

India-People and Economy

Chapter-7 Mineral and Energy Resources

A mineral is a natural substance of organic /inorganic origin with definite chemical and physical properties.

Types of minerals resources

On the basis of chemical and physical properties, minerals may be grouped under two main categories of metallics and non-metallics

1. **Metallics minerals** - metallic minerals are the sources of metals. Iron ore, copper, gold produce metal and are included in this category. Metallic minerals are further divided into ferrous and non-ferrous metallic minerals
 - a. **Ferrous minerals**- All those minerals which have iron content are ferrous such as iron ore
 - b. **Non-ferrous minerals**- All those minerals which do not have iron content are non-ferrous such as copper, bauxite, etc.
2. **Non-metallic minerals**- Non-metallic minerals are either organic in origin such as fossil fuels also known as mineral fuels which are derived from the buried animal and plant life such as coal and petroleum. Other type of non-metallic minerals are inorganic in origin such as mica, limestone and graphite, etc.

Characteristics of Minerals-

- a. These are unevenly distributed over space
- b. There is inverse relationship in quality and quantity of minerals i.e. good quality minerals are less in quantity as compared to low quality minerals
- c. All minerals are exhaustible over time. These take long to develop geologically and they cannot be replenished immediately at the time of need

Distribution of Minerals

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- Most of the metallic minerals in India occur in the peninsular plateau region in the old crystalline rocks
 - Over 97 % of coal reserves occur in the valleys of Damodar, Sone, Mahanadi and Godavari
 - Petroleum reserves are located in the sedimentary basins of Assam, Gujarat and Mumbai High i.e. off-shore region in the Arabian Sea

The North-Eastern Plateau Region

- This belt covers Chotanagpur (Jharkhand), Orissa Plateau, West Bengal and parts of Chhattisgarh
- It has variety of minerals viz. iron ore coal, manganese, bauxite, mica

The South-Western Plateau Region

- This belt extends over Karnataka, Goa and contiguous Tamil Nadu uplands and Kerala
- This belt is rich in ferrous metals and bauxite. It also contains high grade iron ore, manganese and limestone
- This belt packs in coal deposits except Neyveli lignite
- Kerala has deposits of monazite and thorium, bauxite clay
- Goa has iron ore deposits

The North-Western Region

- This belt extends along Aravali in Rajasthan and part of Gujarat and minerals are associated with Dharwar system of rocks
- Copper, zinc have been major minerals
- Rajasthan is rich in building stones i.e. sandstone, granite, marble
- Dolomite and limestone provide raw materials for cement industry. Gujarat is known for its petroleum deposits
- The Himalayan belt is another mineral belt where copper, lead, zinc, cobalt and tungsten are known to occur
- They occur on both the eastern and western parts
- Assam valley has mineral oil deposits
- Oil resources are also found in off-shore-areas near Mumbai Coast (Mumbai High)

Ferrous Mineral

Ferrous minerals such as iron ore, manganese, chromite, etc., provide a strong base for the development of metallurgical industries

Iron ore

- India has the largest reserve of iron ore in Asia
- The two main types of ore found in our country are haematite and magnetite
- It has great demand in international market due to its superior quality
- The iron ore mines occur in close proximity to the coal fields in the north-eastern plateau region of the country which adds to their advantage
- The total reserves of iron ore in the country were about 20 billion tonnes in the year 2004-05
- About 95% of total reserves of iron ore is located in the States of Orissa, Jharkhand, Chhattisgarh, Karnataka, Goa, Andhra Pradesh and Tamil Nadu
- In Orissa, iron ore occurs in a series of hill ranges in Sundergarh, Mayurbhanj and Jhar
- The important mines are Gurumahisani, Sulaipet, Badampahar (Mayurbhaji), Kiruburu (Kendujhar) and Bonai (Sundergarh)
- Jharkhand has some of the oldest iron ore mines and most of the iron and steel plants are located around them
- Most of the important mines such as Noamundi and Gua are located in Poorbi and Pashchimi Singhbhum districts
- This belt further extends to Durg, Dantewara and Bailadila. Dalli, and Rajhara in Durg are the important mines of iron ore in the country
- In Karnataka, iron ore deposits occur in Sandur-Hospet area of Bellary district, Baba Budan hills and Kudremukh in Chikmagalur district and parts of Shimoga, Chitradurg and Tumkur districts
- The districts of Chandrapur, Bhandara and Ratnagiri in Maharashtra, Karimnagar, Warangal, Kurnool, Cuddapah and Anantapur districts of Andhra Pradesh, Salem and Nilgiris districts of Tamil Nadu are other iron mining regions
- Goa has also emerged as an important producer of iron ore

Manganese

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- Manganese is an important raw material for smelting of iron ore and also used for manufacturing ferro alloys. Manganese deposits are found in almost all geological formations
 - Orissa is the leading producer of Manganese
 - Major mines in Orissa are located in the central part of the iron ore belt of India, particularly in Bonai, Kendujhar, Sundergarh, Gangpur, Koraput, Kalahandi and Bolangir
 - Karnataka is another major producer and here the mines are located in Dharwar, Bellary, Belgaum, North Canara, Chikmagalur, Shimoga, Chitradurg and Tumkur
 - Maharashtra is also an important producer of manganese which is mined in Nagpur, Bhandara and Ratnagiri districts
 - The manganese belt of Madhya Pradesh extends in a belt in Balaghat-Chhindwara-Nimar-Mandla and Jhabua districts
 - Andhra Pradesh, Goa, and Jharkhand are other minor producers of manganese

Non-Ferrous Minerals

Bauxite

- Bauxite is the ore which is used in manufacturing of aluminium
- Bauxite is found mainly in tertiary deposits and is associated with laterite rocks occurring extensively either on the plateau or hill ranges of peninsular India and also in the coastal tracts of the country
- Orissa happens to be the largest producer of Bauxite
- Kalahandi and Sambalpur are the leading producers
- The other two areas which have been increasing their production are Bolangir and Koraput
- Jharkhand in Lohardaga have rich deposits
- Gujarat, Chhattisgarh, Madhya Pradesh and Maharashtra are other major producers
- Bhavanagar, Jamnagar in Gujarat have the major deposits
- Chhattisgarh has bauxite deposits in Amarkantak plateau while Katni-Jabalpur area and Balaghat in M.P. have important deposits of bauxite
- Kolaba, Thane, Ratnagiri, Satara, Pune and Kolhapur in Maharashtra are important producers
- Tamil Nadu, Karnataka and Goa are minor producers of bauxite

Copper

Copper is an indispensable metal in the electrical industry for making wires, electric motors, transformers and generators

- It is alloyable, malleable and ductile
- It is also mixed with gold to provide strength to jewellery
- The Copper deposits mainly occur in Singhbhum district in Jharkhand, Balaghat district in Madhya Pradesh and Jhunjhunu and Alwar districts in Rajasthan
- Minor producers of Copper are Agnigundala in Guntur District (Andhra Pradesh), Chitradurg and Hasan districts (Karnataka) and South Arcot district (Tamil Nadu)

Non-metallic

- Minerals Among the non-metallic minerals produced in India, mica is the important one
- The other minerals extracted for local consumption are limestone, dolomite and phosphate

Mica

- It is mainly used in the electrical and electronic industries
- Mica in India is produced in Jharkhand, Andhra Pradesh and Rajasthan followed by Tamil Nadu, West Bengal and Madhya Pradesh
- In Jharkhand high quality mica is obtained in lower Hazaribagh plateau
- In Andhra Pradesh. Nellore district produces the best quality mica
- In Rajasthan mica belt extends from Jaipur to Bhilwara and around Udaipur
- Mica deposits also occur in Mysore and Hasan districts of Karnataka, Coimbatore, Tiruchirapalli, Madurai and Kanniyakumari in Tamil Nadu, Alleppey in Kerala, Ratnagiri in Maharashtra, Purulia and Bankura in West Bengal

Energy Resources

- Mineral fuels are essential for generation of power, required by agriculture, industry, transport and other sectors of the economy
- Mineral fuels like coal, petroleum and natural gas (known as fossil fuels), nuclear

energy minerals, are the conventional sources of energy(exhaustible resources

Coal

- Coal is a one of the important minerals which is mainly used in the generation of thermal power and smelting of iron ore
- Coal occurs in rock sequences mainly of two geological ages, namely Gondwana and tertiary deposits
- About 80% of the coal deposits in India is of bituminous type and is of non-coking grade
- The most important Gondwana coal fields of India are located in Damodar Valley
- They lie in Jharkhand-Bengal coal belt and the important coal fields in this region are Raniganj, Jharia, Bokaro, Giridih, Karanpura
- Jharia is the largest coal field followed by Raniganj
- The other river valleys associated with coal are Godavari, Mahanadi and Sone
- The most important coal mining centres are Singrauli in Madhya Pradesh (part of Singrauli coal field lies in Uttar Pradesh), Korba in Chhattisgarh, Talcher and Rampur in Orissa, Chanda–Wardha, Kamptee and Bander in Maharashtra and Singareni and Pandur in Andhra Pradesh
- Tertiary coals occur in Assam, Arunachal Pradesh, Meghalaya and Nagaland
- It is extracted from Darangiri, Cherrapunji, Mewlong and Langrin (Meghalaya); Makum, Jaipur and Nazira in upper Assam, Namchik – Namphuk (Arunachal Pradesh) and Kalakot (Jammu and Kashmir)
- The brown coal or lignite occur in the coastal areas of Tamil Nadu, Pondicherry, Gujarat and Jammu and Kashmir

Petroleum

- Crude petroleum consists of hydrocarbons of liquid and gaseous states varying in chemical composition, colour and specific gravity
- It is an essential source of energy for all internal combustion engines in automobiles, railways and aircraft. Its numerous by-products are processed in petrochemical industries such as fertiliser, synthetic rubber, synthetic fibre, medicines, vaseline, lubricants, wax, soap and cosmetics
- In Assam, Digboi, Naharkatiya and Moran are important oil producing areas

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- The major oil fields of Gujarat are Ankaleshwar, Kalol, Mehsana, Nawagam, Kosamba and Lunej. Mumbai High
 - There are two types of refineries in India: (a) field based. Eg. Digboi and (b) market based. Eg. Barauni
 - There are 18 refineries in India

Natural Gas

- The Gas Authority of India Limited was set up in 1984 as a public sector undertaking to transport and market natural gas
- Important gas reserves are in Tamil Nadu, Orissa and Andhra Pradesh, Tripura, Rajasthan and off-shore wells in Gujarat and Maharashtra

Natural Energy Resources

- Important minerals used for the generation of nuclear energy are uranium and thorium
- Uranium deposits occur in the Dharwar rocks
- Uranium ores are found in the Singhbhum Copper belt, Udaipur, Alwar and Jhunjhunu districts of Rajasthan, Durg district of Chhattisgarh, Bhandara district of Maharashtra and Kullu district of Himachal Pradesh
- Thorium is mainly obtained from monazite and ilmenite in the beach sands along the coast of Kerala and Tamil Nadu
- World's richest monazite deposits occur in Palakkad and Kollam districts of Kerala, near Vishakhapatnam in Andhra Pradesh and Mahanadi river delta in Orissa
- Atomic Energy Commission was established in 1948, progress could be made only after the
- Again it was established as a Atomic Energy Institute at Trombay in 1954 which was renamed as the Bhabha Atomic Research Centre in 1967
- The important nuclear power projects are Tarapur (Maharashtra), Rawatbhata near Kota (Rajasthan), Kalpakkam (Tamil Nadu), Narora (Uttar Pradesh), Kaiga (Karnataka) and Kakrapar (Gujarat)

Non-Conventional Energy Sources

- Fossil fuel sources, such as coal, petroleum, natural gas and nuclear energy use

exhaustible raw materials

- Sustainable energy resources are only the renewable energy sources like solar, wind, hydro-geothermal and biomass

Solar Energy

- Sun rays tapped in photovoltaic cells can be converted into energy, known as solar energy
- The two effective processes considered to be very effective to tap solar energy are photovoltaics and solar thermal technology
- Advantages of Solar thermal technology are
 - It is cost competitive, environment friendly and easy to construct
 - Solar energy is 7 % more effective than coal or oil based plants and 10 % more effective than nuclear plants
 - It is generally used more in appliances like heaters, crop dryers, cookers, etc.

Wind Energy

- Wind energy is absolutely pollution free, inexhaustible source of energy
- In Rajasthan, Gujarat, Maharashtra and Karnataka, favourable conditions for wind energy exist
- Wind power plant at Lamba in Gujarat in Kachchh is the largest in Asia
- Wind power plant is located at Tuticorin in Tamil Nadu

Geo thermal Energy

- Geothermal Energy is the thermal energy generated by the radioactive decay of materials in the earth's interior
- This energy is now considered to be one of the key energy sources which can be developed as an alternate source
- In India, a geothermal energy plant has been commissioned at Manikaran in Himachal Pradesh

Bio Energy

- Bio-energy refers to energy derived from biological products which includes agricultural residues, municipal, industrial and other wastes

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- Advantages of bio energy
 - Bioenergy is a potential source of energy conversion
 - It can be converted into electrical energy, heat energy or gas for cooking
 - It will also process the waste and garbage and produce energy
 - It improve economic life of rural areas in developing countries, reduce environmental pollution, enhance self-reliance and reduce pressure on fuel wood
 - One such project converting municipal waste into energy is Okhla in Delhi

Conservation of Mineral Resources

Steps to conserve mineral resources are-

- The alternative energy sources like solar power, wind, wave, geothermal energy are inexhaustible resource. These should be developed to replace the exhaustible resources
- In case of metallic minerals, use of scrap metals will enable recycling of metals
- Use of substitutes for scarce metals may also reduce their consumption
- Export of strategic and scarce minerals must be reduced, so that the existing reserve may be used for a longer period.