10.3 MINING AND METALLURGICAL INDUSTRIES

Overview

Minerals constitute the backbone of a Nation’s economy and contribute directly and indirectly to its prosperity. The affluent countries of the world have a rich mineral resource base and a high rate of exploitation. Minerals like gold, silver and diamond strengthen the economy providing the monetary edge necessary for a wide range of developmental activities. Fuel minerals and atomic minerals, ferrous minerals and non-ferrous minerals, industrial minerals and fertilizer minerals form the base for power generation, heavy and medium industries respectively and to grow more food for sustaining life on earth.

Exploitation of minerals involves tampering with the environment in which they occur. Environmental protection therefore assumes as much importance as mineral conservation. The mineral resources of an area are dependent on its geological setting. No country can be stated to be self sufficient for all its mineral requirements. The evolution of the earth during the last 4,500 million years has been punctuated by episodes of formation of specific ores. Briefly stated deposits of iron, chromium, gold and other ferrous and non-ferrous minerals were formed in the ancient rocks of the earth when there was scant life. Coal and lignite were formed after there was luxuriant plant growth of about 200-150 million years ago and oil in younger rocks of the Tertiary group of about 60 million years of age. Thus the formation of mineral deposits has been a well phased out sequence of events interwoven with the evolution of the earth.
However planned a programme of mineral development may be, a time will be reached when there will be no minerals left in the humanly accessible parts of the earth. The duration of the 'Mineral Age' itself in human civilization will depend on the rate at which it reaches the exhaustion point of the mineral resources. Distant future will recognize the 'mineral culture' of the present age as a passing phase of human civilization and the science of mining as an ancient science. Its literature and technique will be looked upon by posterity as a phase in the sum total of man's knowledge in a bygone age. The 'Metal Epoch' (for that is what it might come to be known as) of human civilization will arouse the academic curiosity of only students of human history much as the present day archaeologist, the anthropologist and the historian is interested in the 'Stone Age' and later ages gone by. It is sad to imagine that, if the substitutes for the vanished minerals and metals prove more handy and effective, the very science of present-day mineralogy and the mining techniques would be patronizingly described as laborious process of a half-civilized age in building up human welfare-a welfare which they themselves destroyed by depleting the minerals through overproduction. If, however, on the other hand, the world of the future is destined to be handicapped by the absence of minerals and if it finds their substitutes hard to win and not serviceable enough when won, according to contemporary standards, the age of minerals will be immortalized as the golden age of human civilization with utmost reverence to the savants who knew the great science and with a degree of admiration which might well outstrip our present reverence for the metallurgical knowledge of the ancients who created long-lasting monuments of the world, such as the iron pillar of Delhi and the pyramids of Egypt.

from Minerals of India by Meher D.N.Wadia

Mineral Deposits in Tamil Nadu

Tamil Nadu's mineral resources are limited. The important minerals of commercial value in Tamil Nadu are granite, lignite, limestone and recently found natural gas and oil. Tamil Nadu accounts for 90 percent of lignite potential in the country. Lignite constitutes a major mineral base for the production of power and fertilizers in the State. Manganese deposits in Salem are the largest in India and provide the raw material for manufacture of refractory materials. Granite is one of the important export earners from Tamil Nadu. Salt is found all along the coast and manufactured in large scale in Tuticorin. Other minerals which occur in Tamil Nadu are mica, chromite graphite and bauxite.

The systematic geological survey of the country carried out during the last century and a half has brought to light the mineral potential of the State and provided the base for the industrial development achieved to date. This involved the setting up of cement, ceramic, stoneware, chemical, fertilizer, refractory, abrasives, aluminum and sponge iron industries, lignite mining and power development and mineral oil exploitation and refining units. The State
is now poised for a higher industrial growth during the Tenth Plan period. Concept oriented programmes based on the geological locales of the deposits studied so far will have higher priority. There will have to greater dependence on aero magnetic, satellite imagery, geophysical, geo-chemical and geo-statistical methods of investigation supported by more sophisticated analytical techniques in the State’s future endeavour to achieve the desired industrial growth. The Department of Geology & Mining in Tamil Nadu which originally started as a wing of the Directorate of Industries and Commerce in 1957, has had achievements in assessment of iron ore and limestone for the then proposed Salem Steel Plant, bauxite resources for aluminium plant set up at Mettur, limestone resources for a number of cement plants, major and minor, besides expanding the capacity of the existing plants and meeting the requirements of the increasing mineral based industrial units. The mineral resources located and evaluated by the department formed the base for the setting up of a Mineral Development Corporation – the Tamil Nadu Minerals Limited. It has also rendered valuable assistance to the mineral based public sector units such as TANMAG, erstwhile TACEL and TANCEM.

The revenue collections of the State from the mineral sector have steadily increased from about Rs.2.00 crores in 1983 to Rs.157 crores during 2000-01.

**Ninth Plan Performance**

The overall GSDP growth during Ninth Plan period was 6.09 percent in 1997-98, 5.78 in 1998-99, 4.36 in 1999-2000, 3.06 in 2000-01, and 5.46 in 2001-02. The Mining Sector registered an Annual Average Growth of 4.43% in GSDP during the Ninth Plan Period as the overall GSDP growth of 5.46%. Its contribution to GSDP in 2001-02 was 0.56%.

The jump in growth in the third and fourth years of the Ninth plan was due to the realisation of royalty in that period for exploration of minerals during the first two years of the plan.

The Department of Geology and Mining carried out geological investigation spread over different parts of the State during the Ninth Five year Plan period as detailed below:
Mineral Exploration - The Department carried out several landmark investigations for limestone, bauxite, graphite, magnesite, granite etc. in the past as a result of which several mineral based industries were set up and are functioning in the State. The Department is at present carrying out geological exploration for unearthing the minerals treasures of the State in the following areas:

1. Investigation of Limestone

Keeping in view the growing demand for limestone for use in the industries like Cement, Chemical, Pharmaceuticals, Chemicals etc. an area of about 80 Sq.Km in parts of Ariyalur District has been demarcated for the purpose of drilling 80 boreholes for identifying limestone bearing areas. Till date 21 boreholes have been completed for a total depth of 1212.11 metres. During 2000-01, 10 boreholes have been completed for a total depth of 528.3 metres in Thulair and Marungur villages of Sendurai taluk, Ariyalur district. 98 sludge samples and 46 core samples have also been collected for complete chemical analysis.

2. Continuation of the Geo-technical Studies in the Nilgiris District

The existing Geo-Technical Cell at Coonoor in the Nilgiris District continued its geo-technical studies for identifying landslide prone areas and cleared 298 sites for various construction works in the Nilgiris District. The area in Vellore and Thiruvannamalai Districts was also investigated for Hill Area Conservation Authority clearance.

3. Geo-Technical study in and around Kodaikanal and Palani Hill Areas

Similar to the geo-technical study conducted in the Nilgiris, another geo-technical cell set up at Dindigul has been conducting a study in the hill ranges of Kodaikanal and Palani. Initially, the centre took up the study around Kodaikanal town and its neighbourhood areas, over an extent of 325 Sq.Kms during the year 1998-99. In the year 1999-2000, 545 Sq.Kms was taken up for field check, 15 paleoscars and soil slips were identified and various thematic maps and reports were prepared. During the year 2000-01, an area of 150 Sq.Kms was taken up along with road mapping of Perumalmalai-Palani ghat road for a length of about 40 Kms. Further it is proposed to take up the survey work in the remaining areas of 300 Sq. Km around Berijam lake and its neighborhood in detail on geo-technical aspects during the year 2001-02. In addition to this, road mapping work along Batlagundu-Kodaikanal ghat road for a length of about 46 Kms and the road from Chittarevu village to Thandikudi village for a length of about 30 Kms will be taken up for the detailed study. After the completion of the above works, a final zonation map will be prepared.

4. Exploration of Platinum Group of elements in parts of Salem District

Stream sediments and rock samples have been collected in the ultra basic and ultramafic rocks of chalk hills, Kanjamalai area in Salem District in order to prove the presence of Platinum Group of elements in such rocks.
The samples have been given for chemical analysis and the analytical report will be studied in detail.

5. **Study of Mine dump in parts of Tamilnadu**

With a view to prove the presence of mineralisation of high temperature resistant minerals like molybdenum, tin, tungsten etc., in the limestone and magnesite mines dumps in Tamilnadu, a study has been taken up and in the process several samples have been collected and given for chemical analysis and the analysis report will be studied in detail.

Apart from the above plan schemes, based on the United Nations Development Project studies made in 1968 a circular magnetic anomaly was identified near Mottankurichi, Harur taluk, Dharmapuri District and preliminary Magnetic and Radiometric traverses were conducted as a non-plan scheme.

During Ninth Plan an amount of Rs. 7.90 crores was provided to this sector out of which an expenditure of Rs.2.36 crores was incurred.

**Tenth Plan**

**Thrust Areas**

The speedy industrialization of the State needs an expeditious assessment of the known mineral resources besides locating new mineral deposits. The focus will be on assessment/ exploration of crystalline limestone deposits in Southern and Western districts, black and multi-coloured granite deposits in Madurai-Theni, Pudukkottai-Karur, Tiruvannamalai-Vellore, Erode-Namakkal & Tirunelveli-Dindigul districts, unexplored iron ore deposits in Nainarmalai and additional lignite resources in East of Vellar block in Cuddalore district & Jayamkondacholapuram in Perambalur district.

This can be achieved only by a concerted programme of mineral exploration in the State. The existing technical personnel have been diverted for looking after the mineral administration work after its entrustment to the Directorate of Geology and Mining during 1983. The revenue from mining sector has steadily increased over the years and the revenue realised for the period 2001-2002 is around 162 crores. It is indicated that if the existing staff are diverted from mineral administration for undertaking investigation work, it may entail in fall of revenue in the mining sector. It has therefore been argued that additional staff for carrying out the investigation work is needed, optional utilisation of staff through streamlining and simplification of the procedures of mineral administration will also be undertaken. All staff schemes will be subject to strict scrutiny at the time of sanction. The Geological Survey of India is carrying out exploration work on a regional scale by which the occurrence of various minerals will be brought to light. The Department of Geology and Mining is concerned with the delineation of economically viable deposits and their proper exploitation. This necessitates mapping of minerals in smaller scale i.e. 1:2000 or 1:1000.

The export worthy granite deposits occurring in Government poramboke lands have to be brought under the transparent tender-cum-auction system in order to earn revenue to Government. With this objective in
view, the occurrence of the granite along with the co-existing features such as existence of permanent features classification of land, availability approach facilities etc, along with a note on the recoverable reserves, and whether it will take polish etc has to be studied in detail before preparing the technical report.

The limestone deposits in the State have been under continued exploitation to account annually for nearly 1/3 of the cement produced in the country. The occurrence of crystalline limestone deposits in areas not hitherto identified need to be taken up for a detailed study as basic raw material to support the cement industry.

The black and multicoloured granite deposits have to be fully assessed and their mining regulated. The black granite and some other coloured granites varieties of Tamilnadu are of superior quality in the country.

The magnetic iron ores of Tamil Nadu, although of less than 40% Fe grade are amenable for concentration to higher grades. It is therefore necessary that the unexplored iron ore deposits in Nainarmalai of Namakkal District are expeditiously assessed.

The increasing demand for thermal power in the country necessitates the estimation of the lignite resources along the southern continuity of the Neyveli Lignite field into Cuddalore and Perambalur districts.

In order to store and preserve all technical data hitherto compiled during the course of various geological investigations carried out in the past by this Department and other particulars relating to mining/quarry lease particulars, reserve calculations computed for the lease hold areas, revenue collection from mining sector, etc. the Department has proposed to build up a Geographical Information System (GIS) in the Directorate during the Tenth Five Year Plan.

The following programmes are accordingly proposed to be implemented during Tenth Plan Period.

**Tenth Plan Programmes**

**Ongoing Schemes**

The following schemes were implemented during Ninth Five year Plan.

1. Study of minewaste
2. Geo-technical Cell at Kodaikanal
3. Micro Analytical Lab
4. Limestone investigation
5. Geographic Information System
6. Reappraisal of occurrence and exploration of Molyptinium, Tin & Tungston.
7. State Geo-technical Cell at Coonoor

Out of the above seven schemes, only the scheme indicated below will continue as Plan Scheme during Tenth Plan.
State Geo-Technical Cell at Coonoor - The Geo-technical Cell was established in 1985 at Coonoor in the Nilgiris district under the Hill Area Development Programme to identify the areas prone to landslides and to suggest remedial and preventive measure against such natural calamities. For this purpose zonation maps are prepared to identify the low, medium and high vulnerable zones for landslides after detailed geo-technical, geological, and geo-morphological studies. These maps and technical studies have helped the district administration in deploying men, materials and machinery in the area of anticipated calamities during the rainy season. This will also help the planners in selecting the areas for large scale developmental studies. The Geo-technical Cell has come to stay in the Nilgiris District to offer valuable guidance and expert opinion in respect of landslides and other related activities in the Nilgiris district. This Cell will not only monitor development activities but also suggest vulnerable zones which will be strictly prohibited from further development. A modern Chemical Laboratory under the Directorate of Geology and Mining at Guindy is utilised for analysis of rocks, minerals and ores. The Cell has continued its Geo-technical studies for identifying landslides prone areas and cleared 298 sites for various construction works at Nilgiris District. The programme is being continued in Tenth Plan also. (It is proposed to take up 500 sites for clearance during 2002-03 and so far 49 sites were inspected for clearance.) A sum of Rs.80 lakhs is required for continuing this activity during the Tenth Five Year Plan period.

New Schemes
1. Resource assessment of Black and Multi coloured granites in Tamilnadu

It is proposed to continue the resource assessment of granite deposit taken up during the previous plan periods as black granite is an important ornamental stone earning revenue for the State. In order to identify potential granite areas in the State, it is proposed to utilise the imageries being generated continuously by the Satellites, pertaining to areas in Madurai-Theni, Pudukottai-Karur, Tiruvannamalai - Vellore, Erode-Namakkal, Tiruchirapalli-Dindigul districts.

The work contemplates study of the satellite imagery and location of the black granite and coloured granite bearing areas. It will be followed by field checks and delineation of each granite body identified to trace its extent. This study will also guide the revenue authorities of the limit of the existing quarrying activities of black and coloured granites and identify unauthorised quarries to check illicit mining if any. An area of about 600 Sq. Kms. will be investigated per year by commencing the work from Madurai-Theni districts where there is considerable black and colour granite potential. The investigations will be extended into the districts of Pudukottai-Karur, Tiruvannamalai-Vellore, Erode-Namakkal, Tiruchirapalli-Dindigul during the Tenth Plan period. Based on this the total granite available for mining in each block would be estimated. The samples of granite will be collected and polished to find out their quality for marketability. This study will give a comprehensive picture of the different types of black and multi coloured granites in these districts. This programme would serve to guide prospective
entrepreneurs who approach the department for details on the quality and quantity in the areas applied for by them to plan their investment programme.

It may be mentioned that GSI had carried out extensively assessment of multi-coloured granite deposits in Northern Tamil Nadu & Salem districts and all the major granite bodies shown in the GSI maps of the districts. The exact ores to be assessed may be taken up in consultation with GSI.

The total cost of the scheme proposed during the Tenth Five Year Plan would be Rs.46.50 lakhs of which Rs.20 lakhs will be on capital expenditure and the balance of Rs.26.50 lakhs on staff cost and other revenue expenditure.

2. Reappraisal of Limestone deposits in Southern and Western districts of Tamil Nadu

A detailed limestone investigation for sedimentary limestone in the cretaceous basin of Perambalur and Ariyalur district was taken up during the Ninth Five Year Plan. It is proposed to take up a similar study for unearthing the new crystalline limestone deposits in the southern districts of Tamil Nadu. The southern parts of Tamil Nadu have already contributed sizably in harnessing the available limestone deposits for industrial purpose. Six major cement plants of which five under private sector and one under public sector were set up based on the availability of limestone in these parts of the State. Therefore, the scheme proposed in the Tenth Five Year Plan is designed to cover the unraveled areas so that new areas of Limestone occurrence can be identified and the possibility of setting up of few more major or mini cement plants can be explored, considering the increase in building activities and consequent consumption of cement for such building activities.

The total cost of the scheme works out to Rs.63.77 lakhs which includes Rs.43.80 lakhs towards staff cost, Rs.12.97 lakhs towards other expenditure and the remaining Rs.7.00 lakhs towards capital for the cost of purchase of vehicle and equipments.

3. Investigation of Iron Ores in the Nainar Malai area of Namakkal District.

The iron ores in the Nainarmalai area of Namakkal district investigated by the Geological Survey of India are found to carry a possible reserve of 90 Million Metric tonnes and a cumulative strike length of 4.2 km. with uniformly coarse grain size. Earlier, under the United Nations Development Project, these ores have been studied and the grain size of the magnetite has been found to be a favourable aspect for pelletisation. It was found that the grain size was suitable for complete liberation of magnetite during crushing. The increasing demand for iron ore in the State with the proposed programme for the use of Kavuthimalai-Vediappanmalai ores and the Kanjamaillai deposits necessitates the appraisal of other iron ore deposits in the State. The iron ores of Nainarmalai contain 35 to 41% of Fe., averaging around 36% as in the other deposits of the State. It is coarse grained and amenable for concentration over 50% Fe grade and grain size being 2mm. easy for liberation of iron ore from quartz and other minerals associated with it. It also involves less crushing cost compared to the other iron ore deposits of Tamil Nadu.
Regional geological reconnaissance making use of the map prepared by GSI and detailed mapping of blocks where iron ore is present will be carried out. Geological traverses will be carried out along and across the strike of the formations at 50m. traverse line and trenches cut. Geological cross sections will be prepared on a scale of 1:1,000. Sampling, drilling work, beneficiation and feasibility studies and reserve calculation will be carried out. The total cost of the project would be Rs.43.60 lakhs during the Tenth Five Year Plan of which Rs.28.00 lakhs is towards staff cost and the remaining Rs.15.60 lakhs towards the cost of purchase of geological equipments, cost of beneficiation and pelletisation studies etc.

4. Investigation for Lignite in areas lying to the East of Vellar block Cuddalore district and in the Jayamkondacholapuram area, Perambalur District.

The Neyveli Lignite basin which extends towards Jayamkondacholapuram forms an additional source for lignite in Tamil Nadu. The area constitutes the southern sector of the lignite belt extending from Bahur in Pondicherry State through the centrally located Neyveli Lignite field towards Jayamkondacholapuram. Its continuity further south is quite a possibility Lignite is found here under geological conditions similar to those in the Neyveli field. The thickness of lignite seam varies from 9 to 13 mtrs. with an overburden of about 125 to 150 mtrs. Explorations taken up by the Directorate of Geology and Mining during the VIII plan period indicated a reserve of about 3000 million tonnes of lignite. The continuation of explorations in this field lying to the west of the block investigated around Jayamkondacholapuram is, therefore, proposed during the Tenth Plan period. An area of about 150 sq.kms. west and north of the area already surveyed is proposed to be taken up for assessing the Lignite available in this area. In addition to this, an area of about 7.5 sq.kms. lying south-west of Sethiatoppu on either side of Vellar river will also be taken up. The total number of boreholes proposed is about 80 dovetailing with the boreholes already put down by Mineral Exploration Corporation Limited for the Neyveli Lignite Corporation.

The total cost of the scheme is Rs.39.95 lakhs comprising of Rs.23.30 lakhs towards staff cost, Rs.8.00 lakhs towards the purchase of a jeep with trailer and geological equipments and Rs.8.35 lakhs for other revenue expenditure respectively during the Tenth Five Year Plan period.

5. Scheme for setting up of Geographical Information System in the Department of Geology and Mining

During Eighth Plan period the development of a data base management system concerning Mineral exploration and Mineral Administration was taken up. In order to have a complete analysis of the field data collected during the geological exploration, it has been proposed to set up a Geological Information System package in the Department. It has been estimated that the hardware and software requirements for the G.I.S. package will be Rs.20 lakhs and it has been proposed to have an Assistant Programmer on contract who will apart from attending to programming work also serve as the System Administrator. Similarly, a Data Entry Operator will be appointed on contract basis.
An amount of Rs.26.62 lakhs is set-up apart for this scheme during the Tenth Five Year Plan period for the purchase of computer hardware/software equipment and for remuneration to computer professionals on contract basis and other expenditure for developing GIS package in the department.

The only publication on minerals on Tamil Nadu was published during the year 1964 and till date it has not been updated. There is a need for updating the information on minerals occurring in Tamil Nadu. In this endeavour a senior retired official either of the Directorate of Geology and mining or the GSI may be employed on contract basis for a period of one year on a consolidated remuneration of Rs.30,000/-.

**Tenth Five Year Plan Programmes and Outlay**

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Name of the Scheme</th>
<th>Outlay (Rs. in lakhs)</th>
<th>Revenue</th>
<th>Capital</th>
<th>Total</th>
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<tbody>
<tr>
<td>1.</td>
<td><strong>Ongoing Scheme</strong></td>
<td>State Geo-technical Cell at Coonoor under HADP</td>
<td>80.00</td>
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<td>80.00</td>
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<td>2.</td>
<td><strong>New Scheme</strong></td>
<td>Resource assessment of Black and Multicolour Granites</td>
<td>26.50</td>
<td>20.00</td>
<td>46.50</td>
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<td>3.</td>
<td>Reappraisal of Limestone deposits in Southern and Western parts of Tamil Nadu</td>
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<td>7.00</td>
<td>63.77</td>
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<td>4.</td>
<td>Investigation of Iron Ores in the Nainar Malai area of Namakkal District</td>
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<td>2.00</td>
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<td>5.</td>
<td>Investigation of Lignite in areas lying to the east of Vellar block Cuddalore district and in the Jayamkondacholapuram area, Perambalur District</td>
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<td>8.00</td>
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<td>6.</td>
<td>Scheme for setting up of Geographical Information System in the Department of Geology and Mining</td>
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<td>20.00</td>
<td>26.62</td>
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</table>

**Grand Total** 243.44 57.00 300.44

In addition to the above programmes the following possibilities also need to be considered by the State Geological Programmes Board.

(a) **Exploration for Gold**

The southern extension of the Gold bearing schists of the Kolar Gold Field are seen as two arms in the Dharmapuri district. The arm on the western side is the Adakonda Block near Veppanapalli and the eastern arm is the Maharajakadai area. Both these arms of the schist belt are found to be gold bearing by the preliminary investigations carried out by GSI and the TN State Department of Geology and Mines in the 80's.

The Maharajakadai area, which is on the southern side of the Chittlakunda block of highly rich gold zone of the KGF, has a good potential. This area could not be investigated in detail earlier as the area falls within forest and the Forest Department did not permit the investigation earlier. This area could be explored after obtaining for clearance with the Forest Department indicating the importance and value of the exploration.
(b) Resource assessment of Heavy Minerals and high grade silica sand along the east and southwestern coasts of Tamil Nadu.

The Beach sands along the east and southwestern coasts of Tamil Nadu are enriched with Heavy Minerals like Ilmenite, Rutile, Garnet, Monazite, Zircon and Sillimanite besides high grade silica sand. Assessment of Monazite has been done by the Atomic Minerals Division and mining of Monazite is in progress in Manavalakurichi area in Kanyakumari district. Garnet, which has gained much importance and valuable commercially has been assessed in patches and are being mined and exported by a few Private companies. The other minerals are not being exploited as their economic viability in totality all along coast have not been assessed. The entire east and southwest coast of Tamil Nadu could be explored in detail to assess the resource potential of all the Heavy Minerals and silica sand so as to enable a commercial venture to be taken up by agencies like TAMIN or other Private Corporate bodies.

(c) To assess the Resource Potential of Garnet in rocks

Industrial Garnets have gained importance and are in great demand in Petroleum industry, Aircraft Industry waterjet cutting, ship-building industry, filtration medium besides its wide use as Abrasives. In recent times Garnet is also replacing silica sand in sand blasting as silica is considered as a health hazard.

Presently garnet production is from the Beach sands on the southwest and eastern coasts of Tamil Nadu in Kanyakumari district. If the coastal environmental Management is strictly adhered to the production of garnet from Beach sands may not last long. Hence it is worthwhile tapping the garnets from the garnet enriched rocks, such as Garnet gabbros and garnet pyroxenites. Explorations have to be carried out all along the Bhavani - Cauvery valley in Coimbatore, Erode and Tiruchirapalli districts, where garnet bearing rocks are exposed as linear ridges running for several kilometres with width varying from 10 to 300 metres. Even production of garnet from the exposed surface rocks itself can produce several crores worth of garnet. India, is a leading producer of garnet in the worth, next only to USA and Australia and USA alone is importing 35 to 45% garnet from India. Hence a detailed exploration in the above said is warranted.

(d) Appraisal of the Magnesite deposits and the enclosed Host Rocks

Magnesite, the high temperature resistant mineral is being mainly used for the production of Refractory Bricks for furnaces in steel and other industries. With the dwindling resource of the major magnesite deposit in Chalk Hills area in Salem district and the recent discoveries of the host rock of the magnesite, i.e., the dunite-peridotite, pyroxenites also being high temperature resistant suitability these are being used in Tata Steel Industry.

Hence a reappraisal of the available magnesite deposits in Salem, Dharmapuri, Coimbatore, Erode and Nilgiri districts and the host rocks like Dunite, Peridotite, and Pyroxenites has to be done. During the first two-three years of the Tenth Plan period the appraisal of the magnesite deposits in
Kanjanur near Uthangarai in Dharmapuri District, and minor occurrences in Salem district, magnesite occurrences to the south and north of Sathyamangalam in Erode district and the Upper Bhavani - Moyar regions can be taken. The assessment of the Host rocks can also be done simultaneously. Physical tests have also to be carried out on several other pyroxenites that occur in abundance in the Northern Tamil Nadu for Refractory Industries.

(e) Reappraisal of the Geophysical and geochemical Survey data carried out during the UNDP programme

A reappraisal of the geophysical and geochemical survey data available with the Department of Geology and Mines, Tamil Nadu have to be carried out in collaboration with Geological Survey of India who have carried out much geophysical work and have mapped most part of Tamil Nadu in large scale, after the UNDP work in 1965-70. Such collaborative work can bring to light new areas of mineralisation that can be targeted for exploration.

The cost on (a) to (e) above could not be estimated at this juncture.

The outlay approved for the sector for the Tenth Five Year Plan is Rs.5 crores. As the additional staff requirement has been reduced and will undergo scrutiny at the time of individual sanctioning, there may be variation (reduction) in the requirement from the approved outlay. Inter-sectoral adjustments will be made in the Annual Plans and Mid-Term Appraisal with the approval of the Union Planning Commission.