

Lesson-10

Mineral and Energy Resources

Introduction-

Mineral means substances obtained from earth through mining which have chemical and physical properties useful for human beings and have some economic value. They are called mineral resources. Physical and biological components play a very important role in their formation. That is why these have been classified as biotic and abiotic minerals such as coal, petroleum, natural gas etc. are biotic minerals and iron, manganese, mica etc. are under abiotic category.

India is rich in mineral resources. The geological structure of the country has provided many minerals. Out of the total mineral wealth of India 96% of mineral reserves are found in peninsular plateau, Arawali mountain regions, Brahmaputra valley, Himalayan regions and Southern coastal regions.

Minerals in India are divided into following categories on the basis of their physical and chemical properties

1. Metallic Minerals-

Minerals which contain some part of metal are called metallic minerals. It is further divided into two types :-

(a) Ferrous Minerals-

Minerals having iron content for example, iron ore chromite, pyrite, tungsten, cobalt, etc.

(b) Non-Ferrous Minerals-

Minerals devoid of iron contents for example, gold, silver, copper, zinc, bauxite,

magnesium.

2. Non-metallic Minerals-

Minerals which do not have metal contents are called Non-metallic minerals. Limestone, dolomite, mica, gypsum etc. are example of these.

Energy minerals are also included in the category of non-metallic minerals. These minerals give heat or energy. On the basis of their properties they can be divided into two types :-

(a) Fuel Minerals-

Mineral which are used as fuel material are called fuel minerals such as coal, petroleum, natural gas etc.

(b) Nuclear Power Minerals-

Minerals which give atomic energy are called nuclear power minerals. They include uranium, beryllium, thorium, limonite etc.

About 100 metallic and non-metallic minerals are found in India out of which there are 52 non-metallic, 10 metallic and 23 minor minerals- building material and 4 are fuel minerals which form 3.4% of Gross Domestic Production and 11% of industrial production.

Major Mineral Belts of India-

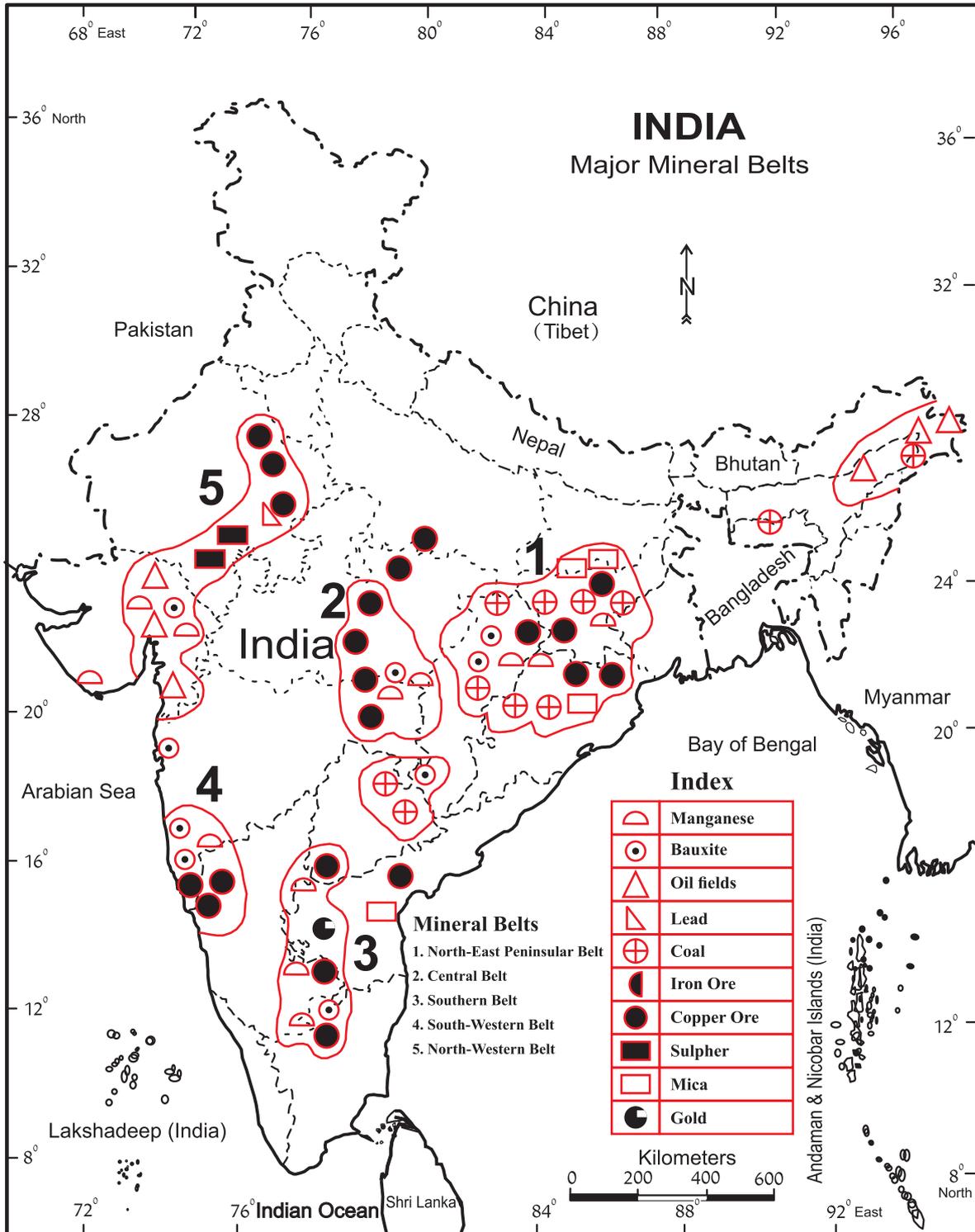
In India there is uneven distribution of mineral resources. In India there are five major mineral belts-

1. North-East Peninsular Belt - This belt is spread from Chota Nagpur Plateau to Orissa Plateau region. This belt is the most wealthiest mineral belt of India. In this belt there are large

reserves of coal, iron ore, manganese, mica, bauxite, copper and many other minerals.

2. Central Belt - This belt is extended in the parts of Chattishgarh, Madhya Pradesh, Andhra

Pradesh and Maharashtra. This is the second wealthiest mineral belt in India. Here minerals reserve of manganese, bauxite, lime stone, marble, coal, emerald, iron ore, mica etc. are found in good amount.



Map 10.1 : Major mineral belts of India

3. Southern Belt - This belt is spread in the areas of Karanatak plateau and high lands of Tamilnadu. Like North-Eastern peninsular belt this is also having good reserves of iron ore and bauxite but there are will poor deposits of coal, mica and copper minerals.

4. South Western Belt - This belt is extended in southern parts of Karnatak and Goa states. Here rich deposits of iron ore, garnet and clay are found.

5. North Western Belt - This belt is spread in the aravalli region of Rajasthan and adjoining areas of Gujarat. Here the reserves of non-ferrous metallic minerals like copper, lead, zink etc. are found with the deposits of uranium, mica, precious stone, gypsum, salt etc.

Major Minerals of India-

1. Iron ore- It is the backbone of modern industrial economy which is obtained from igneous rocks. India is the second largest country after Russia in the world in its reserves. Four types of iron ore magnetite, hematite, limonite and siderite are found in India. India has iron deposits of 2300 crore tons which is 20% of the world's availability. It includes magnetite (60-70% of iron element) 8% hematite (70-80% iron element) 85% and 7% of other kinds. Production and distribution of iron in India is as follows :-

Orissa- Out of the total production of India 22% is found in Orissa. Hematite type of iron ore deposits are in Mayurganj, Sundargarh, and Keonjhar districts. It is found in Gurumhisim, Badam hills are in Mayurganj district and also in Baspani, Thakurani, and Kiruburu in Keonjhar district. Iron ore is exported to Japan and other countries from Pardadeep and Vishakhapatnam ports.

Karnataka- 25% of total reserves and 26% of iron ore production is obtained from this state. Here Hematite type of iron ore is found is Bellari, Chickmangloor, Chitradurg and Shimoga districts. It is also found in Bababudan hills, Kemangudi, Kadremukh, and in Chickmangloor districts. This iron ore is refined in Bhadrawati and Vijaynagar

plants.

Chhattisgarh- It is the third largest state in production of iron. 18% iron ore of total reserves and 20% of total production is obtained from this state. Reserves of hematite type of iron-ore are found in Bastar, Durg, Danwtewada. Bilaspur and Rajnandgam districts. It is found in Dhalli- Rajhara range, Bailadia Ravghat, and Jagdalpur regions of these districts. This iron-ore is refined in Bhilai plant and the remaining iron ore is exported to Japan from Vishakhapatnam port. Bailadia mine is the largest iron ore mine in Asia.

Goa- It is the fourth largest iron-ore producing state of the country 11% of total production of the country is obtained from this state. Here limonite and siderite type of inferior quality of iron-ore with impurities along with manganese is found.

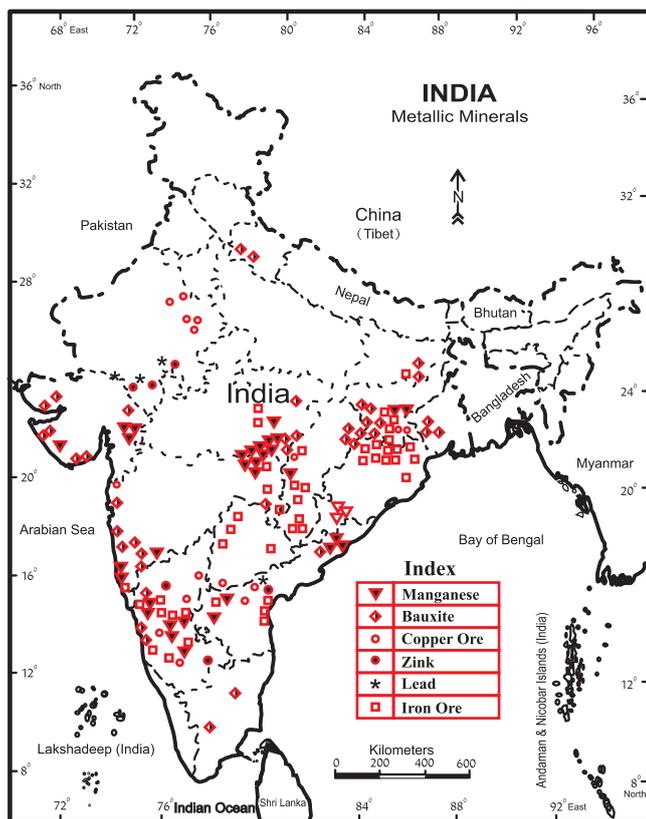
The reserves of iron-ore here are found in Pirna-Adelepale-Asnora, Kudnem-surla, Tosilla-Dongarwado areas. Entire iron obtained from here is exported via Marmagoa port.

Jharkhand- It is the fifth largest iron-ore producing state in the country where 10.4% of total iron-ore is produced. Reserves of iron-ore are present in Singhbumei and Palamu districts. It is obtained from in Nauamundi, Gua and Daltonganj areas of these districts, This iron-ore is refined in Kulti and Baranpur plants. Mining of iron-ore started first of all in this district.

In other states it is obtained from Telangana, Salem in Tamil Nadu, Udaipur, Jaipur, Bhilwara, and Alwar in Rajasthan and Mahendragarh in Haryana . It is third most important export item in foreign trade. It is exported to Japan and some European countries.

2. Copper- It is found in metamorphic rocks of Dharwar and Arawali ranges in the form of sulphite and charcairite ore which is used in electric, wireless, Air condition and Freeze, utensil and various other industries. India has 01% of world's copper deposits. 95% of copper of India is obtained from Balaghat and Betul in Madhya Pradesh Singhbhoomi, Hazaribagh, and Palamu in

Jharkhand, Jhunjhunu, Alwar, Rajsmand, Bhilwara, and Udaipur, districts in Rajasthan, Guntur, and Kurhul, in Andhra Pradesh and Chitradurg district in Karantaka. Kalihan mines. Mandhan mine, Mosabani mine, Rakha etc. are famous copper mines in India. Hindustan Copper Limited is the only public sector company authorised to refine copper in India. Due to less production, India imports copper from foreign countries to meet its demand.



Map 10.2 : Important metallic mineral of India

3. Bauxite- This ore is used in making aluminum and aluminum is used in electrical industry, machinery industry and for making utensils. In India it is obtained from lava rocks of Vindhyaachal and Dharwar range.

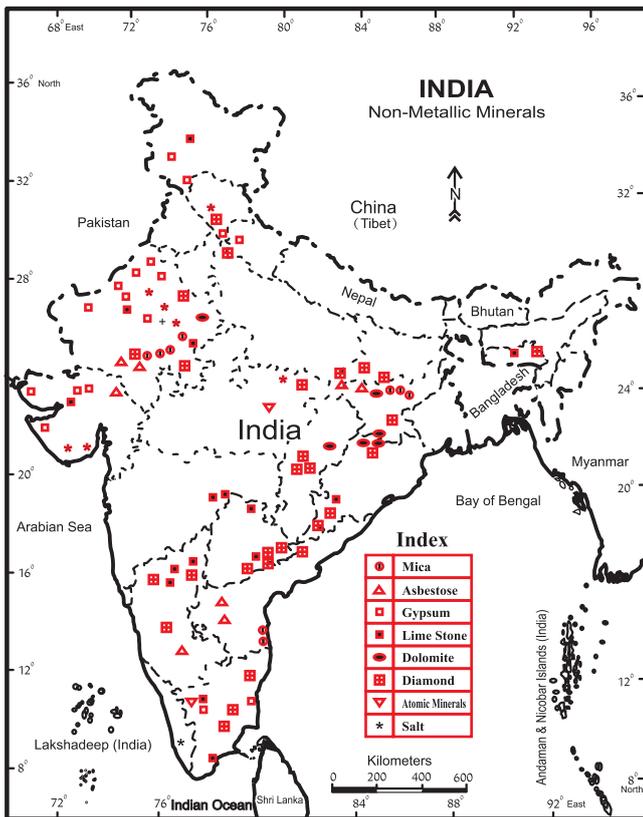
India is the fifth largest country in the world from bauxite deposit point of view. 95% of bauxite deposits are found in Korput and Kalahadi districts in Orisa, Ranchi, Palamu, Giridih, Lohardaga, in Jharkhand districts Balaghat, Katoni and Jabalpur, in Madhya Pradesh, Kheda, Jamnagar, Junagarh

and Kachha district in Gujarat, Sarguja, Raipur and Bilaspur in Chhattisgarh, Kolhapur, Ratongiri, Pune, in Maharashtra and in other states of Karnataka, Goa and Tamil Nadu. 80% bauxite in the country is used in making aluminum. 60% of production is consumed in India. Rest of the produce is exported to European and Gulf countries.

4. Lead and Zinc- It is present in sedimentary rocks of Arawali range in mixed form of galena. Zinc is used in chemicals, dry battery and anti rusting work. Lead is also used in making brass, military equipments, railway engines and many other articles. 95% of lead and zinc deposits is present and production is done in Chittore, Rajsmand, Bhilwara and Udaipur districts in Rajasthan. Refining work of lead and zinc is done by a public sector company Hindustan Zinc Limited and Jawar mines Udaipur, Other deposits are present in Andhra Pradesh, Jharkhand, Orissa and Tamil Nadu.

5. Mica- India is at the first place in mica production in the world. 70 to 80% mica of the world is mined in India. Here muscovite (ruby mica) and biotite (pink mica) is obtained from ingenious and metamorphic rocks. It can resist high temperature and is of non-conductive shining metal with foliation layers. It is used in electrical industry, aircraft industry, and military equipment industry. Mica in India is in protected state because there is less consumption of mica deposits. Mica deposits are present in Nellore, Guntur, Cuddapah, in Andhra Pradesh (first in country), Bhilwara, Ajmer, Jaipur, Udaipur and Tonk in Rajasthan (second in country), Hazaribag, Kodarma, Giridih, Dhanbad, Bokoro and Palamu in Jharkhand (third in country) Aurangabad, Gaya, Nawada and Begusarai in Bihar, Madurai and Coimbatore, in Tamil Nadu and Balaghat and Chhindwara in Madhya Pradesh.

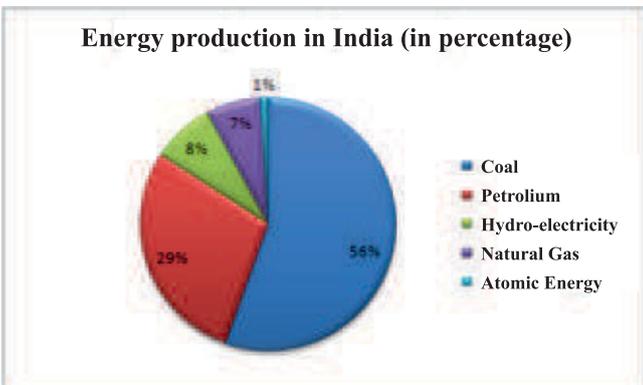
Other than mica there are reserves of Lime stone, Dolomite, Asbestos, Gypsum etc. Non-matellc minerals in India. India is leading producer of many of these non-matallc minerals.



Map 10.3 : Important non-metallic mineral of India

Energy Minerals-

From these minerals be obtain heat and energy. For the industrial development of any country energy is considered as its primary need. The natural sources of energy minerals are fossil material and atomic elements. It is obtain from coal, petroleum, natural gas and atomic energy traditionally and used in industries, agriculture, transportation and at household level to the modern life style.

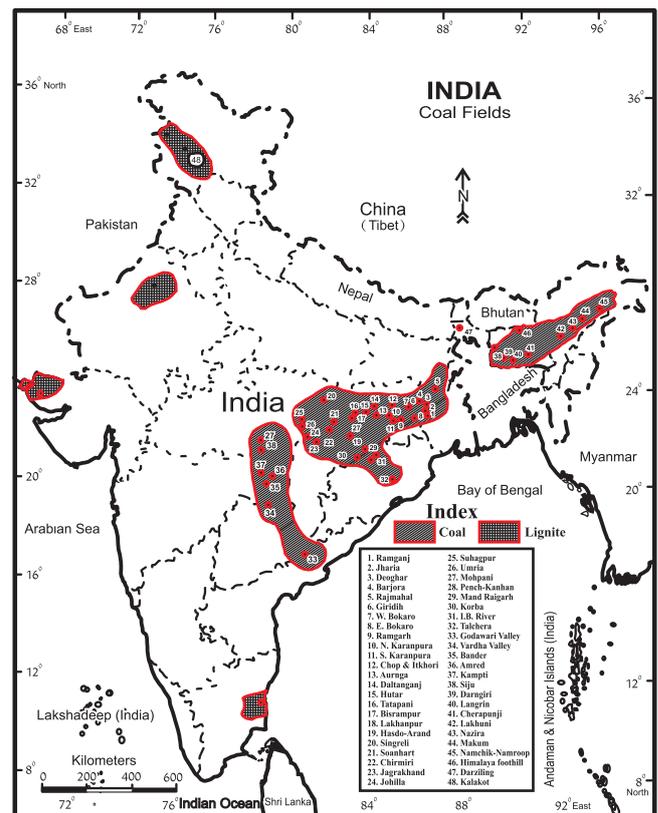


Diag. 10.1 : Energy production in India

The production and distribution of these resources of the country is as follows-

1. Coal- India is the third largest coal producing country in the world after China and America. In India, coal was found first in Raniganj in 1774. After this its development started in 19th century. Its discovery and mining began in other parts of the country. Coal has been categorized on the basis of carbon contents as-Anthracite (80-95%) Bituminous (40-80%) Lignite (40-55%), Piet (< 40%) coal. In India 98.5% deposits are present and 99% production of coal is obtained from sedimentary rocks of Gondwana period. It is physically present in Mahanadi valley region, Damodar valley, Son-valley, Godawari-Wardha region and in five river valley region of Brahmani, Indrawati and Koel. Here bituminous coal is found in the form of thick layers of 10 m. to 30 m.

Lignite type of inferior quality coal of tertiary period built about 15 to 60 lakh years ago is found in mixed form. The deposits of such type of coal are found in Assam, Meghalaya, Arunachal



Map 10.4 : Major coal fields of India

Table 10.1 : Coal reserves, production and production areas in India

Name of the State	Percentage of total reserves of the county	Percentage of total production of the county	Major regions
Jharkhand	28	22	Jharia, Bokaro, Rajmahal, Deoghar, Daltonganj
Orissa	24	16	Dhenkanal, Sambalpur, Telcher, Sundargarh, Brahmani valley
Chhattisgarh	16	15	Sarguja, Bilaspur, Ramgarh, Korba, Bishrampur
W. Bengal	11	6	Raniganj, Bardhaman, Balkonda, Purulia, Veer Bhumi, Darjeeling
Madhya Pradesh	8	13	Shahdol, Chhindwara, Narsingpura, Betul
Telangana & Andhra Pradesh	7	9	Khammam, Adilabad, Warangal, Singreli, Challapalli
Maharashtra	4	6	Chandrapur, Yavatmal, Nagpur
Uttar Pradesh	0.50	0.15	Sonbhadra district
Other States	2	6	Eastern states and rest of India
Tertiary Coal	0.50	7	Makum, Nazira in Assam, Palana, Kapurdi and Barsingsar in Rajasthan and Neyveli in Tamil Nadu
Total Coal in India	100	100	

Table 10.2 : Coal production in India

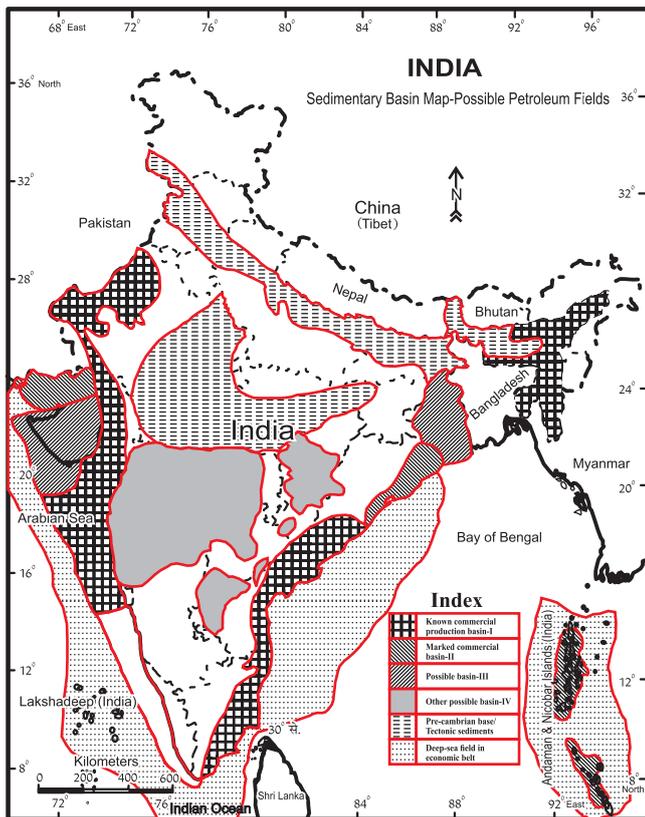
Year	Coal Production (in ten lakh tonnes)
2012–13	556.40
2013–14	565.77
2014–15	612.44
2015–16	447.48

Pradesh, Himachal Pradesh, Nagaland and Rajasthan.

Lignite coal is found in Rajasthan which is present with limestone at Kapurdi, Jalippa, Giral, Bhadkha, Gunga and Shiv in Barmer, Barsingsar, Palana, Gudha, Deshknok in Bikaner, Merta, Kasanu, Kuchera and Matasukh in Nagore district. This lignite in Rajasthan is used in thermal power plant.

2. Petroleum Products- Petroleum is today the pivot of transport facilities and industrial

development of any country. In India petroleum is spread in 17.2 lakh square km. area and this sponge like fossil mineral oil is found in vast sedimentary rocks. It is formed by immersing of vegetation and living organism in oceanic parts and chemical and thermal processes. It is found below the reserves of natural gas and used in transport and machinery sectors. Its reserves are found in Brahmaputra valley and Surma valley in Assam, Sundervan delta in West Bengal, Eastern coastal parts of Orissa, Rajasthan. Saurashtra, Himalayan Tarai, regions, North and central Gujarat, Mumbai Basin,



Map 10.5 : Possible petroleum fields of India

Godawari and Kaveri delta regions, Mumbai Basin and Bombay High in Arabian sea.

Major Regions of Petroleum Reserves in India-

In India 90% of total petroleum production is obtained from Maharashtra, Assam, Gujarat and Rajasthan. This crude oil is sent to 24 large refineries of the country through pipelines to Gohati, Baroni, vadodara, Haldia, Mathura, Digboi and Jamnagar. In the same way the reserve of natural gas are found in Tamil Nadu, Himachal Pradesh, Punjab, Rajasthan, West Bengal, Tripura, and Arunachal Pradesh. They are managed by Gas Authority of India. This company provides total natural gas of the country for electricity production (38%), fertilizer manufacture (33%) and remaining for other industries and domestic use. Out of total production of the country, 91% is produced in Maharashtra, Gujarat, Assam and Rajasthan.

Reserves of petroleum in Rajasthan are found in Bikaner, Barmer, Jaisalmer, and Ganganagar districts in 12 blocks In which large

Table 10.3 : Major Regions of Petroleum Reserves in India

Name of the State	Major Regions
Assam	Digboi, Lakhimpur, Hansa Pug, Badarpur, Masimpur, Patharia, Nahar Katia, Hugriganj, Moran
Gujarat	Ankleshwar region, Lunel region, Kalol, Mehsana and in Aliabet Island in the Arabian Sea
Maharashtra	Bombay High in Arabian Sea and Vasai off shore region
Rajasthan	Bikaner, Jaisalmer, Barmer
Andhra Pradesh	Kelalur and Amalapuram in Godvari Basin
Tamil Nadu	Madnam coast, Nagapattinam, Kovikollam

Table 10.4 : Production of petroleum products in Rajasthan

Year	Crude Oil production (MMT)	Percentage Increase	Natural Gas production (BCM)	Percentage Increase
2010-11	37.684	11.85	52.21	9.94
2011-12	38.090	1.08	47.559	-8.92
2012-13	37.862	-0.60	40.679	-14.47
2013-14	37.788	-0.19	35.407	-12.96
2014-15	37.461	-0.87	33.656	-4.95
2015-16	37.046	-1.11	35.28	4.83

reserves are present in Jaisalmer block, Sanchor-Gudhamalani block, Bikaner- Nagore block, Bikaner-Ganganagar block. Cairn India, a foreign company has dug 91 wells in Gudhamalani and Sanchor blocks of which commercial production has started in 12 wells from 2005.

Atomic Energy Minerals- Uranium-338, 235 and 233, Plutonium-239 Thorium, Beryllium and Zircon minerals are used as atomic energy. one ounce of uranium can produce energy equal to 100 metric tons of coal.

Atomic Energy Commission was founded in 1948 and then 17 atomic reactors were established in India. These atomic reactors generate 4800 mw. electricity. In atomic reserves Uranium reserves are found in Dharwad and archean rocks, Singbhum in Bihar, in pegmatite rocks in mica regions of Rajasthan in monazite rocks in coastal parts of Kerala. Thorium reserves

are present in the sands of Kerala and Bihar, deposits of Eliminite reserves are present in the sands of Kerala, and Beryllium reserve are present in Rajasthan, Bihar, and Andhra Pradesh.

Minerals in Rajasthan-

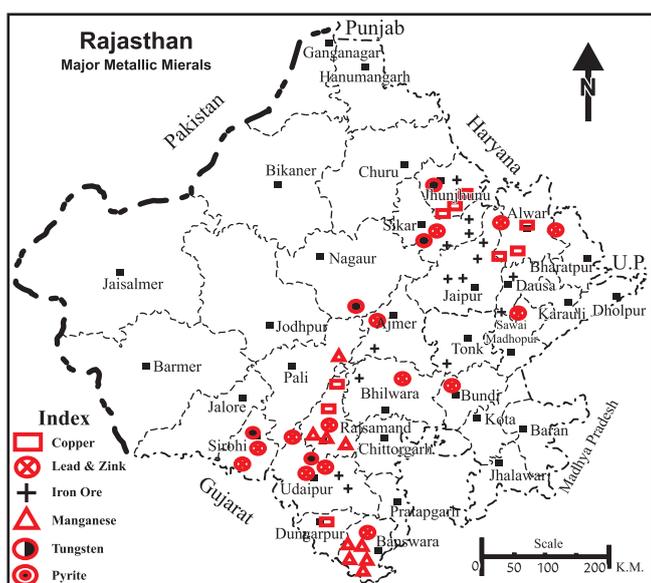
Rajasthan is known as 'the museum of minerals'. About 79 types of minerals are found in Rajasthan, out of which 44 kinds are large 23 small and 12 are micro minerals. From availability point of view Rajasthan is the third largest mineral producing state in the country after Madhya Pradesh and Chhatisgarh. Some cities and towns in Rajasthan are famous for minerals like copper city (Khetri), marble city (Makrana). Rajasthan has monopoly in deposits of some minerals like lead zinc, silver, wollastonite, jasper, fluorite, gypsum, asbestos, rock-phosphate, tungsten and garnet. The distribution of minerals in Rajasthan is given in a following tables and diagrams.

Table 10.5 : Major mineral producing areas in Rajasthan

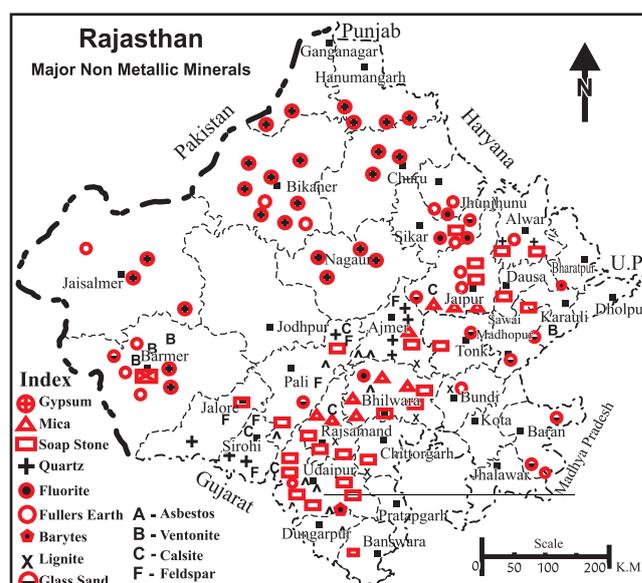
Mineral	Producing Regions	Major Districts
Copper	Khoh Dariba (Alwar), Debari-Salumbar (Udaipur), Bhim-Railmagra (Rajsamand), Bidasar (Bikaner), Khetri-Singhana (Jhunjhunu)	Jhunjhunu
Lead and Zinc	Zawar, Rajpura-Debari (Udaipur), Rampura-Agucha (Bhilwara), Pur Banera belt, Gudha Kishori Das	Bhilwara and Udaipur
Iron ore	Morija-Banol (Jaipur), Dabla (Jhunjhunu), Neemla-Raisela, Nathra ki Pol, Thur-Hunder, Banswara and Bhilwara	Jaipur
Mica	Bhilwara, Ajmer, Tonk, Jaipur, Sikar	Bhilwara
Tungsten	Degana-Bhakri (Nagaur), Ajmer, Pali, Sirohi	Nagaur
Rock phosphate	Deccan Kotra and Jhamar Kotra (Udaipur), Birmania (Jaisalmer), Sikar, Jaipur, Pali	Udaipur
Gypsum	Jamsar and Lunkaransar (Bikaner), Goth-Manglod (Nagaur), Mohangarh and Nachna (Jaisalmer)	Nagaur
Garnet	Rajmahal and Kalyan Mines (Tonk), Sarwar and Kharkhari (Ajmer), Mahwa and Bageshwar (Bhilwara)	Tonk
Coal	Palana, Gurha, Barsingsar, Raneri-Hadla (Bikaner), Kapuradi, Jalipa and Girda (Barmer) and Merta (Nagaur)	Bikaner
Petroleum products	Gudamalani (Barmer), Jaisalmer, Ganganagar	Barmer
Natural gas	Shahgarh-Tanot, Manihari Tibba, Chimne Wala, Ghotaru and Ghamne Wala (Jaisalmer), Badhey Wala (Bikaner)	Jaisalmer

Table 10.6 : Copper reserves in Rajasthan

District	Region	Reserves (in Lakh metric tonnes)
Ajmer	Hanotia, Sear	5.0
Alwar	Bhagoni	1.42
Bhilwara	Pur-Dariba, Banera, Devpura, Devtalai	7.0
Chittorgarh	Wari, Akola	1.0
Jhunjhunu	Kolihan, Basawa, Dolamala, Chicholi, Tunda, Ankawali	105.0
Rajsamand	Majera, Karauli, Gopakura	0.48
Sirohi	Golia, Pipela, Deri, Basantgarh	4.2
Udaipur	Ajani, Bedawal ki Pal, Chani, Nandwel, Akola	4.2



Map 10.6 : Metallic mineral in Rajasthan



Map 10.7 : Non-metallic mineral in Rajasthan

Important Points

1. Minerals are substances containing physical and chemical properties obtained from land through mining. Minerals useful for mankind are called mineral resources.
2. 96% of mineral deposits of the country are found mainly in Peninsular plateau, Aravali

mountain ranges, Brahmaputra valley, Himalayan region and Southern coastal areas.

3. Minerals in India have been divided on the basis of their chemical and physical properties into ferrous and non-ferrous minerals.
4. Iron is obtained from igneous rocks. India is the second largest country in the world after Russia from deposit point of view.

5. Copper is found in Dharwad and Arawali mountain ranges in the veins of metamorphic rocks as sulphite and charcopyrite ore Kohhan Mine, Mandhan mine Mosabane mine and Rakha mine are famous mines for copper.
6. Highest mica production in the world is done in India. Muscovite (ruby mica) and biotite (pink mica) is obtained from igneous and metamorphic rocks.
7. 75% deposits and production of lead and zinc in the country is carried out in Rajsamand, Bhilwara and Udaipur districts of Rajasthan.
8. In India, coal is found in sedimentary rocks of Gondwana period. 98.5% of total coal deposits are found and 99% production is done here.
9. Petroleum products are found in sponge like form of sedimentary rocks. It is formed by immersion of vegetation and living organism in oceanic parts and chemical and thermal processes.
10. Reserves of petroleum products are found in 12 blocks in Bikaner, Barmer, Jaisalmer and Gangnagar districts.
11. Uranium 358, 235 and 233 plutonium-239 and thorium, beryllium, zircon minerals are used in atomic energy.

EXERCISE

Very Short Answer Type Questions-

1. In how many forms are Indian minerals categorized?

2. What are fuel minerals in India ?
3. What is the meaning of minerals ?
4. What type of iron-ores are found in India ?
5. In which districts of Rajasthan are fuel minerals found?
6. Which ores of mica are found in India ?
7. Which minerals are atomic minerals ?
8. What do you mean by fossil fuels ?

Short Answer Type Questions-

1. Describe the situation of minerals in India.
2. Describe the distribution of bauxite in India?
3. Describe the distribution of lead and zinc in India.
4. Describe the distribution of mica in India.
5. Describe the distribution of copper in India.
6. Describe about the distribution of lignite coal in Rajasthan.

Essay Type Questions-

1. Describe the distribution of iron ore in India
2. Illustrate the contribution of minerals in Indian economy.
3. Describe the distribution of petroleum in India.
4. Illustrate the distribution of coal in India.
5. Mark the following on the map of India.
 - (a) Coal regions of India
 - (b) Major minerals of Rajasthan