CHAPTER - 7
MINING AND PRODUCTION

7.1 GENERAL

The mining and production aspects described include brief history and development of mining, reserves and mining leases, grading, prospecting and exploration, mining practice, cost of production, mineral taxation, and absolute and relative production of both vein and bedded barytes of Cuddapah district. In the case of bedded barytes, some of the problems in mining such as preservation of a small block of deposit as National Geological Monument, flooding of water in mines, surface subsidence and landslips, disposal of overburden are also highlighted and described.

7.2 MINING OF VEIN BARYTES

7.2.1 Brief Mining History

Barytes deposits of Cuddapah district can be classified as vein and bedded deposits. The vein deposits are by far the most commonest type of deposits, presently occurring in eight taluks viz., Pulivendra, Kamalapuram, Cuddapah, Badvel, Sidhout, Lakkireddipalle, Rajampet, and Kodur taluks of the district (Fig. 2). The mineral barytes which is locally
called 'muggurayi' is known to occur in the district since times immemorial. The mineral has been locally used as an ingredient of certain Indian medicines, and in decorative designs and drawings on the floors and around places of human habitation and temples (Sivasankaranarayana, 1967).

Though the mineral was prospected first in as early as 1910, it was mined for the first time in 1931 by two pioneers of the mining industry, viz., T.H.B. Tiffins and A. Krishnappa, independently. Later, several others had taken up mining of barytes in the district. The first systematic geological investigations carried out by Coulson (1933) revealed that vein barytes occurs in 12 localities in Cuddapah district, including those occurrences which were already known. These localities are Mittamidapalle, Chimalapenta and Uppalapalle (14°26' : 78°3'30", 57 J/11) of Cuddapah taluk; Rajupalem of Kamalapuram taluk; Nandipalle, Kothapalle, Bakkannagaripalle, Midipenta, Rachegaripalle, Elamvaripalle, Ippatla, Karnapapayapalle of Pulivendla taluk (Table. 1). Ghosh (1952) reported that there are 28 barytes mines working in Chennakesavapuram, Shotrium and Mamillapalle in Badvel taluk; Kothur and Nandimandalam in Cuddapah taluk; Rajupalem, Tangedupalle and Kothagangireddipalle in Kamalapuram taluk; Kondapuram in Muddanur taluk; Gondipalle, Ippatla, Nandipalle, Tallapalle, Velamvaripalle, and Vemula in
Pulivendla taluk.

Snow-white, white and off-colour varieties of barytes were primarily mined from the above localities. The snow-white barytes was fetching around Rs.120/- per tonne in lump form and Rs.200/- per tonne in powder form. The white barytes was fetching around Rs.60/- per tonne in lump form and Rs.150/- per tonne in powder form. The off-colour barytes was fetching around in Rs.25/- per tonne in lump form and Rs.100/- per tonne in powder form. All these rates are FOR Cuddapah, Yerraguntla, Muddanur or Kondapuram. The mineral was mostly exported to Bombay and Calcutta in lump form or in powder form. The royalty paid to the Government towards mining of barytes was just 31 paise per tonne. It is noted that the off-colour variety was fetching nearly one-fifth of the value over the superior variety in lump form and only half the value over the superior variety in powder form. This had necessitated the establishment of pulverising mills in the Cuddapah district.

Now, the available literature and the Government records show that there are totally 55 localities of vein barytes occurrences (Table. 1 and Fig. 3) scattered in the eight barytes-possessing taluks (Fig. 2) of Cuddapah district.
7.2.2 Reserves and Mining Leases

The Vempalle formation, with its associated igneous and volcanogenic rocks and economic mineral potentiality, occurs as a belt of 270 Km long and 5-10 Km wide from Guvvalacheruvu on the south to Bollaram on the north of Krishna river. The major barytes occurrences are, however, limited to Cuddapah district, where they occur primarily as veins in traprocks and subordinately as fillings of cavities in Vempalle formation. The deposits extend for about 100 Km from Velidendla in the west to Mittamidapalle in the east in Pulivendla, Kamalapuram and Cuddapah taluks in Cuddapah district and have an estimated aggregate reserves of 6,23,500 tonnes upto a depth of 30 metres from ground level (Murthy, 1956). A probable reserve of 7,00,000 tonnes of barytes upto a depth of 30 metres, for the Cuddapah and Pulivendla taluks only was given by Murthy (1957). Prasad and Prasannan (1972) estimated a possible reserve of 350000 tonnes of barytes upto a depth of 20-30 metres for the Venula area of Pulivendla taluk only. Table 55 gives the details of barytes mining leases in Cuddapah district since the dawn of independence to our country (i.e., since 1947). From the table it can be seen that barytes occurs in Badvel, Cuddapah, Kamalapuram, Kodur, Lakkireddipalle, Pulivendla, Rajampet, and Sidhout taluks of
### TABLE - 55

**BARYTES MINING LEASES IN CUDDAPAH DISTRICT**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Taluk</th>
<th>Leases in force</th>
<th>Leases expired</th>
<th>Total leases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Badvel</td>
<td>3</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>Cuddapah</td>
<td>7</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>Kamalapuram</td>
<td>7</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td>Kodur</td>
<td>31</td>
<td>2</td>
<td>33</td>
</tr>
<tr>
<td>5</td>
<td>Lakkireddipalle</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Pulivendla</td>
<td>64</td>
<td>101</td>
<td>165</td>
</tr>
<tr>
<td>7</td>
<td>Rajampet</td>
<td>2</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>8</td>
<td>Sidhout</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

**TOTAL**  116  134  250
Cuddapah district, and there are 250 mining leases totally.

Cuddapah district ranks second among the districts of Andhra Pradesh State, having the highest number of mining leases, which is mainly because of the large number of barytes leases. Out of the total 250 mining leases granted, only 116 leases are presently in force. The rest of the mining leases, i.e., 134 leases got lapsed due to several reasons such as (i) stray, superficial and pocket types of occurrence of barytes without signs of extension into depth, (ii) not opening up the mine at all for want of enough finances and technical know-how and (iii) impossibility of renewing lease of the deposit located in a reserved forest area. Among the mining leases in force in Cuddapah district, the areal extent of the lease ranges from 0.2 to 285.5 hectares with an average of 14.3 hectares. Out of the 116 mining leases in force, actual production has been reported presently from only 12 mines in Pulivendla taluk and 19 mines in Kodur taluk. The mines working in Pulivendla taluk produce vein barytes, whereas the mines working in Kodur taluk produce bedded barytes.

2.3 Grading

The classification of vein barytes for commercial purpose is mainly based on the colour. The colour is partly superficial and can often be removed to some extent by washing.
However, the pinkish colour is usually the body colour and is attributed to iron as an impurity. Barytes, for commercial purpose is classified into four different grades (Fig. 107) as given below:

<table>
<thead>
<tr>
<th>Grade</th>
<th>'A' grade</th>
<th>Snow-white</th>
<th>Pure white in colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade II</td>
<td>'A' grade</td>
<td>white</td>
<td>White in colour with low iron content</td>
</tr>
<tr>
<td>Grade III</td>
<td>'B' grade</td>
<td>'B' grade</td>
<td>Pale white to pink or light red in colour</td>
</tr>
<tr>
<td>Grade IV</td>
<td></td>
<td>Off-colour</td>
<td>Reddish, greyish and other varieties with impurities of iron and sulphide</td>
</tr>
</tbody>
</table>

But in practice, the barytes recovered in the mining mostly in the form of lumps are broken into smaller pieces (Fig. 108) and hand-sorted and classified into only 3 different grades (Fig. 109) as given below:

- Snow-white
- White
- Off-colour

In this grading, the Grade III ('B' grade) and the off-colour grade are combined and treated as only one grade viz., the off-colour grade due to the lack of whiteness in the mineral in both the grades. Some people prefer to
Barytes of different grades. From left to right the grades of the 4 specimens are: (i) Snow-white  
(ii) White (iii) 'B' grade (iv) Off-colour.

This grading was once followed in Shotrium II Mine (Dayyala Kona Mine), Vemula. But this is not in  
Vogue now in any of the barytes mines of Cuddapah  
district. The grading followed presently (i) Snow-  
white (ii) White and (iii) Off-colour

Breaking and sizing of barytes in the Shotrium II Mine  
(Dayyala Kona Mine), Vemula.

The barytes recovered in the mining will be in the form  
of lumps. The lumps are broken into small pieces by  
experienced ladies with the help of pick hammer and  
sledge hammer

Classification of barytes into 3 different grades.

The barytes, after sizing by breaking, is hand-sorted  
by experienced ladies and classified into three grades  
Viz., (i) Snow-white (ii) White and (iii) Off-colour and  
dumped as four different heaps by the ladies again. The  
heap at the bottom left (medium grey and coarse) is the  
off-colour variety, the heap at the bottom right (dark grey)  
is the gangue, the big heap at the feet of the ladies  
(greyish white) is the white variety, and smallest heap  
(white and little) beyond the white barytes is Snow-white  
variety.
recognise one more grade called super snow-white grade or 'A' special grade which refers to the mineral with milky white colour and lot of shining, and it is superior to the snow-white grade. But this variety of barytes is generally rare in occurrence. Of the commonly available 3 varieties (grades) of barytes, the off-colour variety forms about two thirds of the total production in the Cuddapah district.

The snow-white and white varieties are used as fillers in the manufacture of rubber goods and opacifying material in the manufacture of paints. The off-colour variety is used either for the manufacture of chemicals or pulverized for use in drilling muds. Foreign importers, especially those from the Middle East Countries, prefer barytes powder of over 300 mesh, having a minimum specific gravity of 4.2, and bagged in hessian cloth.

7.2.4 Prospecting and Exploration

The association of the economically workable vein barytes deposits of Cuddapah district with Vempalle Formation and basic sills (traps) gives a very good field guide in the prospecting operation. The regional target areas should be selected in such areas where these two rock formations are present. Barytes occurs as veins, stringers and fissure fillings emplaced along shear planes, fault planes
and to a smaller extent along joints in the traps, Vempalle Formation and occasionally in Pulivendla Quartzite. Thus the mineralisation is structurally controlled. Solution creep is typical and generally leads to outcrops (IBM, 1980). Float ores are not common although in some cases they may be found.

Sophisticated technical methods for prospecting vein barytes deposits have not yet been developed, chiefly because new deposits have been fairly easy to find in known areas. However, recently Varaprasada Rao and Murali (1972), and Varaprasada Rao and Bhimesankaram (1982) have successfully employed geophysical surveys (electrical resistivity profiling and gravity survey) in tracing barytes-bearing shear (conductive) zones, and in demarcating and estimating the extent of the barytes deposit associated with the Pakhal Formations of Khammam district, Andhra Pradesh.

The prospecting and mining of vein barytes are not easy tasks as the risks involved in them are tremendous. The mineral may occur as ramifying veins (Fig. 15) or as a continuous body (Fig. 16) or a series of disconnected lenses within the host rock. The thickness of the veins may range from a few millimetres to about 12 metres (Table. 7). Once barytes deposit is found at a place, the extent of the
deposit along a horizontal direction is called its strike direction. On tracing the extension of the deposit along the strike direction and towards the depth, by pitting (Fig. 110), trenching (Fig. 111), exploratory underground mining (Fig. 112) or drilling, it is noted that the veins pinch and swell to a very high degree. When a vein pinches completely, it cannot be said that the vein has permanently ended. On going further, a new vein might be located. Sometimes, no vein might be located in spite of going to any extent. In this respect, the prospecting and mining of vein barytes are considered as wild speculations.

Mapping on 1:2000 to 1:5000 scale in the regional exploration stage and on 1:1000 scale in the intensive exploration stage, pitting across the ore body (Fig. 110) and trenching along the strike direction (Fig. 111), core sampling and pit sampling for grade analysis, and the study of recovery with depth are the chief exploration guides for vein barytes (IBM, 1980).

7.2.5 Mining

Andhra Pradesh contributed 92 per cent of the total production of barytes in India till the end of the year 1947, and more than one half of this production was from the Cuddapah district only. Since then the production of barytes from the Cuddapah district has maintained a steady
Prospecting of barytes by pitting or test pitting. The test pit is located 2 km. north of Vempalle and 0.5 km. from Vempalle-Erraguntla road. The size of the pit is 3 m x 1.5 m x 3 m.

The extension of the barytes deposit towards the depth is traced by pitting across the ore body. Pit sampling is done for grade analysis. The author is examining the exposed barytes (greyish white) at the mouth of the test pit.

Prospecting of barytes by trenching. The trench is located 2.2 km. north of Vempalle and 1 km. from Vempalle-Erraguntla road. The size of the trench is 60 m x 2 m x 8 m.

The extension of the barytes deposit along the strike direction is traced by trenching along the strike of the ore body. Trench sampling is done for grade analysis.

Exploratory underground mining for barytes. The mine is situated 0.5 km. south of Chinnakudala.

A square well-like opening is made in the ground and the snow-white barytes (white) mined is being lifted by a small diesel-operated crane, and water is bailed out periodically by a pump.

The author and his research supervisor are examining the mine, standing at the brink of the mine.
progress due to the persistent occurrence of vein barytes even at greater depths, whereas the production of the mineral from most of the other districts in Andhra Pradesh dwindled significantly owing to the exhaustion of the deposits.

Of the total 55 places of occurrence of vein barytes in the Cuddapah district (Table. 1 and Fig. 3) 29 occurrences, i.e., more than half of the occurrences, are from the Pulivendla taluk only. Gradually the production of vein barytes from the other 7 taluks (Fig. 2) dwindled drastically and almost reached the point of exhaustion. Therefore, any mention of the mining of vein barytes in Cuddapah district actually means the mining of vein barytes in Pulivendla taluk itself (Figs. 4 and 5). In this taluk, totally 165 mining leases for barytes were granted since the year 1947. But only 64 mining leases, which constitute less than 39 per cent of the leases so far granted, are in force now, and the mining activity is confined to merely 12 mines. These mines are Shotrium I (Dayyalakona) mine, Shotrium III mine, Vighneswara mine, Srinivesa mine, Balichettikona mine, Kummaragutta mine, Spring barytes mine, Tallapalle (Tiffs Barytes) mine, Nandipalle (K.A.B. Ltd.) mine, Midipenta (S.S. GAZDAR) mine, Chinnakudala mine and Karnapapayapalle mine. Most of these working mines are located in Vemula and Velpula areas (Fig. 5) of the taluk. Of these 12 active mines, presently Shotrium III, Vighneswara and Chinnakudala mines are the most productive
mines. The salient features of these 12 active vein barytes mines are presented (mines with S. Nos. 1-11 and 16) in Table. 7 of Chapter-2.

When vein barytes is exposed on the ground or on the hill slope (Fig. 16) or in the valley or in a test pit (Fig. 110) or in a trench (Fig. 111), mining of the mineral is carried out by quarrying, where the long direction of the quarry is along the strike direction. Generally, the width of the quarry is kept large at the surface and, if the barytes vein pinches at depth the width of the quarry is also made narrow at depth.

Figure 113 is a panoramic view of the Shotriun III mine (Table. 7), the largest open cast vein barytes mine in Pulivendla taluk, which is being mined very systematically. After the mine has reached a depth of about 30 metres, it has been converted into an underground mine. Shotriun I mine (Dayyalakona mine) is another open cast mine converted into an underground mine (Fig. 114) at depth. Both these mines are semi-mechanised and are provided with electricity and facilities for jack hammer drilling, blasting, haulage and dewatering. In Shotriun I mine (Dayyalakona mine), hand tramming (Fig. 114) method of haulage i.e. pushing of the tubs by men, is practised. Figure 115 is a panoramic view of Shotriun group (Shotriun I, Shotriun II and Shotriun III) of vein barytes mines.
A panoramic view of Shotrium III Open Cast Mine (the largest open cast vein barytes mine in Pulivendla taluk), Vemula, showing benches or stepped working faces. From a depth of 30 m. it is converted into an underground mine.

The white streaky patches in the slopes of the brown gangue or country rock are snow-white barytes.

Haulage of barytes in Shotrium I Mine (Dayyala Kona Mine), another open cast mine converted into an underground mine.

In this mine, hand tramming method of haulage i.e., pushing of the tubs containing ore by men, is practised.

A panoramic view of Shotrium group of vein barytes mines.

Shotrium I Mine (the mine with grey dumps and a hut) is in the foreground. The Yonder hazy white or greyish white patches on the vegetation-covered hills are the Shotrium II and Shotrium III mines.
Shotrium I mine (Bassukalakonda mine) is in the fore ground and the other two mines or at yonder as small white patches.

In some cases, where the overburden to be removed is very thick, underground mining is necessary to win the vein deposit. Open cast mining is not economical in such cases. In view of the occurrence of barytes in fractures which also store and transmit large quantities of groundwater, it becomes necessary to pump up groundwater at a high rate to carry out mining operations. As the thickness of barytes is usually very low, it is necessary to mine not only the barytes but also the barren host rock (gangue) associated with it. The amount of gangue to be mined along with barytes is found to range from 10 to 100 times or even more. The amount of gangue to be mined becomes much more when mining has to be carried out in a systematic way, as per the norms prescribed by the Department of Mines Safety, the Indian Bureau of Mines and the Department of Mines and Geology. The first two Departments belong to the Central Government while the third department belongs to the State Government. Thus, the cost of mining depends upon the percentage of gangue to be mined along with the mineral.

Vein barytes, for commercial purpose, is classified into 4 varieties viz., super snow-white, snow-white, white and off-colour varieties. Although the cost of mining is independent of the quality of barytes mined, the value realised
from the super snow-white variety is more than two times of that realised from the off-colour variety. Thus, the return obtained from the mining of barytes will be high if the proportion of high-grade or white colour barytes is high and low if the proportion of low-grade or off-colour barytes is high. Therefore, the economics of vein barytes mining depends not only upon the proportion of gangue to be mined to recover barytes, but also upon the relative proportion of the different grades of barytes mined.

The vein barytes mines owned by the two prominent private limited companies of Cuddapah district viz., M/s Krishnapa Asbestos and Barytes Private Limited and M/s Tiffins Barytes, Asbestos and Paints Private Limited are well-planned, well-organised, semi-mechanised and productive mines. These two companies carry out mining throughout the year but for few short periods of heavy rainfall, when they find it difficult to dewater the mines. They have both open cast and underground mines. They alone have permanent labour, both males and females in their mines. The females carry out cutting and sizing of barytes lumps into smaller pieces and sorting them into different grades. The mines are worked for one shift, i.e. day shift in a day, as there are no adequate lighting facilities provided to work in the night time.
All the other vein barytes mines in the district, i.e. the mines operated by the individual private mine-owners are neither well-organised nor productive. All these mines are open cast mines with no electricity and no facilities for dewatering. Mining is done inter-mittently, i.e., only when there is good demand for barytes, and when there are no rains. The mine-owners sell their produce to the earlier mentioned two prominent private limited companies of the district or to the owners of pulverising mills or to the middlemen. In this transaction, often the middlemen get more profits, and the mine-owners get very little profit as the value they realise is not more than one-half of the actual FOB Cuddapah price.

7.2.6 Cost of Production

In the early years of mining of vein barytes in the district, there were large number of working-mines, and the mining was of unmechanised nature. Moreover large quantities of the mineral was available at shallow depths. Therefore, the cost of mining was much less. With the exhaustion of the mineral at shallow depths, the need to mine at increasingly greater depths became more and more. As mining at depth involves more expenditure towards development, haulage, ventilation, dewatering etc., the
Cost of mining has increased exorbitantly. With the advance in mining, the need for the installation of machinery, which involves high capital expenditure, has become necessary. Due to the sudden pinching and unpredictable nature of the vein barytes the cost of locating new veins and ore zones has become fairly high. All this has resulted in the disappearance of the small mine-owners from the scene of mining activity. The only two mine-owners who could face all the challenges and vicissitudes of mining and still remain undauntedly in the field of mining are M/s Krishnappa Asbestos and Barytes Private Limited and M/s Tiffins Barytes, Asbestos and Paints Private Limited. Most of the production of vein barytes from the Pulivendla taluk, the hub of mining activity in the district, has been obtained from these two companies only.

Due to the high variations in the proportion of barytes present in the whole material mined, and due to the variations in the relative proportions of different grades of barytes obtained, it is rather difficult to arrive at the actual cost of production of vein barytes. However, from an enquiry from the owners and their representatives of the earlier mentioned two premier and private limited companies, the average cost of production of one metric tonne of vein barytes is arrived at to be around ₹ 350/-
7.3 MINING OF BEDDED BARYTES

7.3.1 Brief Mining History

The bedded barytes deposit of Cuddapah district is unique in respect of its form, colour, appearance, size and occurrence. It is a stratiform or layered and massive deposit, and light grey to dark grey in colour. It gives the appearance of a grey shale or grey limestone, and it is stupendous in size like a rock formation. It occurs at one and only one place in the whole country, and the place is Mangampeta. In no way it resembles the vein barytes, which till recently was considered as the true and only barytes. Due to this deceptive appearance of the bedded barytes, several people, including geologists and miners, were having a misconception for a long time that the mineral occurring at Mangampeta is not barytes at all. Some others opined that even if it were to be barytes it is not useful at all because of its dark colour. But much against to their imaginations and apprehensions, today this dark coloured and much forsaken mineral at Mangampeta has become the pride of Andhra Pradesh, nay the pride of whole India.

Though the name of the person who discovered this prized and world's largest single deposit is not known precisely, the credit of its discovery should go to
S. M. Salaruddin, the Nawab of Cuddapah, for his venture to obtain the very first mining lease of 1.6 hectares for bedded barytes at Mangampeta in 1950 despite the discouragement by his fellow-men. Later, several others followed the suite, and 18 private mine-owners of the Cuddapah district obtained mining leases in Mangampeta. The mine-owners used to sell the produce to a Bombay entrepreneur at a nominal price of Rs.25/- to Rs.30/- per metric tonne FOR Kodur, a place very near to Mangampeta. The Bombay entrepreneur in turn used to pulverise the mineral and either sell it to the local barytes-consuming industries or export it to the oil-drilling companies at a high price. The mine-owners could hardly sell about 10000 tonnes of bedded barytes per annum by this business transaction.

In 1970, S.P. Goenka, an enterprising business magnate of Bombay, started a concern called Gimpex Minerals Private Limited, Madras, and raised the price of barytes from Rs.30/- to Rs.50/- per tonne. He also started advancing interest-free loans to the mine-owners on a large-scale. He constructed the first pulverising mill near Kodur Railway Station with an installed capacity of 36000 tonnes per annum. He realised that export of bedded or grey barytes, which was till then from the Bombay port, located at a distance of about 1078 km. from Kodur Railway Station, is much costlier than the
export of the mineral from Madras port, located at a distance of about 184 km. from Kodur Railway Station. This is because of the fact that the cost of transportation by rail for long distances is much higher than that by ship. He exported the first consignment of 10000 tonnes of barytes in November 1971 by a chartered vessel from the Madras Port. Goenka's entry into the grey barytes trade has shattered the monopoly of the Bombay traders and as a result of this the production of barytes in 1972 got temporarily dislocated. However, there has been a big boost again in the production of barytes since 1973 due to the incentives given by Goenka. He established offices in several foreign countries and could penetrate into the international barytes market in a big way. The margin of profit made by Goenka was much higher than what he was paying to the private mine-owners. They realised this and some of them have contacted the middlemen in barytes-consuming countries for the direct sales of barytes and became rich by selling their produce to those countries.

In the early years of mining the cost of mining was quite low and the sale price for grey barytes was quite high. Hence, the mine-owners could make large profits in mining. Some of the middlemen in the barytes trade have become mine
owners. Some of the mine-owners have established pulverising mills. In the Mangampeta grey barytes mining and trade there are several instances of the mine-owners and middlemen becoming rich overnight due to wind falls. There are also instances of either mine-owners or persons connected with barytes mining or processing or trade becoming leading politicians of the Cuddapah district.

The earning of huge profits by several private mine-owners and traders made both Central and State Governments to realise that grey barytes is not only an invaluable asset to the Nation but also an important commodity for developing international trade and foreign exchange earnings. Therefore, the A.F.M.C (Andhra Pradesh Mining Corporation Limited), a State Government's undertaking stepped into Mangampeta and took up mining of grey barytes in 1975 in a big way. It has reserved several new areas of barytes in and around Mangampeta for public exploitation, and banned further issue of mining leases to private mine-owners.

7.3.2 Reserves and Mining Leases

The bedded barytes deposit of Mangampeta has been under active exploitation, though on a small scale, by private entrepreneurs for over a decade i.e., since 1958, when Salaruddin obtained the very first lease and started mining.
It has received the attention of G.S.I (Geological Survey of India) in 1970, when Karunakaran (1970) followed by Mehdi and Nagaraja Rao (1970) recognised the sedimentary nature and the vast potentiality of this deposit. Considering the ever increasing demand for barytes in oil-well drilling, the necessity of exploration of Mangampeta barytes field for an assessment of its quality-wise and quantity-wise potential was felt by the Government of India in 1974, and they directed the G.S.I to take up exploratory drilling at Mangampeta to prove the barytes reserves. Scores of workers from G.S.I have carried out detailed Geological and Geophysical investigations of this deposit since 1974, and their work has proved that the deposit is the World's largest single deposit. By the end of the year 1978, when the G.S.I has wound up its exploration work at Mangampeta, it completed mapping of an area of about 787 sq.km., drilling of 70 bore holes covering a metreage of 8880 m, collection of 2106 samples (core, groove, composite etc. samples), partial or full chemical analysis of 4200 samples, and determination of specific gravity of 2300 samples, which indeed is a magnificent job.

The investigations of G.S.I have indicated that the barytes deposit of Mangampeta occurs in the form of lensoid
bodies (Northern and Southern lenses) separated from one another by a distance of 700 m. Of the two lenses, the Northern lens deposit is larger in extent (76 hectares) and thickness (about 40 metres maximum) and contains almost all the reserves (73.39 million tonnes of all grades). The Southern lens deposit is smaller in extent (1 hectare) and thickness (about 12 metres maximum) and contains very few reserves (0.66 million tonnes of all grades). The Northern lens has superior grade barytes (marketable grade ore with 92.47% BaSO$_4$, and beneficiable low-grade ore with 77.72% BaSO$_4$), whereas the Southern lens has inferior grade barytes (low-grade ore with 73.63% BaSO$_4$). The total reserves of the deposit (reserves of both the lenses put together) are 74.05 million tonnes (G.S.I., 1982). The salient features of the deposits are given in Table 9 of Chapter 2. A perusal of the geological cross section of Northern lens (Fig. 19 of Chapter 2) indicates that the low-grade barytes (rosette/lapilli barytes), which requires beneficiation before marketing, overlies the high-grade barytes (granular barytes) which requires no beneficiation before marketing. The G.S.I has also estimated the quantity of directly marketable grade barytes reserves under 1:4 ore to over burden ratio to be 15.89 million tonnes, the thickness of the over burden to be 1.70 metres (minimum) to 181.05 (maximum), and the range of thickness of barytes to be 39.88 metres.
The details of barytes mining leases in Cuddapah district since 1947 are presented in Table. 55. From the table it can be seen that 33 mining leases were so far granted in Kodur taluk, the taluk where Mangampeta bedded barytes deposit is present, of which 2 leases expired. Among the 31 leases which are in force, 1 lease is of vein barytes occurring at Anantaratrupeta which is very near to Mangampeta, and 1 lease of bedded barytes was transferred from one lessee to another. Among the remaining 29 mining leases of bedded barytes, 19 leases which account for an areal extent of 15.1 hectares have been held by private mine-owners, while the remaining 10 leases which account for an areal extent of 29 hectares have been held by the A.P.M.C., a public sector undertaking of the Government of Andhra Pradesh state. Fig. 116 shows the lease-hold areas of the productive mines and the names of the mine-owners. Out of the total 77 hectares of barytes field demarcated by G.S.I at Mangampeta, only 44.1 hectares of the area is the lease-hold area. The balance area is reserved by the Government of Andhra Pradesh for public exploitation. The areal extent of the mining leases held ranges from 0.1 to 22.8 hectares with an average of 1.52 hectares, which is a low figure. If the one lease having an areal extent of 22.8 hectares is ignored, the areal extent of mining leases held ranges
from 0.1 to 1.6 hectares with an average of 0.69 hectare, which is much low. The mining lease of 22.8 hectares area is held by A.P.H.C, and it is a land in which the barytes deposit is at such a great depth that no private mine-owner liked to take it for lease earlier.

The areal extent of any mining lease granted at Mangampeta is quite low due to the non-cooperation of the villagers. The Mangampeta village was a shotrium village with all the barytes-bearing land being held by a large number of private people. It had become impossible for the mine-owners to get the subsurface rights over a piece of land unless it was purchased from its owner to get the surface rights first. The land-owners of the village either refused to part with their lands or claimed a heavy price towards the sale of their lands. There had been many legal disputes between the land-owners and mine-owners which were finally settled in favour of the mine-owners. Ultimately, the village was evacuated, the inhabitants were given good compensation and shown another area nearby for erecting their houses and form new village there. This new village is also called Mangampeta.

7.3.3 Grading

The Mangampeta bedded barytes, being light grey to
Dark grey in colour, finds maximum use in oil-well drilling as drilling mud in its powder form. Barytes, analysing minimum 90% \( \text{BaSO}_4 \) with 4.15 specific gravity is stipulated by the ISI (Indian Standard Specifications) for the oil-well drilling (Table. 50) in India by ONGC (Oil and Natural Gas Commission) and OIL (Oil India Limited), whereas the API (American Petroleum Institute) and OCMA (Oil Company Materials Association), U.S.A., specify 92% \( \text{BaSO}_4 \) with 4.20 specific gravity for their oil industry. While computing the grades, these specifications were taken into consideration.

From a voluminous data obtained by determining the specific gravities and the corresponding assays (\( \text{BaSO}_4 \) %) of thousands of grey barytes samples, G.S.I observed that there is a definite correlation between the specific gravity and assay of the samples. They further observed that this relationship prevails in the granular barytes and the massive rosette/lapilli barytes, and it tends to be erratic in rosette/lapilli barytes containing intercalations of tuff (Personal communication from S. Neelakantam, G.S.I., Southern Region, Hyderabad, 1986).

Similar observation was made by the geologists of APMC and several other private mines. The present investigation has proved that this observation is correct (Table. 56).
TABLE - 56

BaSO₄ % AND SPECIFIC GRAVITIES OF MANGAMPETA BARYTES

<table>
<thead>
<tr>
<th>S1. No.</th>
<th>Sample No.</th>
<th>BaSO₄ %</th>
<th>Specific gravity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>B15</td>
<td>98.61</td>
<td>4.42</td>
</tr>
<tr>
<td>2</td>
<td>B20</td>
<td>91.20</td>
<td>4.15</td>
</tr>
<tr>
<td>3</td>
<td>B26</td>
<td>99.30</td>
<td>4.45</td>
</tr>
<tr>
<td>4</td>
<td>B31</td>
<td>96.92</td>
<td>4.35</td>
</tr>
<tr>
<td>5</td>
<td>B38</td>
<td>93.95</td>
<td>4.25</td>
</tr>
<tr>
<td>6</td>
<td>B45</td>
<td>98.08</td>
<td>4.40</td>
</tr>
<tr>
<td>7</td>
<td>B50</td>
<td>93.74</td>
<td>4.22</td>
</tr>
<tr>
<td>8</td>
<td>B51</td>
<td>98.28</td>
<td>4.40</td>
</tr>
<tr>
<td>9</td>
<td>B57</td>
<td>86.40</td>
<td>4.10</td>
</tr>
<tr>
<td>10</td>
<td>B65</td>
<td>81.40</td>
<td>3.80</td>
</tr>
<tr>
<td>11</td>
<td>B66</td>
<td>98.92</td>
<td>4.43</td>
</tr>
<tr>
<td>12</td>
<td>B71</td>
<td>95.47</td>
<td>4.30</td>
</tr>
<tr>
<td>13</td>
<td>B76</td>
<td>94.75</td>
<td>4.25</td>
</tr>
<tr>
<td>14</td>
<td>B88</td>
<td>97.81</td>
<td>4.38</td>
</tr>
<tr>
<td>15</td>
<td>B92</td>
<td>66.13</td>
<td>3.68</td>
</tr>
<tr>
<td>16</td>
<td>B93</td>
<td>73.03</td>
<td>3.72</td>
</tr>
<tr>
<td>17</td>
<td>B94</td>
<td>79.32</td>
<td>3.90</td>
</tr>
<tr>
<td>18</td>
<td>B95</td>
<td>88.24</td>
<td>4.07</td>
</tr>
<tr>
<td>19</td>
<td>B96</td>
<td>89.59</td>
<td>4.10</td>
</tr>
<tr>
<td>20</td>
<td>B118</td>
<td>97.46</td>
<td>4.35</td>
</tr>
</tbody>
</table>

Analyst: K. Sivarami Reddy

Description and location of samples are given in Table. 30.
From this it is obvious that with the help of the specific gravity, a simple physical property, the grey barytes can very safely and conveniently be graded without the botheration of its assaying. In fact, this is what is being practised by all the mine-owners of Mangampeta barytes including the A.P.M.C people. Skilful and experienced workmen of the mines carry out the grading of big barytes lumps by glancing at them and by judging, their specific gravity approximately just by hefting. They separate the barytes into super, good, waste etc., grades. Sometimes these are called A, B, C etc., grades also. The good grade ore i.e., the ore with sp.gr > 4.2 goes directly to the pulveriser bin. The rest of the ore, after grading, is stacked in the stock-piles of the mines (Fig. 117), and from where it is loaded into the lorries. Blending of the super-grade with low-grade is being practised to get a specific gravity of the product very near 4.2. In the case of small barytes lumps and pieces, the female workers sieve the material to remove the adhering clayey particles before loading into lorries, so as to improve the quality of barytes. In some mines, grading is done near the stopes of the mines when mining is going on, and the material is directly loaded into the lorries without the botheration of stacking it elsewhere.
quality-wise grading and stacking of the bedded barytes by A.P.M.C. at Mangampeta.

Skilled workers carry out the grading of the big barytes lumps by just glancing and hefting, and grade the lumps into 3 categories called (i) Super (ii) Good and (iii) Waste which are also called A, B and C grades sometimes. The good grade ore is the ore with specific gravity more than 4.2.

After grading, the ore of different grades is stacked in the stock-piles near the mine and exported.

A panoramic view of the open cast mines of bedded barytes at Mangampeta. Mines are irregular and they have reached great depths. The overburden of tuff (northeastern part) is more.

Note the presence of a big partition wall (at the top, left corner with traces on it) which is not a wall actually but unmined barytes deposit itself left untouched between two adjacent mines.

Another panoramic view of the open cast mines of bedded barytes at Mangampeta, with exposed mine faces. The irregular mines have reached great depths and crossed even the water table which is evidenced from the presence of a permanent water body (at the centre of the photograph).

Note the presence of huge over burden of tuff on the right and the freshly opened stope of barytes (dark grey) in the foreground.
Based exclusively on BaSO₄ content, the different grades of barytes computed are:

Grade I  Over 94% BaSO₄
Grade II  Over 92% BaSO₄ (inclusive of Grade I)
Grade III  Over 80% BaSO₄ (inclusive of Grade I & Grade II)
Uncategorised Below 92% BaSO₄ (exclusive of Grade II and inclusive of Grade III)

The grades I & II are suitable for oil-well drilling. Grade III is partly suitable for blending with Grade I & II and partly amenable to beneficiation. Considerable quantities from Mangampeta barytes deposit falls below 92% BaSO₄ and it is worthwhile to undertake the beneficiation studies.

7.3.4 Prospecting and Exploration

The genetic association with strata bound tuffaceous rocks is the lithological field guide for some of the important bedded barytes deposits in the World, including the deposit in Mangampeta (Brobst, 1970; Karunakaran, 1973). Therefore, the regional target areas should be selected in such areas where tuffaceous rocks are present. The bedded barytes deposits have the geological characteristics, such as laminated and massive form, light grey to dark grey colour, and very fine-grained nature, which may cause the barytes to be easily overlooked during field work. Except for its
heaviness, much of this ore could be mistaken for impure limestone or shale. However, in some cases, the solution creep leads to outcrops (IBM, 1980).

The main problem encountered in the location of bedded barytes deposits of Mangampeta has been the lack of any outcrops due to the softness (hardness of 3 on Moh's scale) of the mineral. According to Karunakaran (1973), the Mangampeta bedded barytes deposit has practically no outcrops and it came to light only from the exposures seen in well-sections and pits. The Cudapah formation present in Mangampeta area (Pullampet Formation) has been affected by Pre-Cambrian acid volcanism, and the bedded barytes mineralisation is related to this volcanic activity. The acid volcanism was evidenced by the detailed petrographic scanning, involving field and laboratory petrographic methods, and regional geochemical studies made by the G.S.I. Discussing about the prospecting techniques for barytes deposits of Arkansas, U.S.A. Brobst and Ward (1965) were of the opinion that the geochemical techniques may be helpful in prospecting, due to the presence of increased concentration of barium in rocks enclosing barite-rich zones.

Gravimetric surveys also have potential use in prospecting for barytes (Uhley and Scharon, 1954).
Geophysical surveys and exploratory drilling were carried out by the G.S.I in the Mangampeta area to decipher the shape, size and quality of the barytes deposit. The gravimetric surveys carried out by the G.S.I have indicated three gravity anomaly zones in the area. While two anomalies correspond to the Northern and Southern lenses, the third one is located west of the Southern lens. The gravity anomaly zones were traversed by resistivity and seismic refraction surveys in order to determine the probable thickness of overburden and the thickness of the ore body. Test drilling of the anomaly over the Northern lens gave encouraging results. Large scale mapping of the area covering the Northern and Southern lenses of barytes was also carried out by the G.S.I.

Mapping on 1:2000 to 1:5000 scale in the regional exploration stage and on 1:1000 to 1:2000 scale in the intensive exploration stage, pitting 2 to 4 numbers for every square kilometre, drilling at 400-600 metres interval and 200-300 metres interval in the regional exploration stage and intensive exploration stage respectively, core and channel sampling for grade analysis, and the study of recovery with depth are the chief exploration guides for bedded barytes (IBM, 1980).

7.3.5 Mining

The barytes deposit of Mangampeta (Fig. 18) consists
of two lenticular ore bodies called 'Northern lens' and 'Southern lens'. The Northern lens deposit occurs near Mangampeta village, and this is the main ore body comprising bulk of the barytes deposit. This ore body contains barytes of superior grade that can be marketed directly. Therefore, almost all the open cast mines (Fig. 116) and quarries of bedded barytes of Mangampeta are located in this ore body, in the southwestern part of it. The Southern lens deposit, located 700 metres south of the Northern lens, is considerably small in size, and the quality of barytes is so poor that the mineral mined cannot be marketed without beneficiation. Therefore, there has been practically no mining activity in the lease-hold areas of this lens.

In the earlier years, the mining of barytes was simple and mostly manual because of the fact that high-grade barytes was available near the surface with little or no overburden. In course of time, with the progress of mining it has become necessary to remove huge overburden and mine at deeper levels to win the high-grade barytes. Figures 118 and 119 are the panoramic views of the open cast mines of bedded barytes of Mangampeta. From these two figures it is obvious that the overburden is much, the mines have reached great depths, mining is not systematic, and shapes of the mines are irregular. From what has been discussed under
"Reserves and Mining Leases" (Section 7.3.2), it is clear that the areal extent of almost all the mining leases held at Mangampeta are small. The sizes and shapes of the lease-hold areas are so small and irregular that it is not possible to carry out mining in a systematic manner and give a regular shape to the mine. Figure 119 shows also the exposed faces of the mine with grey barytes at deeper portions. In order to avoid litigation involving the possibility of one mine-owner taking up mining in the lease hold area of another mine-owner, the Law of Mines and Minerals (Seshagiri Rao, 1985) prescribes for creating a buffer zone of land along the Common boundary left unmined. In order to show the common boundary between two mines (lease-hold areas), a rectangular block of barytes is kept unmined for some distance along the boundary (Fig. 118). Boundary disputes and legal battles are not uncommon despite leaving an unmined buffer zone.

Although there are 29 mining leases in force, they are broadly found to belong to the A.P.M.C. and to seven private mine-owners as shown in Figure 116. The stalwart private mine-owners are Y.S. Raja Reddy, K. Obul Reddy and C.M. Ramanatha Reddy who presently dominate in the grey barytes business of the Cuddapah district. Most of the private mine-owners, including the three stalwarts mentioned, carried
out mining for a long time using very simple tools like crow-bars, shovels, and pans and earned big profits. The technology they adopted was more or less same as that adopted for the construction of dug wells. The wages paid to the workers were meagre. But as mining advanced they resorted to jack-hammer drilling, blasting (Fig. 120) and occasional bulldozing to step up their production. In the early years of mining activity, the haulage of the mined barytes was done by trolleys which run on rails. With the advance of mining, the quarries were sufficiently widened for the movement of lorries directly into the bottom of the quarries (Figs. 121 & 122). This reduced the cost of haulage. The mined ore is loaded in trucks and lorries manually for transport (Fig. 121). But the vehicular traffic in the mines generates lot of dust, which is a source of air pollution (Fig. 122).

The largest producer of grey barytes in Mangampeta area is the A.P.M.C. After the acquisition of mining leases in the area, the A.P.M.C has taken the consultancy services of the I.B.M (Indian Bureau of Mines) in October 1976 to prepare a mining scheme for a targeted annual production of 3 lakh (0.3 million) tonnes of graded barytes for the next 10 years. In the final report of I.B.M (1980), a priority block of barytes having around 6.013 million tonnes of barytes, which could be mined in the next 18 years, has been identified.
FIELD PHOTOGRAPHS

FIGURE 120

Blasting operation (white cloudy smoke) in a bedded barytes mine at Mangampeta.

As the mining advances, new and fresh mine faces are opened or exposed first by blasting and later by jack-hammer drilling and bulldozing.

FIGURE 121

Manual loading of the mined barytes in lorries at the bottom of the quarry or at the stoping point (dark grey region).

Due to the presence of sufficiently widened quarries and sloping pathways, lorries and trucks can directly reach the stoping point, where mining is going on, for the loading of barytes and its transport.

Note the presence of a permanent water body in the right part which is formed due to mining beyond water table.

FIGURE 122

Transporting of mined barytes, from the stoping point in the mine, by lorries and trucks along the sloping pathways.

This method of transporting reduces the cost of haulage, no doubt, but, the dust generated by the vehicular traffic poses an environmental problem of air pollution.

Note the presence of permanent water body in the centre.
It is expected that 4.128 million cubic metres of overburden has to be removed in the 10-years period, to produce 3 million tonnes of barytes. Mechanised mining has been advocated for the removal of overburden while semi-mechanised mining for the excavation of barytes. A capital expenditure of ₹15.988 millions is proposed for the removal of overburden and ₹5.173 millions for the removal of barytes, while the recurring expenditure, including overheads, for mining and other operations is put at ₹21.045 millions. The total manpower to be employed is fixed at 259, with two production shifts and one general shift. The overall output per man-shift has been fixed at 4.06 tonnes. It is proposed to stack low-grade barytes separately for future beneficiation.

In accordance with the report and guidelines given by the I.B.M., the A.P.M.C. has been carrying out mining since 1976 using the sophisticated machinery like wagon drills, jack hammers, heavy-duty loaders, and bulldozers. It has a very big establishment of big office, laboratory, staff and labour quarters, many mining engineers, two geologists, samplers, laboratory personnel, drilling personnel, several vehicles, stack yards, a big pulverising mill, and many labourers. The employment generated by the A.P.M.C in the peak period is around 1200, while the permanent employees in the live register are around 230. Inspite of such an establishment and mechanised
mining, the performance of the A.P.M.C in regard to the quantum of overburden to be removed and the quantum of barytes to be mined has been found to be much below the targets fixed by the I.B.M. It became necessary for the A.P.M.C to shift the course of the old main road, leading from Kodur to Cuddapah (Fig. 18) and also to shift the old village of Mangampeta, and to lay the new road adjacent to the hill A 1198 (Fig.18) and to form a new village, as the old road and the village were situated on a productive portion of the Northern lens. By this, the A.P.M.C has incurred heavy expenditure.

The most economical and systematic mining of barytes, even at great depths, is possible if the entire mining area belongs to only one person or party or organisation. In order to accomplish this, the State Government has resorted to cancellation of mining leases of the private mine-owners and transferring these leases to the A.P.M.C which is its own undertaking. However, the State Government has not fully succeeded in its efforts because of the endless litigation with the private mine-owners.

Most of the private mine-owners carry out mining only when there is demand for barytes, and the barytes so mined is transported either to a pulverising mill or to the Madras port for export.
7.3.6 **National Geological Monument**

One of the responsibilities and functions of the G.S.I., the country's premier organisation in geology, is to preserve rare and unparalleled geological features and formations of the country as National geological monuments for the benefit of the posterity, and to be their custodian. In furtherance of this, in 1982 the G.S.I. has preserved an undisturbed pyramidal block of the Čangampeta bedded barytes deposit (Fig. 123), which exhibits a typical succession of beds with their extremely interesting structures and depositional features, and depicts an unique natural phenomenon (G.S.I., 1982). Three enamel sign boards, describing the history and geology of the Čangampeta deposit, were fixed on the top of the monument. It has now become a permanent scientific exhibit of National and International importance.

The site chosen by the G.S.I. for this monument lies at the common boundary of leases of the A.P.M.C and Vijayalakshmi Mineral Trading Company, a leading private mining concern. Unfortunately, there is no approach road to reach the top of the monument and read the information inscribed on the sign boards, nor there is provision to make a close study of the typical succession of the geological formations preserved in the monument. Since 1982, busy mining
FIGURE 123

National Geological Monument, of a beautiful and typical vertical section of bedded barytes deposit at Mangampeta, established by G.S.I in 1982.

The monument is an unmined pyramidal block of Mangampeta bedded barytes deposit exhibiting typical succession of beds with their structural and depositional features, and depicting an unique natural phenomenon.

Note the presence of 3 enamel sign boards on the top of the monument, on which the history and geology of the deposit is described for the benefit of visitors.

FIGURE 124

Collection of mine water in sumps in a A.P.M.C. barytes mine, Mangampeta area.

Water accumulates in the mine mostly due to the seepages from aquifers and also due to monsoonal rain water. As the A.P.M.C. Mines are located at greater depths, more water gets collected.

To facilitate uninterrupted mining, water from various working places is first allowed to flow into small sumps through pipes and collected, and from where it is pumped to the surface.

FIGURE 125

Bailing out of collected water on to the surface by pumping through big pipes in a A.P.M.C. barytes mine, Mangampeta area.

The water collected from various working places of the mine is stored in small sumps or reservoirs and from where it is bailed out on to the surface by pump sets, and later put to proper use without any wastage.

Note the location of Indian Barytes and Chemicals Factory (Yonder white sheds & structures) in the
activity has been going on all around this monument, which in course of time has almost become an isolated block.

In all the mines at Mangampeta the mining is mostly selective. As a result of this, lot of low-grade barytes has accumulated in dumps, and high percentage of barytes is lost as waste. No efforts are made so far either to beneficicate the low-grade barytes or to recover the barytes from the waste.

7.3.7 Flooding of Mines

Flooding or accumulation of water in an open cast mine may be due to (i) seepages from water-bearing horizons or aquifers, or (ii) percolation of surface water sources, such as streams, ponds and rain water, or (iii) influx from water-logged old and abandoned workings in the adjoining areas of the mines, or (iv) heavy rain fall during the rainy season.

In Mangampeta area the mines are inundated with groundwater i.e., the seepages from aquifers, and also with monsoonal rain water. As the mining of barytes has extended to great depths and the mines are inundated heavily during the rainy season, it has become impossible to carryout any mining in this period. Most of the private mine-owners are
used to stop mining during the monsoon. However, with the increase in demand for barytes, they gradually felt the need to bail out water by pumping and to carry out mining at least in the beginning and ending phases of the monsoon period. The A.P.M.C mines are located at greater depths than those of the private mine-owners. Therefore, more water gets collected in the A.P.M.C mines generally, and more so during the monsoon. The A.P.M.C made elaborate arrangements for collecting groundwater and pumping it up on to the surface round the year. Water, from various working places, is first allowed to flow into small sumps or reservoirs through pipes or drains and collected (Fig. 124), and from where it is pumped to the surface (Fig. 125). Then, through specially dug small channels (Fig. 126), water is led to agricultural fields (Fig. 127) adjacent to the mines and also to a nearby tank called Surabhi-kunta tank (Fig. 128). The tank is now able to provide water for irrigation of paddy for its ayacut round the year. In return, the A.P.M.C gets nothing from the cultivators. Part of the pumped out water from the A.P.M.C mines is diverted to small ponds situated nearby, which is utilised by the washermen for washing clothes (Fig. 129).

Inspite of having elaborate arrangements for pumping out the mine water, the A.P.M.C is not in a position to carry out the mining operations for about 2 to 3 months in
Diverting the bailed out water from the A.P.M.C Mines, Mangampeta area into channels dug on the surface.

In the areas adjoining the A.P.M.C Mines, channels are specially dug to divert the bailed out water to the cultivated fields and water tanks. The author is tracing the course of one such specially dug channel and taking notes.

Utilization of bailed out mine water for agricultural purposes. The water, through specially dug channels, is led to the nearby agricultural fields for raising crops. The mine water has become a means of sustenance for many people in the Mangampeta area.

A view of the perennial irrigation tank fed by the bailed out water from the bedded barytes mines of Mangampeta area. The water, through specially dug channels, is also led to a nearby water tank called 'Surabhikunta tank'. The tank provides water for irrigation of paddy for its ayacut round the year.

Note the presence of yonder huge dumps of overburden, mostly tuff, (white and brown) removed from the Salaruddin and Sattar Mines situated in the Southern lens of the bedded barytes ore body of Mangampeta.
Utilization of bailed out mine water for washing clothes. Part of the mine water bailed out from A.P.M.C mines and made to move along the specially dug channels is diverted to small ponds situated near the A.P.M.C Mines and is used by the local washermen for washing clothes.

Development of fractures and landslips on the surface, adjoining to the barytes mines in Mangampeta area, due to improper methods of open cast mining.

Note the development of a big fracture on the land surface, adjacent to a private mine, due to subsidence, and the formation of a triangular loose block on the mine wall which may collapse into the mine at any moment. An urchin is made to sit in the fracture zone in order to have an idea about the relative size of the fracture from the photograph.

Overburden dump yard of the A.P.M.C situated at the foot-hill zone of the hill. 894, Mangampeta area.

In the deep mining of barytes by A.P.M.C huge quantities of overburden (mostly tuff) has to be removed and quickly disposed. The A.P.M.C has created a special yard for dumping overburden material, whereas the private mine-owners dump their overburden material on either side of the Tuddapah-Kodur road.
a year. This is because of the fact that the intensity of rainfall in and around Mangampeta during these 2 or 3 months is high, and the capacity of the pumps installed is not adequate to lower the water table in the mines to a level below the floor of the mines. As mining progresses further down, the problem of flooding becomes more and more serious. Therefore, the best way to tackle this problem is not just to pump out water at a high rate by increasing the capacity of the pumps, but to study the groundwater regime in and around the barytes mines' area, to locate the source, direction and rate of movement of groundwater in the water-bearing fissure zones which convey water to the mines, to take steps to reduce the quantum of surface water contributing to the water-bearing fissures, and to pump out ground water in the fissure zones before it finds way into the barytes mines' area. Steps should also be taken to get adequate return from the cultivators for the water they are receiving for irrigation.

7.3.6 Subsidence and Landslips

Subsidence is a serious problem in mining, as sinking of the surface, due to mining operation, can give rise to undesirable effects such as development of fractures and landslips on the surface, and damage to the mine-installations like buildings, pipe lines, and power lines. The fracture
Development may in turn cause flooding of the mine-workings, by drawing in water from surface sources. Development of landslips may have devastating effects on the mines as they cause the collapse of huge mine walls and the burial of all the mine-workings and the miners too. Figure 130 shows the development of big fractures on the land surface adjacent to a private mine due to subsidence, and the formation of a triangular loose block on the mine wall which may collapse at any time into the mine situated just north of it. The mine-owners would have easily avoided this hazardous situation if they had strictly adopted bench and bank (stepped working faces) method of open cast mining.

7.3.9 Disposal of Overburden

In the early period of mining in the Northern Lens deposit, the whole mining activity was concentrated in the southwestern portion of the deposit as the overburden is minimum there (Fig. 19). But with the progress of mining towards northeast, it has become increasingly necessary to remove huge overburden at any cost and extract barytes. As the removal of overburden by manual labour has become quite costly for the mine-owners they have entrusted this work, on a contract basis, to a private firm possessing bulldozer and heavy-duty payloader. Inspite of this, the mine-owners,
including the A.P.M.C. were not able to remove the overburden to the extent it should be done to maintain sustained production. This is because of the fact that the removal of overburden will not fetch any immediate income but increases the overall cost of production of barytes. But if the same tendency continues, in the long run, there will be accumulation of enormous quantity of overburden which has to be removed at a very prohibitive and exorbitant cost, or else the mines have to be closed down once for all. Therefore, something has to be done urgently to set right this situation.

The private mine-owners dump all the mined out overburden, which is mostly tuff, on either side of the Cuddapah-Kodur road and also in some of the waste lands available all around the Mangampeta mines, whereas the A.P.M.C. dumps it in a special yard (Fig. 131) provided at the foot-hill zone of the hill 894 (Fig. 18).

7.3.10 Cost of Production

The cost of mining of bedded barytes can accurately and easily be predicted unlike that of vein barytes. The factors that increase the cost of mining are flooding of the mines during monsoon, failure of the costly machinery and labour unrest and strikes. From an enquiry made by the author it has been found that the average pit head costs of barytes
production by the A.P.M.C and by the private mine-owners are about Rs.140/- and Rs.96/- per metric tonne respectively. In the final report of the barytes mining project prepared by the I.B.M. (1980), for the benefit of A.P.M.C, the expected cost per tonne of barytes was given as Rs.90-06. Therefore, it is obvious that the A.P.M.C has been incurring an expenditure of Rs.50/- more than the expenditure envisaged by the I.B.M. It is also obvious that the expenditure incurred by the A.P.M.C is much more than that incurred by the private mine-owners.

A perusal of the cost elements of the expenditure by the A.P.M.C and the private mine-owners has indicated that the A.P.M.C spends much more than the private mine-owners in the excavation of overburden, dewatering and lighting, sorting and grading of barytes at mine, maintenance of stackyard, welfare activities, watch and ward supervision and office expenses, whereas the private-mine owners show much more than the A.P.M.C towards the depreciation on machinery. The high depreciation shown by the private mine-owners on the machinery appears to be not real, but it has been shown just to reduce their profit margin. Most of the private mines are located at places where there is only a little overburden, whereas most of the A.P.M.C mines are located at places where there
is thick overburden. Hence, the A.P.M.C incurs more expenditure than the private mine-owners towards the removal of overburden. This expenditure is bound to increase in future as the mining advances to greater depths.

7.4 MINERAL TAXATION

In mining the incidence of taxes commences from the very beginning of acquiring lease to the ultimate selling point. The various taxes linked on mining of barytes are presented in Table. 57. They are Royalty, A.P.M.R.T. (Andhra Pradesh Mineral Rights Tax), Cess and Dead Rent.


Royalty is the payment to the owner of mineral rights for the privilege granted by him for mining and producing mineral (Sinha and Sharma, 1980). The owner may be Government or private individual. After a lease has been obtained,
<table>
<thead>
<tr>
<th>Period</th>
<th>White/snow-white/super snow-white barytes</th>
<th>Off-colour/buff/grey barytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Till 22-7-1981</td>
<td>Rs. 10-00 per metric tonne</td>
<td>Rs. 6-50 per metric tonne</td>
</tr>
<tr>
<td>From 23-7-1981 onwards</td>
<td>Rs. 15-00 per metric tonne</td>
<td>Rs. 8-00 per metric tonne</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Period</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Till 14-4-1975</td>
<td>no A.P.M.R.T.</td>
</tr>
<tr>
<td>From 15-4-1975 to 30-9-1977</td>
<td>25% of the prevailing royalty</td>
</tr>
<tr>
<td>From 1-10-1977 to 19-7-1981</td>
<td>50% of the prevailing royalty</td>
</tr>
<tr>
<td>From 20-7-1981 onwards</td>
<td>100% of the prevailing royalty</td>
</tr>
</tbody>
</table>

3. **Cess**

<table>
<thead>
<tr>
<th>Period</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Till the end of first year</td>
<td>no dead rent</td>
</tr>
<tr>
<td>From second to fifth year</td>
<td>Rs. 12-50 per hectare</td>
</tr>
<tr>
<td>From sixth to tenth year</td>
<td>Rs. 25-00 per hectare</td>
</tr>
<tr>
<td>From eleventh year onwards</td>
<td>Rs. 37-50 per hectare</td>
</tr>
</tbody>
</table>

**SOURCE:** Director of Mines & Geology, Hyderabad, A.P.
a lessee has to pay royalty at the rate stipulated on the quantity removed or consumed. Amount of royalty is to be deposited every sixth month or after the expiry of a year as directed by the State Government. The rate of royalty has been fixed on tonnage basis for all known recoverable minerals. The Central Government alone has the right to fix the royalty on major minerals like barytes and the amount of royalty so fixed should not be more than twenty per cent of the sale price of the unprocessed mineral at the pithead. The royalty fixed once cannot be increased more than once in a period of four years.

In 1947, i.e., when India became independent, the royalty on barytes was as low as 31 paisa per tonne. Subsequently, it was increased several times. It became Rs.10/- per metric tonne for white barytes (includes snow-white and super snow-white varieties also) and Rs.6-50 per metric tonne for off-colour barytes (includes buff and grey varieties also). From 23rd July 1981 it was raised to Rs.15/- for white barytes and to Rs.8/- for off-colour barytes.

The Government of Andhra Pradesh has enacted the Andhra Pradesh (Mineral Rights) Tax Act, 1975 (Act No.14 of 1975) providing for the levy and collection of tax on mineral rights of holders of mining leases in respect of certain minerals like barytes in the State over and above the royalty collected.
The collection of this 'APMRY' (Andhra Pradesh Mineral Rights Tax) was meant to provide and improve infrastructural facilities for rapid exploitation of the vast mineral resources of the State. This tax was fixed at 25 per cent of royalty with effect from 15th April 1975. This was further raised to 50 per cent with effect from 1st October 1977 and to 100 per cent with effect from 20th July, 1981.

'CESS' is the tax collected on the mining lease areas by the State Government for the benefit of Panchayats or other local bodies who provide amenities to the labourers and the mines. This tax is presently fixed at 37 per cent of the royalty and this amount is paid to the local bodies by the Government once a year. 'Dead Rent' is the minimum royalty which a lessee has to pay to the State Government or to the owner of the property when he does not carry out mining or produces mineral at very low quantities. The dead rent is proportional to the area of the mining lease and it should not be so high as to hinder the development of the mines at the initial stage and it should not be so low as to make the mine-owner to be idle and postpone mining operations to a later date. As per the new section 9A inserted in the Mines and Minerals (Regulation and Development) Act, 1957 and the enactment of the Mines and Minerals (Regulation and Development Amendment Act, 1972 (Act 56 of 1972), the State Government has the right to produce or waive the dead rent, but it cannot
increase the dead rent beyond the rates fixed. Dead rent is payable only from the second year of the lease, if the property remains unexploited. No dead rent is charged in the first year of the lease, although royalty becomes payable in the very first year if the deposit has been opened up for mining and some quantities have been produced. A lessee is required to pay either dead rent or royalty, which ever is more, and not both.

7.5 **PRODUCTION OF BARYTES**

Although the Cuddapah district occupies the highest position in India in respect of the reserves of barytes (Table. 3), its position in respect of the production of barytes has not been that high all the time. There have been some fluctuations in its barytes production. Therefore, it is worthwhile to consider not only the absolute production of the district but also its relative production in relation to that of Andhra Pradesh as a whole, and India as a whole to get a better picture of the production status of the district.

7.5.1 **Barytes Production of Cuddapah District Relative to that of Andhra Pradesh**

In the early years of barytes mining in Andhra Pradesh, the production of barytes from the Cuddapah district was definitely significant but not very high. This is due to the
production of large quantities of barytes from the other districts of Andhra Pradesh, particularly from Anantapur, Kurnool, Prakasam and Khammam districts. According to Sivasankaranarayana (1967), the annual production of vein barytes from Cuddapah district, during the period 1956-61, ranged from 5423 to 9734 tonnes with an average of 7838 tonnes. The percentage production of barytes in Cuddapah district to the total production of India as a whole has shown a steep decline from 84.5% in 1956 to 28.3% in 1961, indicating that there has been a substantial increase in production from other parts of India in general and Andhra Pradesh State in particular, relative to that of Cuddapah district.

In course of time, the deposits of Anantapur district have almost been depleted, while those of other districts have gone down very much in quantity. The deposits of Nellore district, especially those located near Vinjamur are no doubt significant from the point of view of quantity, but much attention has not been paid on these deposits due to their poor quality and their remote location, very far away from the railway station. The new deposits of barytes discovered in Mahaboobnagar district do not appear to be significant from the point of view of the persistence of the deposits at depth.
As years advanced, the production of barytes from the Cuddapah district has increased, while that from the other districts of Andhra Pradesh has decreased. This has become particularly true with the commencement of production of barytes at Mangampeta. The annual production of vein barytes in Pulivendla taluk, bedded or grey barytes in Mangampeta area, barytes in Cuddapah district as a whole, barytes in Andhra Pradesh as a whole, and barytes in India as a whole are given in Table 58. From the table it is noted that the annual production of vein barytes from Pulivendla taluk ranges from 9096 to 21205 metric tonnes with an average of 13015 metric tonnes, during the period 1973-83. Although there has been a general rise in the production of barytes from the taluk, the per cent production, from Pulivendla taluk, in India's total production ranges from 7.6 per cent in 1973 to 2.4 per cent in 1979 with a marginal increase in later years. The relative production of barytes from Pulivendla taluk is not so much dependent upon its actual production, but is dependent mainly upon the fluctuations in the production of barytes at Mangampeta in Cuddapah district. From the table it is also noted that the annual production of bedded or grey barytes from Mangampeta area ranges from 77827 to 454241 metric tonnes with an average of 276452 metric tonnes, during the period 1973-83. The per cent production, from Mangampeta area,
### TABLE - 58

**ANNUAL PRODUCTION OF BARYTES IN CUDDAPAH DISTRICT, ANDHRA PRADESH, AND INDIA**

**IN METRIC TONNES**

<table>
<thead>
<tr>
<th>Year</th>
<th>Mangampeta</th>
<th>Pulivendla</th>
<th>Cuddapah district</th>
<th>Andhra Pradesh</th>
<th>India</th>
</tr>
</thead>
<tbody>
<tr>
<td>1973</td>
<td>77827 (64.8)</td>
<td>9096 (7.6)</td>
<td>86923 (72.4)</td>
<td>112790 (94.0)</td>
<td>120054</td>
</tr>
<tr>
<td>1974</td>
<td>119141 (81.3)</td>
<td>9605 (6.6)</td>
<td>128746 (87.9)</td>
<td>139539 (95.3)</td>
<td>146490</td>
</tr>
<tr>
<td>1975</td>
<td>175081 (87.2)</td>
<td>10328 (4.6)</td>
<td>207409 (91.8)</td>
<td>215333 (95.2)</td>
<td>226099</td>
</tr>
<tr>
<td>1976</td>
<td>177485 (75.1)</td>
<td>11055 (4.7)</td>
<td>188540 (79.8)</td>
<td>225867 (95.6)</td>
<td>236240</td>
</tr>
<tr>
<td>1977</td>
<td>285410 (86.2)</td>
<td>12475 (3.8)</td>
<td>297885 (90.0)</td>
<td>325110 (98.2)</td>
<td>330989</td>
</tr>
<tr>
<td>1978</td>
<td>355875 (91.6)</td>
<td>11960 (3.1)</td>
<td>367835 (94.7)</td>
<td>384366 (98.9)</td>
<td>388582</td>
</tr>
<tr>
<td>1979</td>
<td>454241 (92.6)</td>
<td>11790 (2.4)</td>
<td>466031 (95.0)</td>
<td>482590 (98.4)</td>
<td>490699</td>
</tr>
<tr>
<td>1980</td>
<td>410513 (92.8)</td>
<td>13410 (3.0)</td>
<td>423923 (95.8)</td>
<td>436765 (98.7)</td>
<td>442326</td>
</tr>
<tr>
<td>1981</td>
<td>363584 (89.5)</td>
<td>21205 (5.2)</td>
<td>384789 (94.7)</td>
<td>398580 (98.1)</td>
<td>406239</td>
</tr>
<tr>
<td>1982</td>
<td>360350 (92.9)</td>
<td>1780 (4.6)</td>
<td>378030 (97.5)</td>
<td>380674 (98.1)</td>
<td>387875</td>
</tr>
<tr>
<td>1983</td>
<td>261464 (89.5)</td>
<td>14560 (5.0)</td>
<td>276024 (94.5)</td>
<td>288051 (98.6)</td>
<td>292170</td>
</tr>
</tbody>
</table>

Figures in parenthesis give per cent production in India's production.

**SOURCE:**
- Asst. Director of Mines & Geology, Cuddapah;
- Director of Mines & Geology, Hyderabad and
- IBM Minerals Year Books.
in India's total production has shown a general increase from 64.8 per cent in 1973 to 89.5 per cent in 1983.

From the records available in the office of the Assistant Director of Mines & Geology, Cuddapah, it has been found that in the overall production of barytes at Mangampeta during the period 1976-83, the per cent contributions by the A.P.M.C and the private mines are 21.6 and 78.4 respectively. If the production per hectare lease area is taken into account, the per cent contributions by the A.P.M.C and the private mines will be 10.5 and 89.5 respectively. Thus, from this date, it is evident that the contribution of A.P.M.C in the overall production of barytes at Mangampeta is small. It has also been found from the same records that in the Cuddapah district, all the twelve mines whose annual production ranges from 5000 to 45000 tonnes belong to Mangampeta, and of the six mines whose annual production ranges from 1000 to 5000 tonnes, four mines belong to Mangampeta and three mines belong to Pulivendla taluk. From this account, it is clear that the bulk of production of barytes comes from Mangampeta.

Figure.132 is the histogram showing the yearly productions of barytes in Cuddapah district, Andhra Pradesh and India from 1973 to 1983. From a glance at this histogram and the Table, one can easily gain the impression that the rise in production of barytes from Cuddapah district has in turn shown a significant
YEARLY PRODUCTION OF BARYTES IN CUDDAPAH DISTRICT, ANDHRA PRADESH AND INDIA (FROM 1973 TO 1983)

FIGURE 132
rise in the overall production of barytes in Andhra Pradesh State in recent years. Further, from the Table.58 it can be inferred that the per cent production of barytes in Cuddapah district to that of Andhra Pradesh State has shown a general increase, ranging from 77.1 per cent in 1973 to 99.3 per cent in 1982, and a slight decrease to 95.8 per cent in 1983. The lowest percentage recorded was 83.5 per cent in 1976. In view of the huge reserves of barytes established at Mangampeta and absence of worth-mentioning reserves anywhere else in the State, it can be said with confidence that Cuddapah district will dominate in the production of barytes in the entire State of Andhra Pradesh for many more years to come.

7.5.2 Barytes Production of Andhra Pradesh Relative to that of the other States of India

The production of barytes in Andhra Pradesh State relative to that in other States of India can be inferred from the Figure.132 and the last two columns of the Table.58. From Figure.132, it can be noticed that the production of barytes in Andhra Pradesh shows a close parallelism to that in India as a whole, especially from 1977 onwards. It can easily be realised from Table.58 that the lion's share of the production of barytes in India is by the Andhra Pradesh State only and the contribution by the other States of India
is quite meagre. In view of any significant reserves of barytes are not being reported in other States, it is almost impossible for any other State of India to compete with Andhra Pradesh in the field of production of barytes. The only exception is Rajasthan State where the reserves of barytes are reported to be more than a million tonnes (Table 3 of Chapter 1). Therefore, next to Andhra Pradesh, Rajasthan is expected to load in the production of barytes. As the deposits are located in Udaipur district of Rajasthan, which is far away from the sea port, the production of barytes realised in this State can only be used for internal consumption. Next to Rajasthan, barytes has been produced from Sirmur district of Himachal Pradesh (Table 3). In view of the meagre reserve position, it is expected that this state would not be in a position to continue its production in future unless new reserves are discovered. The other States, where from barytes production has been reported, include Maharashtra, Tamil Nadu, Madhya Pradesh and West Bengal. In all these States, production has been intermittent with no production at all in certain years. From Maharashtra and Tamil Nadu some production has been reported in recent years while from Madhya Pradesh and West Bengal no production has been reported in recent years.
7.5.3 Barytes Production of India

From the foregoing discussions it is quite obvious that Cuddapah district is the most important producer of barytes in Andhra Pradesh State. But any meaningful conclusions can be arrived at only by taking production of barytes of India as a whole. Therefore, an attempt is made to study the year-wise production and production growth of barytes in India.

The year-wise production of barytes in India is shown in Table. 59 and Figure. 133. Year-wise production growth is also shown in the same table. It is observed from the table that the mean annual production of barytes was very low in the period 1918-47, moderate in the period 1948-72, and very high in the period 1973-83. The lowest production before 1948 can be attributed to the colonial rule to which India was subjected, under which conditions, raw materials which have low unit value, were alone allowed to be exported. The marked increase in the production of barytes after the country's independence can be attributed to the announcement of the National Mineral Policy spelt out by the Government of India, wherein it has been clearly stated that the mineral wealth should play a vital role in the industrial development of the country. The sharp increase in the production from 1973 onwards can be attributed to the commencement of
<table>
<thead>
<tr>
<th>Year</th>
<th>Production in metric tonnes</th>
<th>Production growth when 1973=100</th>
<th>Year</th>
<th>Production in metric tonnes</th>
<th>Production growth when 1973=100</th>
</tr>
</thead>
<tbody>
<tr>
<td>1948</td>
<td>23515</td>
<td>19.59</td>
<td>1966</td>
<td>52608</td>
<td>43.82</td>
</tr>
<tr>
<td>1949</td>
<td>21456</td>
<td>17.87</td>
<td>1967</td>
<td>53016</td>
<td>44.16</td>
</tr>
<tr>
<td>1950</td>
<td>12155</td>
<td>10.12</td>
<td>1968</td>
<td>57747</td>
<td>48.10</td>
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<td>1951</td>
<td>10639</td>
<td>8.86</td>
<td>1969</td>
<td>65478</td>
<td>54.54</td>
</tr>
<tr>
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<td>10191</td>
<td>8.49</td>
<td>1970</td>
<td>78634</td>
<td>65.50</td>
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<td>1953</td>
<td>9551</td>
<td>7.96</td>
<td>1971</td>
<td>58695</td>
<td>48.89</td>
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<td>19094</td>
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<td>1972</td>
<td>48348</td>
<td>40.27</td>
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<td>120054</td>
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<td>1956</td>
<td>6416</td>
<td>5.34</td>
<td>1974</td>
<td>146490</td>
<td>117.02</td>
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<td>10.93</td>
<td>1975</td>
<td>226099</td>
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<tr>
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<td>1959</td>
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<td>11.29</td>
<td>1977</td>
<td>330989</td>
<td>275.70</td>
</tr>
<tr>
<td>1960</td>
<td>16906</td>
<td>14.08</td>
<td>1978</td>
<td>388582</td>
<td>323.67</td>
</tr>
<tr>
<td>1961</td>
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<td>1979</td>
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<td>408.73</td>
</tr>
<tr>
<td>1962</td>
<td>32662</td>
<td>27.21</td>
<td>1980</td>
<td>442326</td>
<td>368.44</td>
</tr>
<tr>
<td>1963</td>
<td>38063</td>
<td>31.70</td>
<td>1981</td>
<td>406239</td>
<td>338.38</td>
</tr>
<tr>
<td>1964</td>
<td>47205</td>
<td>39.32</td>
<td>1982</td>
<td>387875</td>
<td>323.08</td>
</tr>
<tr>
<td>1965</td>
<td>48458</td>
<td>40.36</td>
<td>1983</td>
<td>292170</td>
<td>243.37</td>
</tr>
</tbody>
</table>

Mean Annual Production in Metric Tonnes

Source: IBM Minerals Year Books
YEARSLY PRODUCTION OF BARYTES IN INDIA (FROM 1948 TO 1983)
production of barytes from Mangampata. By considering 1973 as the base year with 100 as production, the production growth of barytes for each year has been calculated. This figure is very low in 1956 with a production growth of 5.34 and very high in 1979 with a production growth of 408.73.

From the Figure.133 it is noticed that there has been a general rise in production, but the production figures of individual years show high fluctuations. These fluctuations may partly be due to some snags and minor delays in production, and as a result of which production of one year includes the production of the previous year and/or the succeeding year. In order to avoid such fluctuations, Harris (1965) has proposed a moving average method of determining the average annual production of each year by taking the average production of the year under question, the previous year and the succeeding year.

Figure.134 shows the yearly production of barytes in India found by moving average method when the same data, i.e. the data used (Table.59) for the Figure.133, has been plotted in Figure.134, the rise or fall of annual production is found to be gradual. From the figure it is noticed that the production of barytes is more or less steady during the period 1948-59 with minor fluctuations. The period between 1959-70
YEARLY PRODUCTION OF BARYTES IN INDIA FOUND BY MOVING AVERAGE METHOD (FROM 1949 TO 1982)
showed a moderate increase in production. After a sudden fall in production in 1971, there has been a steep rise in production during the period 1972-80. Afterwards, there has been again a steep fall in production. The more important reasons for high fluctuations in production are location of new barytes deposits in and outside India, problems in production, changes in demand for barytes in domestic and foreign markets, changes in export policy by the Government of India, and performance of Indian exporters relative to those in other countries. Production is almost wholly related to fluctuations in exports because of low internal consumption. This aspect is discussed in detail in Chapter 8.