very slow and remained

stagnant. Thus the cost estimate made in 1975 became obsolete again due to price rise. Eventually, cost estimate was revised from Rs. 980 to Rs. 1,197 lakhs in February, 1979. The first kiln was commissioned in 1978, but before the second kiln was commissioned, another revision of cost estimate had to be made in December 1981 at Rs. 1,360 lakhs.

Further, it was found that even when both the kilns were commissioned, the erection of coal dryer and some other related accessories could not be completed. The works of the structural coal dryer as well as packing plant and raw water supply scheme were not completed until 1986-87. Therefore, it becomes clear that there was lack of comprehensive and sequential planning to implement the expansion programmes, as a result of which, scarce funds could not be utilised profitably by the Company. This seems to have been responsible for the poor financial performance of the MCCL resulting in its negative return to the capital employed by the enterprise.

3. Highly-Geared Capital Structure

Another reason responsible for the loss of the enterprise was said to be due to highly geared capital structure. Capital gearing implies a relationship between equity capital and long-term debt bearing fixed interest.

And, an enterprise is said to be highly geared when it has a proportionately larger issue of debentures or preference shares for raising its long-term resources. In other words, when the enterprise tilts in favour of preference and interest-bearing loans as against equity share capital, then the capital structure of the enterprise is said to be highly geared.

The equity share capital can be floated in the market. Institutional loans may be secured and household savings mopped up (even sometimes the share capital may be over subscribed), only when the enterprise has a bright future and has the potency to make profit, even if it has not made any substantial profit in the initial years. MCCL, an enterprise under our consideration, had made losses year after year (see table 3.2 ante) and, therefore, it had practically no prospect of mobilising savings from the market. True, in the Indian context, the financial institutions including the nationalised banks may have to come forward to prop up an enterprise which from other consideration is truly 'sick', but one has to understand that even public sector financial institutions including the nationalised banks cannot go subsidising such loss at their expenses year after year. Obviously, therefore, such an enterprise can only be financed by loans which may carry a relatively high rate of interest. Or, if it is a public

sector enterprise, as was the case with MCCL, the required finance was given by the state government through subscribing its share capital. As we have stated earlier, augmentation of capital (both working and fixed) of the enterprise was made possible by increased funnelling of funds through state government's purchase of equity shares and not through tapping of private savings from the capital market.

As shown in table 3.1, the share of private participation remained constant at 2 per cent almost throughout the period of study. Therefore, the argument that highly geared capital structure was the cause of the loss is difficult to reconcile. Rather in our opinion, it appears that the high gearing capital structure of the enterprise could be the effect of loss. The failure of MCCL to secure sufficient returns will in the long-run necessitate unprecedented public debt through the government's financing of the loss. Worse still is the observation that the government turned a blind eye to the matters relating to debt-servicing which resulted not only in non-utilisation of loans, but had resulted also in huge payment of penal interest. In the midst of the financial crisis, it is logical to say that this feature is disturbing enough which, if not reverted, can cause great damage not only to the enterprise but more importantly to the economy as a whole.

4. Non-Availability of Good Quality Coal

Coal is an essential raw material for cement production. Its regular and adequate supply is almost necessary for the smooth functioning and optimising cement production. Besides, the quality of coal has also a direct bearing on the quality of cement produced. Therefore, it is understandable enough that coal as an input has a true impact on the final output of any cement producing enterprises.

With regard to MCCL, it was found that in more than one occasions, the Directors in their reports attributed to non-availability of good quality coal as a major obstacle to the successful working of the enterprise. Poor quality raw material like coal would mean poor quality input which was, therefore, likely to sap the funds of the enterprise. This is understandable enough because coal of bad quality is needed relatively more in quantity for cement processing than coal of good quality. In a note submitted to the Board of Directors by the Managing Director in 1981-82, it was emphasized that it was difficult to get supply of a good quality coal from local sources. Moreover, this situation was further aggravated, since supply of coal came from private contractors who often diverted their supply elsewhere when the enterprise failed to conform with their demand price. In another note presented by the Chairman of

the Board of Directors to the Management Committee in 1983, it was stated that the enterprise was handicapped due to poor quality coal coming from Cherra side which incidentally is located in the vicinity of the enterprise itself. It is also found from the same note that the enterprise was taking steps to transport coal from Jowai area because coal from that area was found to be superior to that of Cherra area.

In the same note it was further stated that the price differential between Jowai coal and Cherra coal was so much as to become uneconomical for the enterprise to transport the former to the factory site. It is relevant to mention that we tried to get information about the actual price differential, but the same was not available. Notwithstanding the paucity of information, it may be plausible to surmise that the whole matter about the supply of good quality coal was not given the importance it deserved. In any case, we do not find enough justification for the management's suggestion to request the government to open up a buffer stock of coal at Guwahati, and at the same time to ask the government to check the movement of coal outside the state. Logically, the opening of a coal depot at Guwahati for the need of the factory will not reduce, but will rather increase the transportation charge of coal to the factory site. Secondly, if the government

was to restrict the export of coal from Jowai areas to the other areas outside the state, the demand has to be originated from the state itself. As the Chairman of the Management Committee had specified, the enterprise could have purchased coal from Jowai side, presumably at lower transport cost than ex-Guwahati. That would have been perhaps logically a correct step towards restriction in the movement of coal outside the state.

It seems really a paradox that while hundreds of truck-loads of coal have been going outside the state (to diferent parts of India), the MCCL as well as the government failed to tap this important source for their own advantage. Therefore, in this context, asking for a buffer stock at Guwahati instead of at Shillong seems to be an unncessary and inconsistent move. Thus the blame put forth on poor quality and non-availability of coal does not appear to hold ground, since the state and the enterprise did not conform themselves with the arrangements which would help easing the problem. If the state was to strive towards a higher economic order, special emphasis should have been given by the government to avail all possible facilities such as tapping of coal resources of Jowai areas to remove the hindrances that stood in the way of smooth working of the enterprise.

5. Transport Bottlenecks

A perusal of the Director's Reports of the enterprise during the period from 1966-67 to 1990-91 reveals that there was a vast scope for marketing of cement in view of a very favourable demand in the region. In the North-East Region (NER) alone, the demand for cement has been substantial enough amounting to 8.09 lakh tonnes in 1985 while the supply was 7.33 lakh tonnes which means a shortfall in the availability of cement to the tune of about 76,000 tonnes. Of the total supply of 7.33 lakh tonnes, only 2.63 lakh tonnes come from factories within the region including MCCL. This position has been clearly depicted in table 3.7 and table 3.8 below :

Table 3.7

Demand for Cement in NER, 1985

(in lakh tonnes)

Sl.No.	States	Demand	Percentage to total demand
1	Assam	4.57	56.50
2	Arunachal Pradesh	.34	4.21
3	Manipur	.62	7.67
4	Meghalaya	.77	9.52
5	Mizoram	.21	2.58
6	Nagaland	.72	8.88
7	Sikkim	.43	5.32
8	Tripura	.43	5.32
	Total	8.09	100.00

Source : Marketing Report of MCCL, ACCL, Bombay, 1989.

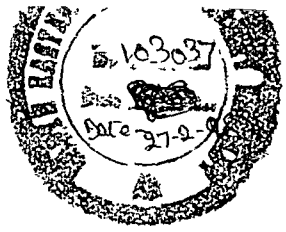

Table 3.8

Factory-Wise Position Regarding Total Supply of Cement to NER, 1985

(in lakh tonnes)

Sl.No.	Factory	Amount supplied
1	CCI Bokajan	1.69
2	Banjari	.10
3	MCCL	.94
4	IDC Bargarh	.06
5	OCL Rajganpur	.10
6	Durgapur	.13
7	CCI Akaltava	1.08
8	ACC Jamul	1.18
9	Raymond	.18
10	Century Tilda	.96
11	CCI Mandhar	.91
	Total	7.33

Source : Marketing Report of MCCL, ACCL, Bombay, 1989.

From the above table, it can be seen, that out of the total supply of 7.33 lakh tonnes, only 2.63 lakh tonnes was produced within the Region by the two factories, namely, CCI, Bokajan, Assam and MCCL, Meghalaya. Thus the actual gap between demand and supply of cement within the Region in 1985 was 5.46 lakh tonnes.

In both the above tables, we see that MCCL could easily take advantage of the shortage of cement required in the region by efficiently working on its capacity. Besides, it has also been found that the development activities in the NER has been growing manifold. To meet this, the estimated demand for cement in 1990 for the NER was put at 13 lakh tonnes with Assam alone requiring about 8 lakh tonnes and with Meghalaya alone about 1 lakh tonne. In this context, since demand is already there, there can be no selling constraints for MCCL, not only in Meghalaya itself but also in other parts of the NER. If MCCL produces 85 per cent of its rated capacity, it could easily feed 12.5 per cent of the total requirement in the NER in 1990 or 21 per cent of the total requirement in Assam only or 17 per cent of the combined requirement of Assam and Meghalaya during the same year.

The MCCL enjoyed relatively better and more advantageous position for extension of its marketing network to the whole of the NER. MCCL apart from being a local enterprise with intimate knowledge of local conditions, it also enjoyed lower cost of distribution compared with other enterprises located outside the NER. Besides, by virtue of its locational advantage, the freight cost for transporting cement in the region was abviously much less. As the report on marketing for reactivation of

MCCL given by ACCL suggests, MCCL primary market lies in Assam and Meghalaya and, therefore, its sales efforts must be directed in these two areas. The remaining part of the NER, particularly Manipur and Nagaland should serve as secondary market. As demand fluctuates for various reasons, the secondary market should act as a supporting one during bad period.

Judging from the above standpoint, one may easily argue that there should have been no difficulty in marketing MCCL's Cement in order to augment its profitability. Thus a vast scope of marketing facilities not withstanding, the management thought transportation of cement was an important hindrance. In view of the fact that cement is easily brought from outside the state, the demand in this region being in excess of supply, there seems to be little justification in attributing transport bottlenecks as one of the factors contributing towards poor financial performance of MCCL.

6. Dearth of Technical Personnel

The Annual Reports of MCCL mentioned another factor namely, dearth of technically qualified personnel, as being responsible for the poor financial performance of the Company. This argument could have held ground, if at all, in the initial years of function of the enterprise. But

after the creation of Meghalaya in 1972, a number of boys and girls are sent every year by the State Government to various technical institutions in the country to be trained as engineers in different fields. This is accompanied by the condition that the students on completion of their study will have an obligation to serve the State Government. But ironically, although a good number of students are trained every year in various engineering disciplines on government scholarship and financial aid, it appears that the State Government did hardly anything to get their service in return. This apart, inadequate advertisements and improper streamlining of employment, in short, imperfect manpower resource planning seems to be responsible for the so-called dearth of technical personnel for the enterprise.

7. Other Factors

An examination of the Auditor's Reports, profit and Loss Accounts and Balance Sheets of MCCL for the years 1966-67 to 1990-91 reveals that books, records and registers were haphazardly maintained by the Company. The same observation has also been made by the Committee on Public Undertakings (CPU) and the Comptroller and Auditor General of India (CAG) in their respective reports. Therefore, the details of expenditure were not always

available and this had often resulted in difficulties to prepare accurate accounts on the operation of the enterprise. The financial mis-management seems to have ruled the enterprise. In the first place, the delay in the expansion programme was detrimental to the enterprise as it had to bear the burden of cost escalation. Secondly, lack of organisation and coordination accompanied by uneconomical operation had resulted in a wastage of quite a substantial amount of public funds. For instance, an amount of Rs. 35 lakhs was never recovered from the contractors for their failure to complete the work in connection with the expansion programmes and the civil works of the enterprise.

One may note, in this connection, some instances of very important 'slip' in the financial management of the enterprise - if one may say so mildly - viz., in not recovering the compensation due from contractors to the enterprise for late commissioning of the work. But instead of pressurising the contractors for fulfilling their commitment in completing their work within the stipulated date, it has been noticed that on many occasions the management succumbed to the contractors' demand and even paid escalation cost, contrary to the procedure, by which the contractors were supposed to pay damages to the enterprise.

Besides, the enterprise also had incurred various avoidable expenditures to the tune of Rs.83 lakhs caused by the non-acceptance of lowest tendered contract; lack of speed to finalise operational programmes and in this process contractors' claims for price escalation had to be incurred by the enterprise; unnecessary payment to the contractors for their staff maintenance even after the work was completed. Thus huge amount if avoided could have lessened the amount of loss the enterprise was making. Further, cases of defalcation of funds of the enterprise have been observed and recorded. The enterprise had on one occasion - in 1974 paid Rs. 3 lakhs for the missing 48 items of equipments and the recovery of this expenditure was yet to be obtained from the insurance company. Obviously, huge amount of funds have been drained out of the MCCL, for which, to our knowledge nobody could be found to be responsible. An enterprise failing to maintain financial discipline was bound to face troubles.

The above analysis lead us to the conclusion that the enterprise was seriously sick in the sense that its operation was encountered with pitfalls and failures such as lack of sense in the husbandry of the resources and the unproductive use of the community's savings.

PROBLEMS OF VIRGO CEMENTS LIMITED[1]

We now propose to study the problems of the second Cement Plant in the State, namely, the Virgo Cements Limited.

Introduction

We have seen that the demand for cement in North-Eastern Region as a basic construction material is so high but its existing production in the region is not in a position to meet the requirements. Cement has to be brought from outside the region to partially meet the demand. It was because of such acute shortage of cement in the North-Eastern Region that led to the establishment of Virgo Cements Ltd. at Damas in East Garo Hills District of Meghalaya. The enterprise was incorporated as a Private Limited Company on 6th August 1986 under the Companies Act 1956. The Company has commenced its commercial production since September 1991 and it is hoped that it would be able, to some extent, to bridge the gap between demand for and supply of this basic construction material in the region.

The total consumption of cement in the region during the period of 8 years from 1981 to 1988 is shown state-wise in table 3.9.

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1. All information relating to the Virgo Cements Limited were obtained from the Meghalaya Industrial Development Corporation (MIDC), Shillong.

Table 3.9

Total State-Wise Consumption of Cements (Levy and Non-Levy) in N.E. Region

(in '000 tonnes)

Year	Assam	Meghalaya	Manipur	Nagaland	Arunachal	Tripura	Mizoram	Total
1981	311	70	61	60	28	44	16	590
1982	308	60	61	73	23	27	13	565
1983	463	77	52	56	27	44	15	734
1984	506	91	68	58	28	31	20	802
1985	457	77	62	72	34	43	21	766
1986	551	99	80	91	43	38	27	929
1987	480	90	58	55	33	38	27	781
1988	598	95	86	55	56	57	27	974

Source : Collected from the Office of the MIDC, Shillong.

From the above table, it is apparent that the total consumption of cement in the North-Eastern Region in 1988 was 9.74 lakh tonnes. As against this, the existing production capacity of cement in the region is only 5.67 lakh tonnes per year. Hence, there has been a wide gap between demand for and supply of cement in the region as already observed earlier. The existing production capacity of different undertakings in North-Eastern Region is shown in the following table :

Table 3.10

Existing Production Capacity of Cement in North-Eastern Region

Sl.No.	Name of the Undertakings	Capacity (in '000 tonnes per year)
1	CCI, Bokajan	200
2	North-East Cement, Umrangshu	33
3	Pragshiva Cement, Kamarkuch	8
4	Mawmluh-Cherra Cement, Cherrapunjee	300
5	Udayanu Cement	8
6	Gyan Industries House, Dimapur	8
7	Parasuram Cement, Tezu	10
	Total	567

Source : Collected from the Office of the MIDC, Shillong.

Though the production capacity of the seven factories in North-Eastern Region was 5.67 lakh tonnes in 1988, the actual production was only 2.63 lakh tonnes by 1985 as already observed earlier.

Technology

Virgo Cements Limited is following the technology available in the country provided by Cement Research Institute (CRI) technology of the National Council for Cement and Building Materials (NCCBM). The technology followed by Virgo Cements is also being followed and utilised by many Cement Industries not only in N.E. Region but in the whole country. About 50 cement plants in the country based on the same technology has been established.

Project Cost and Means of Finance

The Company was established with a project capital cost of Rs.865 lakhs. The cost of the project is financed by way of floating the shares in order to attract brisk investment from the concerned promoters and institutions in the following manner :

		(Rs. in lakhs)	
1.	Share Capital:		
	a) Promoters contribution	207	
	b) Financial Institutions (IDBI, IFCI, ICICI)	85	
	c) MIDC	30	
			322
2.	Capital Investment Subsidy		25
3.	State Investment Subsidy		30
4.	Term Loan from Financial Institutions		488
		Total	865

Management

The affairs of the Virgo Cements Limited are entirely looked after by the Board of Directors comprising of the promoters, one nominee from the Industrial Development Bank of India (IDBI), one nominee from Industrial Financial Corporation of India (IFCI), the Director of Industries, Government of Meghalaya, and the Managing Director of Meghalaya Industrial Development Corporation (MIDC).

The Auditor of the Company is M/s. H.S. Kumbhat and Co., Guwahati.

Turn-Over

As per the project plant, the turn-over of the Company is expected to be of Rs. 800 lakh per annum. It is also expected that the Company would contribute to the supply market significantly for meeting the rising demand of cement in the region.

Problems

The Company had confronted some major problems at the start. The main problem was attributed to the law and order situation prevailing in the Assam State. This was experienced at the time of transportation of plants and machinery which had to be done through Assam State, the

gateway linking Meghalaya with the rest of the country.

So far as its production problems are concerned it is too early to assess within one year of the start of its commercial production. It is, however, hoped that the plant would thrive well provided it could take advantage of the shortage in supply of cement in the N.E. Region.

PROBLEMS OF THE JAINTIA CEMENTS LIMITED[1]

The third and the last cement plant in the State is the Jaintia Cements Limited whose problems are discussed here.

Introduction

The same reason that motivated the establishment of the Virgo Cements Ltd. had also led to the promotion of the Jaintia Cements Ltd. In order to cater to the needs of the North-Eastern Region the well-to-do industrialists and entrepreneurs in Jaintia Hills have decided to take risk to float the new undertaking by utilising the same technology available to the Virgo Cements Ltd. In this way a number of cement factories like the Jaintia Cements Ltd. and the Virgo Cements Ltd. are now-a-days coming up in other parts of this region. The undertaking was incorporated as a Private Limited Company under the Companies Act 1956 on 20 November 1986.

1. All information relating to the Jaintia Cements Limited were collected from the Meghalaya Industrial Development Corporation, Shillong.

Technology

The problem of Cement Scarcity in the North-Eastern Region encouraged the promoters of the Jaintia Cements Ltd. to set up the factory at Sutnga, Jaintia Hills by putting in use two modern Vertical Shaft Kilns (VSK) with a capacity of 50 tonnes per day. The Jaintia Cements Ltd. utilises the Cement Research Institute (CRI) technology of the National Council for Cement and Building Materials (NCCBM). The CRI technology of NCCBM is widely accepted throughout the country.

Financing Pattern

Jaintia Cements Ltd. was set up with a project capital cost of Rs.660 lakhs. The resources and means of financing the above cash was not bright due to the paucity of internal financing capacity. Means had to be found out by floating of share capital in the market. The share capital of the Company consisted of the following :

		(Rs. in lakhs)
1.	Share Capital :	
	a) Promoters	105
	b) Financial Institutions (IDBI, IFCI, ICICI)	60
	c) M.I.D.C.	26

		(Rs. in lakhs)
		191
2. Term loan from financial institutions :		
a) IDBI	216	
b) IFCI	108	
c) ICICI	108	
		432
3. Central Investment Subsidy		25
4. State Subsidy		12
	Total	660

It would appear that state investment contribution has been too small.

Management

Jaintia Cements Ltd. is a Private Limited Company. The affairs of the Company are entirely managed and looked after by the Board of Directors. The Board consisting of the promoters, one nominee from the Industrial Development Bank of India (IDBI), one nominee from Industrial Financial Corporation of India (IFCI), the Director of Meghalaya Industrial Development Corporation (MIDC).

For the smooth and efficient running of the Company, the following are the key personnel of the Jaintia Cements Ltd. :

1. Finance and Accounts :

   M/s. A. Paul & Co. Chattered Accounts were to look after the financial matters of the Company.

2. Project Manager :

   Shri M.C. Banks, B.E.(Mech.).

3. Chemists :

   Shri Ratan Sarkar, Shri Ajay Kshatriya, B.Sc., both the chemists have completed practical training course in the National Council for Cements and Building Materials at New Delhi.

4. Senior Burner :

   Shri P.A. Paul.

5. Burner :

   Shri Nawal Kishor Roy and Shri Surendra Roy.

6. Millers :

   Shri Uma Shankar Roy and Shri Upendra Roy.

7. Electrical Engineer :

   Shri Parimal Das.

Besides the above key personnel, the Jaintia Cements Ltd. has been able to provide employment to a large number of local people in various capacities. It is also expected that a large number of ancillary small scale industries would emerge as a result of the establishment of the enterprise.

Status of the Project

The Jaintia Cements Ltd. has at present been able to instal all the plants and machinery and trial runs have already been undertaken and commercial production was to start by September, 1992. The installed capacity of the Jaintia Cements Ltd. is Rs. 600 lakhs per annum.

Problems

Besides the problems faced by the Company on account of the remoteness and the geographical location leading to heavier component of freight cost and the communication bottle-neck, technically no major problems are encountered. As production has just started, production problems are yet to be assessed.

Conclusion

At the end of our discussion on the problems of the three existing cement plants in the State, it must be stated that the production problems faced by the MCCL should serve as a pointer to the other two infant plants, namely, the Virgo Cement and the Jaintia Cement plants. It is understandable that every enterprise has to experience the teething problems. But once the enterprise has been commissioned for commercial production it should have not continued to face these problems. It is expected to

perform profitably particularly because of the extensive market for cement is available within the region itself.

The three existing plants should take advantage of the supply gap in the region. The gap between demand for and supply of cement has been so wide as the above analysis reveals that ample scopes exist for the establishment of more cement plants in the State. We propose to look into this aspect in the next chapter.

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Chapter-4

POTENTIALITY FOR MORE CEMENT PLANTS

Introduction

We have seen that Meghalaya is endowed with rich mineral resources. At the same time there has been a wide gap between demand for and supply of cement in the North-Eastern Region. In the preceding chapter, the gap has been estimated to the extent of 5.46 lakh tonnes. With the import of cement from outside the region, still there was a shortage of about 76,000 tonnes. Among the various minerals found in the State, limestone and coal are found in large quantities. In fact, Meghalaya has the largest single deposit of limestone in the world. Coal is found along with lime throughout the State from west to east. These two minerals are the basic raw-materials required by the cement factories.

Gypsum is another basic raw material, but this mineral is not available in the State. Nevertheless, as the item is not required in large quantity, it can easily be imported from other parts of the country.

Limestone Deposits

The limestone deposit in Meghalaya is about 3,000 million tonnes. This quantity can sustain the total requirements of cement in North-Eastern Region including other various types of limestone-based industries. We have shown in the previous chapter the detailed estimated amount of limestone in every deposit or area where it is available.

A region-wise summary is given in the following table :

Table 4.1
Region-wise Distribution of Limestone Deposits in Meghalaya

Sl. No.	Regions	Reserves (in million tonnes)	
		G.S.I. estimate	D.M.R. estimate
1	Khasi Hills	1338.50	4603.20
2	Jaintia Hills	1052.00	405.06
3	Garo Hills	No estimate	338.70
	Total	2390.50	5346.96

Source : Chapter-2 ante.

The limestone deposits found at Siju, Cherrapunjee, Shella-Bholaganj and Lumshnong-Nongkhlieh are close to the deposits of coal and the areas are ideal for the location of the cement plants.

Coal Deposits

Coal is another principal raw material which the cement plants need in large quantities. It is abundantly found in the State. Coal production of Meghalaya is about 60,000 tonnes per year and the bulk of it comes from small mines. In view of the comprehensive central legislation totally banning coal mining leases to the private sector, the Meghalaya Government is setting up a State Government Undertaking to take over coal mining leases in the State. Coal deposits have been found in all the districts of Meghalaya. Because of abundant availability of coal in the State, the prospect and potentiality of establishing new cement industries both in large and medium size units in the State is very bright. The planning bodies both of the State and the Central government have been putting efforts in preparing project reports on the feasibility of setting up new cement units at various places so that the North-Eastern Region gets its requirements of cement for various developmental projects without depending on outside regions. The quality of coal available in Meghalaya is

also high and comparable to the quality of coal available in the coalfields of Raniganj and Jharia in West Bengal. It is hoped, therefore, that new cement units will come up in future in the State. We have already shown in the previous chapter the detailed estimated availability of coal in the State. We give in the table below, a region-wise summary of the distribution of coal in the State.

Table 4.2

Region-wise Distribution of Coal in Meghalaya

Sl. No.	Regions	Reserves (in million tonnes)	
		G.S.I. estimate	D.M.R. estimate
1	Khasi Hills	162.9	0.9
2	Jaintia Hills	12.0	39.2
3	Garo Hills	359.0	5.0
	Total	533.9	45.1

Source : Technical Data on Minerals, Directorate of Mineral Resources, Meghalaya.

Locational Factors

Despite the fact that Meghalaya has a great potentiality for establishing a number of mini-cement plants, it is essential to study the locational problem of

the industry in the State. Weber's "Regional Factors"[1] favour the location of a number of mini-cement plants in Meghalaya. The industry will not have to face any problems for either transportation costs or labour costs. The location of the existing cement factories and the location of future plants at any place in the State have very favourable transport relations with regard to the sources of raw materials and markets. In other words, the size of the social overhead capital and other incentives are fairly adequate.

As regards raw materials we have made detailed discussions in the proceeding discussions. We have mentioned that both the basic raw materials, namely, lime and coal exist side by side. Clay is also available within the State and can be transported easily. Although gypsum is an essential raw material, but not available in the State, yet there is no problem whatsoever for importing the same from other parts of the country or even from Bhutan as has been done by the MCCL.

As regards markets, it may be noted that Meghalaya is surrounded by all the six states of the North-Eastern Region. It also has common border with sovereign

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1. Quoted in S.C. Kuchhal, The Industrial Economy of India, Chaitanya Publishing House, Allahabad, 1989.

Bangladesh in the south. Myanmar is not too far away, and cement can be exported either through Mizoram or through Bangladesh.

Hence, even if the labour costs may be higher as compared to such costs in other states, the easy availability of basic raw materials will be more than compensated by saving in the transportation of basic raw materials. The manufacturing expenses cannot be higher than in other states. Rather, Weber's "agglomerating"[2] factors may cheapen the production costs of cement in the State.

STATE GOVERNMENT PLANS FOR SETTING UP NEW CEMENT PLANTS

Proposed Cement Plant in Garo Hills

As the first step towards utilisation of the huge quantity of limestone deposits in the State, the Meghalaya Industrial Development Corporation (MIDC) was in the advance stage of finalisation of a scheme for establishing a cement plant in Siju, West Garo Hills District in a joint sector with the Mehta International Limited to cater to the needs of the western part of Meghalaya. The proposed capacity of the Siju Cement is only 0.50 million tonnes per annum.

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2. Ibid.

Before the actual implementation of the cement plant in Garo Hills starts, the Detailed Project Report (DPR) was prepared by M/s. Holtec, the Consultants in 1982 which was revised in August 1988 after site visits were made in November 1987.

The Master Mining Plan has been completed by the consultants. The application for Mining Lease of Limestone area at Siju have been submitted with the State Government. The Department of Mines, Ministry of Steel and Mines, Government of India has now asked the State Government to dispose off the Mining Lease application. The clearance from the Indian Bureau of Mines, Nagpur and the approval from the Government of India, Department of Mines have been received. As all clearance have been received the Mining Department of the State Government will now be able to grant the limestone mining lease as per rules, etc.

The detailed survey for the plant site at Pathergithim around Siju and preliminary soil investigation for the whole area has now been completed. The boundary survey (Scale 1: 4000) for the Siju mining area has also been completed. The State Pollution Control Board had also given their clearance for the setting up of the plant. The MIDC had advertised and contacted almost all the leading cement manufacturers in the country to set up the Siju

Cement Plant in the joint sector with the MIDC. Except the joint sector patners no other party showed much interest in doing so. After a series of discussions, the corporation entered into a memorandum of understanding with the Mehta International Limited on 16 April 1988 to set up the said plant in the joint sector. Owing to the poor infrastructure, the marginal grade of limestone for manufacture of cement and the remoteness of the location, the joint sector patner was asking for some incentives and infrastructural facilities to be provided by the Government to make the project viable. Almost all the demands of the company were agreed to, but in the meantime, the financial position of the joint sector patners has gone down due to the poor performance of both their cement units in the country and some other industrial units abroad. It has now been decided that the MIDC has to find out another party as the co-promoter instead of the joint sector patners to set up the cement plant with the utmost priority.

The MIDC has already discussed with M/s. Associated Cement Company (ACC) on 18 and 19 October 1989. The ACC has expressed their keen interest in the project subject to the condition that additional investigations of the limestone deposits are positive for sustaining a cement plant.

The MIDC has also requested other firms like the Mineral Exploration Corporation Limited (MECL), Calcutta and Nagpur, the Indian Bureau of Mines (IBOM), Nagpur, the Giem (India) Consortium, Calcutta and the National Mineral Development Corporation (NMDC), Hyderabad, for taking up the above investigations of the limestone deposits - positive response is awaited from the above firms. It appears that in view of the above condition stipulated by the Associated Cement Company, the Corporation is now looking for any other reputed cement manufacturers who may be interested in setting up the cement plant at Siju in the joint sector with the MIDC. The firms under active negotiation are M/s. Digvijay Cements, Gujarat, the reputed cement manufacturers, Kanpur and the M/s. Larson and Tubro, Bombay, etc. Meanwhile the MIDC has also applied for the extension of the validity period of the Industrial Licence to the Central Government. Their response is still awaited. It may be mentioned here that two pits were excavated at Siju area in limestone bed as per directives and guidance of the consultants and bulk samples of limestone were taken and analysed for study and establishment of technical parameters like quality of limestone, burnability, crushing strength, etc. Samples are also kept ready for supply to machinery manufacturers on floating of tenders.

Specification for main machinery and equipment for 1500 tonne per day (TPD) plant was prepared earlier by the consultants. The specification for 1500 TPD plant is, however, to be undertaken after the investment decision is made.

The Government of Meghalaya already released Rs.345 lakhs for the cement project upto 1988-89.

Land both at Siju and Pathergithim had been identified and surveyed. Soil testing has been conducted, but no action has been taken for acquisition as the Joint Sector party has not been finally decided upon.

Considering the backward facilities of the area it has been felt necessary that the project be set up as quickly as possible and at a minimum cost of Rs.240 crores. Avenues for cheaper means of finance is one of the measures considered necessary. With this end in view feelers were sent to World Bank Mission at New Delhi to explore the possibility of their financing this project. Reports on the status of the project, the cost and the profitability were sent to them for their scrutiny.

The Industrial Development Bank of India (IDBI) during 1989 informed the feelers that the World Bank is considering the grant of credit for Indian Cement

Industries. The International Bank for Reconstruction and Development (IBRD), during its visit to India in 1988, considered including Siju Cement Project under the aforesaid line of credit. On IDBI's request, the feelers have furnished to it the status of the project to enable them to apprise the World Bank Mission.

The World Bank representative visited the proposed sites of the cement plant and limestone mining area in April 1989. The preliminary round of fruitful discussions were held between the World Bank representative and the Chief Minister of Meghalaya who was assisted by the high level officers in various departments of the Government of the State.

Apparently, with World Bank finance through IDBI, there is a possibility of setting up of the project at a lower project cost. This would be possible as all tenders for supply of machinery and equipments, etc. would be of global nature. Indigenous suppliers of machinery, equipments, etc. would be treated as deemed-exports thereby eliminating the Central Sales Tax, State Taxes, etc. Though the reduction of financial implications could not be assessed immediately, the benefits that would accrue to the project is expected to be substantial.

The World Bank representatives visited Shillong from 29 to 31 August 1989 for pre-appraisal discussions with the Meghalaya Industrial Development Corporation (MIDC). The team was also accompanied by representatives of IDBI and Industrial Credit and Investment Corporation of India (ICICI). The World Bank team is of the opinion that the project is a good one and all steps should be taken to speed up the implementation of the project.

Moreover, the Government of Meghalaya has given an assurance that coal would be made available to the project. The Mining Lease has been granted to M/s. Coal India Ltd., for the proposed Simsang Colliery near the cement plant site. Coal India Ltd., has already started its activities at the site.

The Meghalaya State Electricity Board (MeSEB) envisages no problem for the supply of the required power for the project.

The State Public Works Department (PWD) shall undertake the widening, improvement and strengthening of the road from Damra to Siju in stages to cater to a traffic of 200 trucks per day by 1992-93 and 500 trucks per day by 1994-95. However, the cost of strengthening the bridges, sub-way, smoothering of bends for transport of machinery is to be included in the project cost. The State PWD will

also take up the construction of the linking road to the mining site at Siju and the cost will be borne by the project itself.

The State Public Health Engineering (PHE) Department also agreed to provide water to the residential colonies at Siju including Pathergithim where the plant is to be located. But the cost of water supply at Pathergithim is to be borne by the project.

M/s. RITES who has been entrusted with the task of preparing the DPR for the aerial ropeway by NEC has completed the preliminary field survey and submitted the DPR. The MIDC is now waiting for the execution of an agreement with M/s. ACCL for the erection works of the Siju Cement Plant.

Proposed Cement Plant in Jaintia Hills

In order to meet the demand for and supply of cement in the eastern part of Meghalaya, the MIDC has been actively considering the setting up of another cement plant of 0.60 million tonnes per annum capacity at Lumshnong in Jaintia Hills district of Meghalaya.

The setting up of this cement plant in Jaintia Hills district at Lumshnong seems to be very much attractive because of the local availability of limestone and coal.

The indicated reserves of limestone at Jaintia Hills district have been estimated at around 1050 million tonnes over an area of about 77 sq. km. out of which, a reserve of 22 million tonnes covering an area of 2.5 sq. km. was proved. The detailed investigation in the North Block of the Lumshnong deposit is presently being carried out by the State Geology Department under the NEC sponsored scheme. The deposit is located around 126 km. from Shillong by the side of Shillong-Badapur Road which is a National Highway-44. Moreover, Lumshnong is at 80 kms. only from the nearest railhead of Badarpur in Barak Valley while Cherrapunjee is 159 kms. away from the Gauhati railway station.

The plant site has been selected at a distance of 3 kms. from the limestone mining site and the nearest coal deposit at Bapung area is within 30 kms. which is at present being mined by the local private miners. Necessary infrastructural facilities like high tension power line (within 1 km.) nearest railway head at Badarpur (70 kms.), water source of sufficient capacity from river Lukha (5 kms.) are also available. Limestone is used not only for cement manufacture but also for paper making industry. Setting up of a cement plant will also make the paper grade lime plant more viable since the high grade (above 52% Cao) limestone base occurs towards the bottom

of limestone deposit while the inferior grade limestone of the deposits can be used in the said cement plant. The high grade limestone (of the order of 20% of production which is available in close proximity) can be suitably used for the proposed cement plant since the lime plant required crushed and sized limestone of size 70-150 mm.

Considering the above aspects, the Meghalaya Industrial Development Corporation (MIDC) has already applied for letter of intent of 1800 tonne per day (TPD) capacity in 1985.

The MIDC has also approached a leading and reputed cement manufacturer in the country for setting up the cement plant under the joint sector. The prospective joint sector partner had already visited the site and selected the location of the plant after complete survey of the market. The project cost for 1800 TPD cement plant has been estimated at Rs. 101 crores (i.e., investment of Rs.1,700/- per annual tonne of cement production). Out of the total equity participation, contribution of MIDC and joint sector patner would be at the rate of 26% and 25% respectively and the rest would be met from the public issue of shares.

Since the Jaintia Hills Cement Plant is of much higher capacity, it is proposed that the plant with split

location grinding units of 300 TPD capacity each for Mizoram and Tripura and 600 TPD for Cachar be considered. Thus the future demands of all the three regions could be met easily, the proposition is economically viable according to the Project Report. The Plant when completed could even export cement abroad to Bangladesh and Myanmar.

Thus the setting up of a major cement manufacturing unit in Jaintia Hills district with the prospective joint sector partner will open up greater opportunities for better use of high quality limestone of this backward area.

There are possibilities of setting up plants for the manufacture of special quality cement, viz. oil well cement and sleeper-grade high quality cement for which there is a good demand in the country.

Conclusion

In order to ease the problem of scarcity of cement within the State in particular and in the North-Eastern Region as a whole, it would be important that the two proposed cement plants in Meghalaya are quickly installed and commissioned. A few more mini-cement plants can be established in the State to bridge the gap between the demand for and supply of this construction material. Market is always available for cement within the region.

It can also find market in the neighbouring countries as we have earlier indicated.

According to the data provided by the Cement Marketing Association (CMA) regarding the production and consumption of cement in the North-Eastern Region, the region is going to have short supply for a long time. The position is shown in the following table :

Table 4.3

State-wise Demand and Supply Position of Cement in North-Eastern Region

Sl. No.	Name of the State	Production capacity/ year in lakh metric tonnes	Demand/ year in lakh metric tonnes	Balance in lakh metric tonnes
1	Assam	2.96	5.60	-2.64
2	Meghalaya	4.03	1.18	+2.85
3	Tripura	Nil	1.25	-1.25
4	Manipur	0.8	1.03	-0.95
5	Nagaland	Nil	1.20	-1.20
6	Mizoram	Nil	0.50	-0.50
7	Arunachal Pradesh	0.8	0.80	-0.72
	Total*	7.15	11.56	4.41
At 75% Capacity Utilization		5.36	11.56	-6.19

*Based on 100% capacity utilisation.

Source : Data from Cement Marketing Association published in The Assam Tribune dated 26 July 1990.

It would appear from the table 4.3 that Meghalaya is a surplus state in the supply of cement. But as we have seen in the preceeding chapter, the total supply of cement was less than 1 lakh tonnes. The above data given by the CMA was based on 100 per cent capacity utilisation which did not take place at all in so far as Meghalaya is concerend. Hence scarcity of cement also exists in the State.

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Chapter-5

SUMMARY AND CONCLUSIONS

In the preceeding chapters, attempts have been made to investigate into the large potentials for development of cement industries in the State of Meghalaya. We have looked into the resources endowment of the State and the infrastructural facilities that exist now. Before the actual examination of the development potentials of cement industries in Meghalaya, we have also looked into the production problems of the three existing cement factories in the State particularly the first plant, established 25 years ago which serves as a pointer to the new and future cement plants in the State. After analysing the development potentials for more cement plants in the State, it is now time to summarise our findings of the preceeding

chapters and record our conclusions that emerge therefrom.

SUMMARY OF THE FINDINGS

I

The State of Meghalaya with her own distinct geographic entity and ten well-defined natural regions, is endowed by nature with copious rainfall, good soil and climatic conditions, rich deposit of minerals, valuable forest resources, abundant water power potentials and scenic beauty spots.

Meghalaya is rich in mineral resources. She has the largest single limestone deposit in India. The Geological Survey of India has recorded an estimated deposit of 2390.50 million tonnes of limestone in the State and commented that Meghalaya accounts for an unsurpassable deposit of high-grade limestone. On the other hand, the State Directorate of Mineral Resources has estimated an amount of 5346.96 million tonnes of limestone in various deposits in the State. There are all together twelve areas of limestone deposits in different parts of Meghalaya. Thus there is high potentiality of development of various Industries based on limestone which is suitable for the manufacture of portland cement, calcium carbide and calcium cyanamide.

The State has a number of major deposits of coal. Thus the availability of coal would facilitate the setting up of coal-based industries including the manufacture of cement. Thermal power generation is easily facilitated through the use of coal resources of the State.

The State is also rich in various types of clay deposits. There are 20 areas of important deposits in various parts of the State. The GSI estimates of those deposits investigated by them comes to 76.7 million tonnes, whereas the DMR has recorded an estimated deposit of 35.9 million tonnes only. The existence of clay deposit in the State would, therefore, facilitate the establishment of cement industries in the State.

Meghalaya has the world's largest deposit of sillimanite. There are a number of other minerals of little or unknown economic importance. Uranium, an important atomic mineral is also detected in the State. Gypsum, another mineral needed in cement manufacture, also occur but do not appear to be available in any economic significance.

The various north-flowing and south-flowing rivers of Meghalaya provides immense potential for hydro-electric power generation for irrigation. The climate of the State in general is salubrious and rainfall is heavy. The

State has the wettest place in the world, formerly Cherrapunjee and now Mawsynram - in 1986 the two places recorded a maximum rainfall of 7882 mm and 8699 mm respectively while during 1987 Cherrapunjee recorded an amount of 13,137 mm of rainfall and Mawsynram has no record for the year.

The area under forests extends to more than 7898 sq. kms. or about 34.88 per cent of the geographic areas of the State as against all-India average of 28.7 per cent. There are many valuable medicinal plants and herbs growing wild in the forests of the State. Various types of animals and birds are also available. Garo Hills has been regarded as the natural home of Indian elephants. A variety of orchids and rare species of butterflies are also found.

II

Of the three existing cement plants, the Mawmluh-Cherra Cements Limited (MCCL) is the oldest being established in 1955 under the name and style of Assam Cements Limited. It is the only one large-sized company enterprise in Meghalaya. Its original name was changed into Mawmluh-Cherra Cements Limited after the formation of the State of Meghalaya in 1972. It has been located in a very ideal place where all the basic raw materials like limestone, clay and coal are available in close proximity

and only gypsum is imported from outside the State.

The other two factories are mini-cement plants namely, the Virgo Cements Limited in Garo Hills and the Jaintia Cements Limited. They were recently established and have hardly any production problems to reflect except their teething difficulties. Hence we have been analysing mainly the production problems of the MCCL. During its 25 years of existence, MCCL has not been able to perform satisfactorily. The enterprise has not been able to contribute to the State exchequer. Rather it has been incurring losses and has produced a negative return over the capital employed in certain periods. Inspite of the increased investment by the State Government from time to time, the enterprise continuously suffered a loss during its 25 years of existence, except in the year 1971-72 when it could earn a very insignificant profit.

According to its annual reports, a number of factors have been specified as having been responsible for the poor financial performance of the enterprise. Among these various factors are included (1) Under-utilisation of Capacity; (2) Frequent Mechanical Breakdown; (3) Highly-Geared Capital Structure; (4) Non-availability of Good Quality Coal; (5) Transport Bottlenecks, and (6) Dearth of Technical Personnel. Of all these factors, there are

evidences to show that the performances of the enterprise is below 50 per cent of its installed capacity. By 1990-91, the capacity utilisation was only 44 per cent. Other factors said to be responsible for poor financial performance of the enterprise are not so relevant. The most serious excuse has been the dearth of technical personnel. But even in this aspect it should be observed that the undertaking should have not suffered as it has been deputing and sponsoring a number of students every year to various technical institutions in the country. Hence performing below the installed capacity and the failure to avoid wastage of public funds, might be the only plausible factors for the poor financial performance of the undertaking.

Nevertheless, the various production problems experienced by the MCCL should serve as a pointer to all future cement plants in the State. The problems are avoidable and could be solved through the judicious use of public funds accompanied with strict financial management. The other two mini-cement plants have just started their commercial production and they are yet to face any problems.

III

Considering the existence of basic raw materials particularly lime, coal and clay, we examined the high potentiality for the development of more cement plants in the State. Before dealing with different proposals already made by the MIDC, we have, in fact, looked into the locational factors to justify the installation of a few more cement plants in the State and found that there is possibility for starting a few more cement factories. Project Reports prepared by different consultants were submitted to the MIDC for setting up of two more cement plants in Meghalaya. The two proposed cement plants are to be located in the West Garo Hills District and another in the Jaintia Hills District. The detailed survey of the plant site in West Garo Hills has been completed which proposed to set up the plant around Siju village. The MIDC has already approached M/s. Associated Cement Company to come forward as a co-promoter for setting up the plant. The ACC has agreed to the proposal of the MIDC subject to the condition that additional investigations of the limestone deposits are positive for sustaining the cement plant. Meanwhile, a number of problems cropped up. But the MIDC was determined to set up the project in this backward area of Garo Hills. The World Bank was, therefore, contacted which visited Siju in April 1989. The

World Bank is of the opinion that the project is a good one and all steps have been taken to speed up the implementation of the project. The MIDC is now waiting for the execution of an agreement with M/s. ACCL for the erection works of the Siju Cement Plant.

The Second proposed Cement Plant would be set up in Jaintia Hills at Lumshnong. The project is very attractive not only because of local availability of raw materials but also because Lumshnong is on the National Highway 44 connecting it with wide prospective market in the Barak Valley, Tripura, Mizoram and beyond to the two countries of Bangladesh and Myanmar.

The Jaintia Cement Plant at Lumshnong would be of 1800 TPD capacity. It is proposed to have three split location: grinding units for Mizoram, Tripura and Cachar leaving 600 TPD capacity for the Lumshnong Plant.

Besides the above two proposed cement plants, the possibility of setting up one mini-cement plant each in the West Khasi Hills District and East Garo Hills District can be explored.

Conclusion

On the basis of the findings summarised in the foregoing sections, the following conclusions can be drawn:

Since Meghalaya is endowed with huge quantities of limestone, coal and clay, it should specialise in the manufacture of portland cement. There are bright prospects for doing this since Meghalaya has the largest single limestone deposits in India with an unsurpassable deposit of high grade limestone. This requires setting up of a number of cement factories preferably mini-cement plants in the State. It is possible that the present practice of exporting raw lime to Bangladesh should be discontinued and replaced by the export of cement to that country. The Meghalaya Minerals Development Corporation (MMDC) has apparently a great role to play in the systematic and scientific exploration and exploitation of this huge deposit of high grade limestone in Meghalaya with a view to enhance the revenue of the State.

The exploitation and proper utilisation of these valuable minerals would greatly accelerate the tempo of economic development of the State. It is, of course, required to provide all the necessary infrastructural facilities for the purpose.

In order to know the inhabiting factors that might prevent the State to go in a big way for specialising in the manufacture of cement, the investigation of the production problems of the existing cement plants in the

State was undertaken in the previous chapter. The investigation has brought to light that the so-called problems faced by the oldest cement plant in the State, namely, the MCCL, during its 25 years of existence, could easily be overcome. The other two existing plants, namely, the Virgo Cement Limited and the Jaintia Cement Limited are still in their infant stage and do have some teething problems which could soon be got over. The problems experienced by the MCCL should not necessarily be repeated in these two new ventures. It has to be noted that while the MCCL is a public sector undertaking, the two new enterprises are private undertakings. At any rate the problems faced by the MCCL should serve as a pointer to the new cement plants. It may be repeated that Meghalaya can easily increase the number of cement factories preferably the mini-cement plants as it has got extensive market within the North-Eastern Region itself as the study has shown. The State should take advantage of the wide gap between demand for and supply of cement in the region.

We have looked into the possibility of establishing a number of cement plants in Meghalaya. The existing potentialities for such ventures are very high. As a matter of fact the MIDC is already in the last stage of its consideration to set up two more cement plants in the State - one at Siju, West Garo Hills and another at Lumshnong,

Jaintia Hills. This is indeed a proper step taken by the State Government towards the right direction. As our investigation indicates, all the locational factors are in favour of such a step. The basic raw materials are in plenty. The infrastructural facilities are fairly good. And, markets are wide in so far as Meghalaya is surrounded by all the other six states of the North-Eastern Region and has common borders with the foreign country of Bangladesh. Myanmar is not too far away and cement could be exported even as far as South East Asia. Even if the labour cost is higher, it may be compensated by the easy transportation of the basic raw materials which are available in close proximity of each existing as well as the proposed cement plants.

At the end of our enquiry into the potentials for the development of cement industries in Meghalaya, it might be said that the economic under-development of the State could be removed to a large extent with the development of many mineral-based industries. One step towards this objective is to fully exploit the huge quantity of a high grade limestone available in the State. We can reasonably hope that given the requisite industrial climate, Meghalaya would be able to catch up industrially with the rest of the country.

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