

CHAPTER - 17

MINERAL DEVELOPMENT

Introduction

17.1 Mineral resources are the backbone of industrial and economic development of any nation. The socio-economic development of a country is directly related to availability, proper exploration, and utilization of indigenous minerals. Rajasthan contributes about 22% of industrial mineral production in the country alongwith production of approximately 15% in metallic, 25% in non-metallic and 26% in minor category. Sixty-one minerals are currently being exploited in the state of which 39 are major minerals and 22 are minor minerals, which contributed revenue of around Rs. 814.08 crores to the state exchequer in the year 2005-06. The value of minerals produced from the state was over Rs. 3173.35 crores during 2004-05.

17.2 Rajasthan is the sole producer of Garnet (Gem), Jasper, Selenite and Wollostonite. Almost the entire production of Calcite, Gypsum, Lead-Zinc concentrate and Amphibole variety of Asbestos comes from the state. Besides, Rajasthan is the leading producer of Ball clay (84%), Fire clay 46%, Ocher 93%, Fluorite 56%, Phosphorite 94%, Silver 91 %, Silica Sand 31%, and Steatite 81% in the country. Rajasthan ranks first in production of minor minerals.

17.3 The mineral sector provide direct employment to about 5.06 lacs persons while the indirect employment is more than 20 Lac persons.

17.4 Rajasthan has been the first state to introduce airborne survey through multinational and joint venture companies, which have identified 663 magnetic anomalies, indicating possibilities of sub surface metallic minerals.

Review of Tenth Five Year Plan Progress

17.5 Against an outlay of Rs. 1372.42 lacs for Tenth Five Year Plan, a sum of Rs. 903.54 lakhs is likely to be incurred.

17.6 During intensive prospecting and mineral survey work, 192.57 million tones of SMS grade limestone located in Jaisalmer district. Investigation for cement grade limestone was carried out in Chittorgarh, Jhunjhunu, Jaipur, Jaisalmer, Jodhpur, Nagaur district and proved 903.95 MT reserves. Besides 12.50 MT reserves of chemical grade limestone have also been proved in Ajmer district. Investigation for lignite was restricted in Bikaner district and proved 40MT reserves. Now total lignite reserves proved so far in state are 4270 MT. New deposits of dimensional stone are located at various places- Sandstone in Dholpur, Baran, Jodhpur, Jhalawar district; Yellow marble in Jaisalmer district; marble in Alwar and Sikar district; Granite in Pali and Barmer districts;

Splittable limestone in Jhalawar district. Reserves of industrial minerals like quartzite, Clay, Bentonite, Quartz, Felspar, etc. have also been located at several places in the state.

17.7 During the plan period work of construction of 12 roads and one building was taken up. Eight road works totalling 30 Km length and one building will be completed at the end of this plan period. Under Research, Development and training scheme the important works taken up are participation in state and national level mineral exhibitions, seminars and workshop, participation in technical training programme and sending mineral samples to other laboratories for analysis.

Objectives for the Eleventh Five Year Plan:-

17.8 The mineral resources are to play a very significant role in the overall economic development of the State in the coming years. The industrial development of the State will largely hinge upon the development of the mineral sector and the mineral based industries. In addition mineral has a huge export potential and will be a key sector for encourage the foreign direct investment. Keeping this in view, the main objectives for Eleventh Five Year Plan are as under: -

- Accelerate the pace of mineral exploration by adopting modern techniques.
- Identify technological gaps in mineral exploration upgradation of mineral production, equipment and mechanization.
- Provide thrust on exploration of essential minerals like hydrocarbons, base metals and noble metals so as to curtail their import.
- Assess the reserves and resources of all minerals to generate reliable mineral database in the State.
- Promote development of human resources to meet the demands of modern mineral exploration and mining techniques.
- Promote measures for environmental management in the mining areas.
- Promote R & D in the fields of identification, analysis, exploration and beneficiation of minerals.
- Ensure enforcement of safety norms in mining operation.
- Increase the efficiency of department through reorganisation, computerisation and training of its personnel.
- Organising/participation seminar, mineral exhibition to promote mineral development.
- Increase infrastructure facility by constructing mines roads, departmental building etc.

- Check unauthorised mining.

Outlay during XIth Five Year Plan:

17.9 To achieve the above objectives, scheme wise strategies and outlays are as under:-

Intensive Prospecting and Mineral Survey Scheme:

17.10 This is the fundamental scheme of the department under which mineral survey and prospecting work in the State are taken up. The Prospecting work is carried out through Regional Mineral Survey (RMS) followed by Regional Geological Mapping (RGM) and Detailed Geological Mapping (DGM) in target area. Drilling is done for proving the mineral reserves. The Department take 60 to 65 prospecting /exploration projects every year. During Eleventh Five Year Plan period, mineral exploration programme will carried out for following category of minerals:-

- Lignite
- Limestone
- Base metals and noble metals
- Precious and semi-precious stones
- Dimensional and Decorative stones.
- Industrial minerals etc.

17.11 To carry out the exploration work budget of Rs. 1194 lacs is proposed for Eleventh Five Year Plan and Rs. 133.50 lakhs for Annual Plan 2007-08.

Construction of Mines Approach Roads and Departmental Buildings:

17.12 Infrastructure is the basic requirement for economic development of a region. Minerals resources are generally found in hilly, interior and remote areas. Desert regions of the State also possess a number of economic mineral deposits. All these regions require adequate infrastructure for rapid mineral development. Under this scheme construction/maintenance of mines approach roads and departmental building will be taken up. An amount of Rs. 2260 lacs proposed for Eleventh Five Year Plan and Rs. 300.48 lakhs for Annual Plan 2007-08.

Research, Development and Training :

17.13 Under the scheme following works are to be taken in XI Plan period:

- Determination of quality and grade of various minerals to ascertain their suitability.
- Detail studies including beneficiation, characterization and physico-chemical studies of low grade minerals for utilization.

- Studies to utilize mineral waste generated from the mining and processing industries.
- To conduct analytical work in minerals in laboratories of the department and other organizations like IBM, GSI, CMRI etc.
- Collection, compilation and publication of information related to mineral sector.
- Participation in mineral exhibitions and seminars.
- Regular training programme for officers and technical staffs at other institutes.
- Research and development studies of minerals such as bauxite, silica sand, bentonite, wollastonite etc.

17.14 To achieve these objectives budget of Rs. 20 lakhs is proposed for Eleventh Five Year Plan and Rs. 2.00 lakhs for Annual Plan 2007-08.

Environment Restoration Scheme :

17.15 The Mining and processing activity causes the environmental damage to land, water and air. There is a foremost need for adopting a techno-economic and environment friendly methods of mining and processing. Mechanical mining can reduce waste generation.

17.16 While production of minerals cannot be ignored for overall growth of a society, issues related to their conservation, safe exploitation without any significant impact on the surroundings can not be ignored.

17.17 The mining and processing activities may cause following environmental damages -

- Land Environment: The land used for quarrying is permanently lost due to pits in the earth or dumping of overburden.
- Water Environment: Rain water carrying silt or harmful ingredients from overburden heaps to lake may pollute the later. Similar problem arises when the mining is done below water table.
- Air Environment: The dust generating during mining activities like drilling, blasting, loading, transporting, crushing and by blowing wind over overburden heaps may cause health hazards.

17.18 Thus in XI Plan period land reclamation programme will be taken up in abandoned mines areas. An amount of Rs. 100 lakhs is proposed for this scheme for Eleventh Five Year Plan and Rs. 10.00 lakhs for Annual Plan 2007-08.

Mines Safety

17.19 To promote safe and eco-friendly mining in the state, seminars will be organized in different mining areas to create awareness among mine workers. Thus an amount of Rs. 10 lakhs is proposed for Eleventh Five Year Plan and Rs. 2.00 lakhs for Annual Plan 2007-08.

Building e-Business Infrastructure

17.20 It has been proposed to computerise all activities of the department during XI Five Year Plan period. Thus Rs. 416 lakhs are proposed under this scheme for XI Five Year Plan and Rs. 52.02 lakhs for Annual Plan 2007-08.

Revenue Generation in Eleventh Five Year Plan

17.21 Results of all departmental activities are reflected in realisation of mineral revenue. The department stood 5th in rank after sales tax, state excise, vehicle and stamp registration. Mineral revenue for last 10 year are given as under:-

(Rs. in crores)

Year	Mineral Revenue		Year	Mineral Revenue	
	Target	Achievement		Target	Achievement
1997-98	300.00	292.78	2002-03	495.00	449.38
1998-99	310.00	303.94	2003-04	532.08	513.74
1999-2000	554.50	349.43	2004-05	625.00	640.34
2000-01	390.00	370.10	2005-06	750.00	814.08
2001-02	430.50	412.98	2006-07	850.00	640.45 (Upto Nov,06)

17.22 In the XI Plan period the mineral revenue will be increased mainly due to intensive prospecting and mineral survey work, revision of royalty, setting of lignite based thermal power plants, installing new cement plants, leasing of minerals, etc. The yearwise anticipated revenue during XI plan period is as under -

Year	Expected Revenue (Rs. in crores)
2007-08	892
2008-09	937
2009-10	993
2010-11	1053
2011-12	1127
TOTAL :	5002

Rajasthan State Mines & Minerals Ltd. (RSMML)

17.23 RSMML is a mining company engaged in the mining and selling of four major minerals namely Rock phosphate, Lime stone, Gypsum and Lignite. The company has also installed wind mills having power generation capacity of 37.3 MW in Jaisalmer.

17.24 RSMML is planning to invest around Rs. 60000 lacs during the Eleventh Five Year Plan. The project proposed to be taken up by the company during the Eleventh Five Year plan are as under:

- **Wind Power Project:** The company has already installed wind mills having power generation capacity of 37.3 MW in Jaisalmer. The company is encouraged with the performance of the windmills in generating the green power and deficiency of power in the state. RSMML is planning to add 10-15 MW wind power generation capacity every year, on which a sum of Rs. 29900 lacs would be spent by the company in next five years. It will enhance the power availability in the state without polluting the environment.
- **Land Acquisition for Lignite Projects:** RSMML is planning to invest a sum of Rs. 2500 lacs for this purpose.
- **Geological Exploration work:** The company is proposing to invest a sum of Rs. 2500 lacs for this purpose in next five years.
- **Jhamkotra Mine Development:** The company is proposing to invest a sum of Rs. 2900 lacs for this purpose in next five years.
- **Infrastructure Development for lignite:** The company is proposing to invest a sum of Rs. 2400 lacs for this purpose in next five years.
- **850 TPD DAP Project at Kapasan, Chittorgarh in joint venture with RCF (Rashtriya Chemical Fertilizers Ltd.)** The company is proposing to invest a sum of Rs. 6500 lacs for this purpose in next five years.
- **Refinery/Oil/Gas Project:** The company is proposing to invest a sum of Rs. 7500 lacs for this purpose in next five years.
- **RSMML Foundation:** The company is proposing to invest a sum of Rs. 2500 lacs for this purpose in next five years.
- **Bio-diesel plant and cultivation as part of environment management exercise:** The company is proposing to invest a sum of Rs. 1400 lacs for this purpose in next five years.
- **Mineral Beneficiation Projects for Gypsum, Clay etc.:** The company is proposing to invest a sum of Rs. 1900 lacs for this purpose in next five years.

PETROLEUM

Status of Hydrocarbon Resources & Production in Rajasthan

17.25 Rajasthan is increasingly dependent on conventional energy resources like Electricity, Petroleum, Coal, etc. The indigenous resource for this conventional energy has been very limited, however, for the first time in the history of Rajasthan, good quality of oil reserves in Barmer Sanchore Basin in Rajasthan by M/S Cairn Energy & gas reserves by ONGCL in Jaisalmer Basin has been discovered. The State has now

emerged on the Oil Map of India with these discoveries. Hydrocarbon resources in Rajasthan are as per below:

Hydrocarbon Resources in Rajasthan

(As on 1-4-06)

Basin	Hydrocarbon		Reserves		Product
			Prognostic	Provided	
Barmer Sanchore Basin	Crude Oil (API Range 22° to 56°)		380 MT (As per DGH)	480 MT	1-2 Fields Commence from Oct. 2006
	Natural Gas		Large	3000-6000 MCM (Flow rate 1.0 MMS (CMD))	Exploration Underway
Bikaner Nagaur Basin	Crude Oil	Heavy	250 MT (OIL + OEG)	14.60 MT	Pilot studies underway
		Bitumen		33.20 MT	
Jaisalmer Basin	Natural Gas	Lean		11790 MCM	0.8 MCM/Day
		High		Not Assessed (flow rate 60000-70000 M ³ /Day) (Anticipated 6-7 TCF)	Exploration for reservoir extent underway

17.26 Cairn energy carried out exhaustive exploration in Barmer Sanchore Basin. The company has drilled 125 wells till date & has discovered oil & gas in 17 fields proving about 480 MT of inplace crude oil reserves and 3000 to 6000 million cubic meter inplace gas reserves.

17.27 National Oil Companies like OIL & ONGC have discovered extensive reserves of lean gas, Heavy Oil & Bitumen. ONGC has discovered 2590 million cubic meter of gas reserves in 6 gas fields namely Manhera Tibba, Ghotaru, Bankia, Bakhriwala, Sadewala & Kharatar. OIL has discovered 9200 million cubic meter of gas reserves in 3 gas fields namely Tanot, Dandewala & Baggi Tibba. Recently, ONGCL has discovered good quality of gas in Chinnewala Tibba area of South Kharatar, District Jaisalmer. It has potential to produce about 1 lac cubic meter per day. Similarly, OIL has also discovered good quantity of gas in Dandewala areas, District Jaisalmer, which can produce 60000 cubic meter of gas per day.

17.28 Ultra Heavy oil in Baghewala area of Jaisalmer district was discovered in 1991. Subsequently 10 wells were drilled in the area and reserves of 14.60 MT heavy oil & 33.2 MT Bitumen were proved in the area. But due to lack of technology to produce this heavy oil resources, commercial production could not be made. This block was again taken up by OIL for R & D Project for which they have entered into an

agreement with PDVSA of Venezuela to develop and exploit the heavy oil resource. It is expected that commercial production of heavy oil may start in next 2 or 3 years if the pilot scale operations proves economically viable. Presently, pilot scale operations are going on to establish the producibility of heavy oil & Bitumen.

17.29 The Government of Rajasthan is developing an alternative source for power generation by the way of Coal Bed Methan (CBM) gas entrapped in deep-seated lignite and Syn-gas generated through in situ lignite gasification from Barmer Sanchore Basin & Bikaner Nagaur Basin. For this Petroleum Department has undertaken R&D project for evaluating CBM resources in Rajasthan, particularly in Barmer & Bikaner districts. Based on this, two blocks have been awarded to Reliance Industries through competitive CBM-II Global Bidding by Government of India.

17.30 An MoU has been signed between Government of Rajasthan & GAIL to carry out pilot scale operations for under ground Lignite Gasification in Barmer Sanchore Basin.

Review of X Five Year Plan

17.31 The likely expenditure on petroleum sector during Tenth Five Year Plan is Rs. 209.81 lacs against the outlay of Rs. 275.00 lacs.

17.32 Presently, production of about 8 lac cubic per day gas from Jaisalmer Basin is underway by Oil India Ltd & ONGC.

17.33 High quality gas reserves have also been discovered in Shahgarh area of Jaisalmer Basin, which have been equated with Miano & Swan Fields of Pakistan.

17.34 Geological Reservoir studies have been undertaken for the exploitation & development of heavy oil resource of Baghewala area in Jaisalmer.

17.35 CBM resource potential is prognosticated to be about 183 BCM in deep-seated lignite of two blocks of Barmer-Sanchore Basin based on the R&D work carried out by this Directorate. These blocks have been awarded to Reliance in CBM-II bidding. Besides, there is a vast Potential of generating syn-gas through UCG from deep-seated lignite seams (<500 m) has been explored.

17.36 Entered into Gas Co-operation Agreement with GAIL (India) Limited on 10.09.2003 to conduct a comprehensive gas sector study jointly to access gas demand potential in industrial, residential, transport & power sectors.

17.37 With the efforts of the State Government 5 blocks for Oil & Gas and 2 blocks for CBM have been awarded in different rounds of NELP & CBM bidding. 5 more blocks for Oil & Gas under NELP –VI and 2 blocks for CBM-III are in process for awarding.

Vision of Eleventh Five Year Plan

Hydrocarbon Production Strategy in Rajasthan

17.38 The major strategy for production of Hydrocarbon in Rajasthan is as under:

- Production of Crude Oil from Barmer-Sanchore Basin
- Out of 18 fields discovered, 2 fields will be put on commercial production during 2007. 3 fields shall be put on production by 2008-09. Rest of the fields shall come into force after declaration of its commerciality by Government of India.
- Development of Heavy Oil Resource In Rajasthan
- Pilot study is being undertaken by OIL with PDVSA Company of Venezuela to establish producibility of heavy oil resources from Baghewala area of Distt. Jaisalmer.
- Exploitation of Natural Gas Resources in Barmer-Sanchore Basin
- Optimum Production of lean gas reserves by blending with high gas from 4 PML areas by ONGCL and its use for generation of power (Anticipated Capacity 110 + 100 MW).

17.39 Production of Gas by Cairn Energy from Raageshwari Field for the generation of Power (Anticipated Capacity 50 MW) for captive use.

Refinery Prospects & Socio-Economic Development

17.40 Looking to the availability of large crude oil reserves and pipeline network in Rajasthan, MRPL, a subsidiary of ONGCL have shown interest in establishing wellhead refinery of 7.5 MMTPA in Barmer area.

17.41 This will lead to socio-economic development in the western region by way of petro-chemical industries, ancillary units, human resource development & infrastructure development.

Revenue Generation & Financial Resources

17.42 Petroleum Sector shall be the important source of revenue for tax & non-tax in the State in coming years.

17.43 Initial revenue by way of Royalty during 2007-08 shall be Rs. 34.00 crore, which will be enhanced to Rs. 216 crore during 2008-09 and finally it will go upto Rs. 1847 crore by the end of 2011-12. The Sales Tax Revenue will also start from Rs. 22 crore during 2007-08 and it will be enhanced to Rs. 152 crore by 2008-09 and it will go upto Rs. 1773.00 crore in the year 2011-12.

17.44 Efforts shall also be made for commercial development of discoveries of Natural Gas from the gas fields of Chinnewala Tibba & Shahgarh of District Jaisalmer and heavy oil of Baghewala, District Jaisalmer & Bikaner.

Financial Outlay & Strengthening of Petroleum Sector

17.45 The strength of Petroleum Directorate has to be increased to complete the channel of technical officers and ministerial staff. To ensure state participation in petroleum sector & to encourage public private participation, the creation of Rajasthan State Petroleum Corporation is under process. A sum of Rs. 460.00 lakhs is proposed for Eleventh Five Year Plan and Rs. 76.00 lakhs for Annual Plan 2007-08.