Chapter 5
Minerals and Energy Resources

- **Minerals**
  Minerals are naturally occurring substances that have a definite internal structure.
  - They are found in various forms and are used for a variety of purposes.
  - E.g., Diamond, limestone, fluoride, aluminium etc.

- **Rocks**
  They are a combination of minerals along with impurities. A rock can contain either a single mineral or a number of minerals.

- **Ores**
  An accumulation of any mineral mixed with elements. They are the source of minerals. Minerals are extracted from their ores by various processes.

- **Occurrence of Minerals**
  - **In igneous and metamorphic rocks**: Cracks, crevices, faults or joints called veins or lodes. E.g., Zinc, copper and lead.
  - **In sedimentary rocks**: Beds and layers as a result of deposition and accumulation. E.g., Coal, iron, gypsum and sodium.
  - **Decomposition of surface rocks**: In the form of residual mass containing ores. E.g., Bauxite.
  - **In sands of valleys**: As alluvial deposits called *placer deposits*. E.g., Gold, silver, tin and platinum.
  - **In oceans**: In diffused form. E.g., Salt, magnesium, bromine etc.

- **Distribution of Minerals in India**
  - Petroleum deposits: Gujarat and Assam
  - Non-ferrous minerals: Rajasthan
  - Coal, metallic minerals and non-metallic minerals: Peninsular plateau
Mine
It is a large area having an abundant quantity of mineral deposits that can be easily and economically extracted.

Ferrous Minerals

- Iron Ore
  - India is rich in iron ore deposits.
  - Ores
    - Magnetite: 70% iron content
    - Hematite: 50 to 60% iron content
  - Iron ore belts
    1. **Orissa–Jharkhand**: Badampahar, Mayurbhanj, Kendujhar, Singhbhum, Noamundi and Gua are the major mines.
    2. **Durg–Bastar–Chandrapur**: In Chhattisgarh and Maharashtra, high quality hematite ores are found that are exported to Japan and South Korea.
    3. **Bellary–Chitradurga–Chikmanglur–Tumkur**: In Karnataka, Kudremukh mine is the most important. It is a 100% export unit.
    4. **Maharashtra–Goa**: Ratangiri mines have rich deposits of iron ore.

- Manganese
  - Used in manufacturing
    1. Steel
    2. Bleaching powder
    3. Insecticides
    4. Paints
  - Largest producer: Orissa

Non-Ferrous Minerals

- India is not rich in non-ferrous minerals.

- Copper
  - India is deficient in copper.
  - Malleable, ductile and a good conductor of electricity.
  - Used in
    - Electrical cables
    - Electronics
    - Chemical industries
  - Largest producer: Balaghat mines in Madhya Pradesh produce 52% of India’s copper.
  - Singhbhum in Jharkhand and Khetri in Rajasthan are also important copper producing areas.

- Bauxite
  - An ore of aluminium.
  - Found in Amarkntak plateau, Maikal hills and Katni.
Largest producer: Orissa (45% of total bauxite production)
Koraput in Orissa has the largest reserve of bauxite in the country.

Non-Metallic Minerals

- Mica
  - Made of a series of plates.
  - It splits into thin sheets.
  - It can be black, green, red, yellow or brown in colour.
  - It has excellent di-electric strength, low power loss, good insulation and resistance to high voltage.
  - Used in electric and electronics industry.
  - Found in
    - Koderma, Gaya and Hazaribagh (Jharkhand)
    - Ajmer (Rajasthan)
    - Nellore (Andhra Pradesh)

Rock Minerals

- Limestone
  - Found in calcium carbonate sedimentary rocks.
  - Used in
    - Cement industry
    - Iron smelting
  - Largest producers are Andhra Pradesh, M.P. and Rajasthan.

Hazards of Mining

- Pulmonary diseases caused by dust and noxious fumes from mines.
- Inundation and fires in mines and collapsing of the mine’s roof pose a serious threat to miners’ lives.
- Mining contaminates nearby water sources owing to dumping of waste and slurry.
- Land degradation is caused as land is dug deep for mining. This makes it unsuitable for any further use after the mining site is abandoned.

Conservation of Minerals

Conservation of minerals is necessary because

- Mineral formation is an extremely slow process. Hence, rate of consumption should not overshoot the rate of replenishment.
- Only one percent of the total mineral deposits are accessible.
- Minerals are a limited resource and will get exhausted if not used judicially.
Coal
- Most abundantly available fossil fuel in India.
- Types of Coal
  - **Lignite**: Low grade brown coal. It is soft with high moisture content. Found in Neyveli in Tamil Nadu.
  - **Bituminous**: Most popularly used coal. Used in smelting iron in blast furnaces.
  - **Anthracite**: Highest quality coal.
    - Found in Damodar valley (West Bengal, Jharkhand).
    - Jharia, Raniganj and Bokaro are important coal fields.
    - Coal is also found in Meghalaya, Assam, Arunachal Pradesh etc.

Petroleum
- Found in the rocks of tertiary age.
- 63% petroleum comes from Mumbai High.
- 18% from Gujarat’s Ankleshwar oil field.
- 16% from Assam’s Digboi, Naharkatiya and Moram–Hugrijan oil fields.
- Digboi (Assam) is the oldest oil field of India.

Natural Gas
- Environment friendly owing to low carbon dioxide emissions.
- Used as CNG (Compressed Natural Gas) in vehicles.
- Found in
  - Krishna–Godavari basin
  - Gulf of Cambay
  - Andaman and Nicobar Islands
  - Mumbai High
- Transported through pipelines.
- Hazira–Vijaipur–Jagdishpur is the longest (1700 km) pipeline that transports gas from Mumbai High to Bassien.

Electricity
- **Hydroelectricity**: By the force of water.
Bhakra Nangal and Damodar valley projects generate hydroelectricity.

- **Thermal Electricity**: By coal, petroleum or natural gas.

- **Nuclear Energy**
  - Obtained from the nuclear fission of radioactive elements such as uranium and thorium.
  - Uranium and thorium are found in Jharkhand, Rajasthan and Kerala.
  - India has six nuclear power stations. These are
    - **Rawatbhata** (Rajasthan)
    - **Naraura** (Uttar Pradesh)
    - **Kalpakkam** (Tamil Nadu)
    - **Tarapore** (Maharashtra)
    - **Kaiga** (Karnataka)
    - **Kakrapar** (Gujarat)

- **Solar Energy**
  - India is a tropical country and has enormous potential for solar power.
  - Solar energy can be converted into electrical energy by using photovoltaic technology.
  - Largest solar plant in India: Madhapur (Gujarat)
  - Maximum potential: Rajasthan and Gujarat

- **Wind Power**
  - India is a wind super power.
  - Largest wind farm cluster: Tamil Nadu
  - Nagacoil and Jaisalmer have large wind farms.
  - Andhra Pradesh, Maharashtra, Gujarat, Kerala etc. have huge potential for tapping wind energy.

- **Biogas**
  - Produced from farm waste, animal and human waste.
  - Much effective than firewood, dung cakes and kerosene.
  - Used mainly for domestic consumption in rural areas.
  - Gobar gas plants are set up in rural areas which decompose organic waste and produce gas as well as provide manure for agricultural fields.

- **Tidal Energy**
  - Energy of the oceanic tides is used for producing electricity.
  - Gulf of Kuchchh (Gujarat) has a great potential for tidal energy.

- **Geo-Thermal Energy**
  - It is the energy produced by using internal heat of the Earth.
  - The hot springs in India are ideal sources for the generation of geothermal energy.
  - Manikaran (H.P.) and Puga valley (Ladakh) have geo-thermal power projects.
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