MINERALS AND ENERGY RESOURCES

CHAPTER COVERAGE

- ✦ Classification of Minerals
- Conservation of Minerals
- Conventional Sources of Energy
- Mode of Occurence of Minerals
 Energy Resources
- ♦ Non Conventional Sources of Energy
- ♦ Conservation of Energy Resources

♦ Natural Gas

MINERAL

A substance which is found in the earth's crust and which generally has a definite chemical composition.

♦ Importance of minerals :

- 1. Everything we use are made from minerals.
- 2. The country earns foreign exchange from the export of minerals.
- 3. Mining and extraction of minerals provide employment to the people.
- 4. Minerals like coal and petroleum are also the main source of power.

CLASSIFICATION OF MINERALS



Metallic Minerals :

We get metals from these minerals. metallic minerals further be divided into ferrous and non-ferrous.

1. Ferrous minerals : The minerals which contain Iron ore are called ferrous minerals. e.g. Iron Ore, Nickel, Cobalt etc.

- 2. Non Ferrous : Minerals containing metals other than iron ore are known as non-ferrous minerals. Gold, Silver, Platinum etc.
- **3. Precious Mineral :** The minerals which have very high economic value are known as Precious minerals e.g. Gold, Silver etc.

Non-metallic minerals : There are those minerals which do not contain metals. e.g. Mica, Salt, Potash, Sulphur etc.

Energy Minerals : The minerals which provide energy or power are known as energy minerals. e.g. Coal, Petroleum, Natural gas etc.

> MODE OF OCCURENCE OF MINERALS

1. Minerals in igneous and metamorphic rock :

The minerals are found in crevices, faults or joints. The smaller occurence are called veins and larger lodes. In most cases, they are formed when minerals in liquid/molten/gaseous form are force upwards through cavities towards the earth's surface. They cool and solidifies as they rise. Major metallic minerals like Tin, copper, Zinc and Lead etc are obtained from veins and lodes.

2. Minerals in decomposed rocks :

This involves the decomposition of surface rocks, and the removal of soluble constituents, leaving a **residual mass of weathered material** containing ores, Bauxite is formed this way.

3. Minerals in alluvial deposits :

Certain minerals may occur as **alluvial deposits** in sands of valley floors and the base of hills. These deposits are called "Placer deposits" and generally contain minerals which are not corroded by water. e.g. Gold, Silver Tin etc.

4. Minerals in sedimentary rocks :

In sedimentary rocks a number of minerals occur in **beds** or **layers**. They have been formed as a result of deposition, accumulation and concentration is horizontal stratas coal and some forms of Iron ore have been concentrated as a result of long periods under great heat and pressure. Gypsum, salt, Potash and Sodium salt are formed as a result of evaporation especially in arid regions.

5. Minerals is ocean water :

The minerals which are found in ocean water are called ocean water minerals e.g. common salt, Magnesium and Bromine are largely derived from ocean water.

6. Minerals are very unevenly distributed :

- 1. **Minerals in Deccan :** The peninsular rock contain most of the reserves of coal, metallic minerals, mica and many other non-metallic minerals.
- 2. **Minerals in western and eastern region of India :** Sedimentary rocks of the western and eastern parts of India. i.e., Gujarat and Assam have most of the petroleum deposits.
- 3. Minerals in Rajasthan : Rajasthan with the rock system of the peninsula, has reserves of many non-ferrous minerals.
- 4. Minerals in North India : North India is almost devoid of economic minerals.

Concentration of minerals in the ore, the ease of extraction and closeness to the market play an important role in affecting the economic viabiliity of a reserve.

> FERROUS MINERALS

Iron Ore :

1. Iron ore is the basic minerals.

2. India is rich in good quality Iron ores.

Varieties :

- 1. **Magnetite :** This is the best quality of Iron ore and contains about 72 % iron. It has excellent magnetic qualities, especially valuable in the electrical industry.
- 2. **Hematite :** It is most important industrial Iron ore in terms of quantity used. It contains 60 % to 70 % of pure Iron.
- 3. The major iron ore belts in India are :
- (a) Orissa Jharkhand belt : In Orissa high grade hematite ore is found in Badampahar mines in the Mayurbhaj and Kenduihar district. In Singhum district of Jharkhand hematite Iron ore is mined in Goa and Noamundi.
- (b) **Durg-Bastar-Chandrapur Belt :** This belt lies in Chhattisgarh and Maharashtra. Very high grade hematites are found in Bailadila range of hills in the Bastar district. It has the best physical properties needed for steel making. Iron ore from these mines is exported to Japan and South Korea via Vishakhapatnam.
- (c) Bellary Chitradurga Chilk Manglur Tumkur : The belt is in Karnataka. The Kudermukh mines are a 100 % export unit, known to be one of the largest in the world. The ore is transported as slurry through a pipeline to a port near Mangalore.
- (d) Maharashtra-Goa belt : The belt includes the state of Goa and Ratanagiri district of ores are not of very high quality. Iron ore is exported through Marmagao port.

MANGANESE

♦ Uses :

- 1. It is mainly used in the manufacturing of steel and ferro-mangnese alloy.
- 2. It is also used in manufacturing bleaching powder, insecticides and paints.
- 3. It increases the strength of steel.
- 4. It is also used for making glass and chemicals.

♦ Importance :

- 1. India is one of the leading producer of Manganese.
- 2. Manganese of India is of high quality and is in great demand.
- 3. Japan is the leading importer of India's Manganese.

Production :

Maharashtra, M.P., Orissa, Karnataka and Andhra Pradesh.

> COPPER

Properties :

- 1. The physical properties of copper make it valuable to industry.
- 2. Being malleable, ductile and a good conductor, It is mainly used in electrical cables, electronics and chemical industry.
- 3. India is critically deficient in the reserve and production of Copper.

♦ Uses :

- 1. It is useful in cooking utensils, radiation and refrigerators.
- 2. It is used in ranging from rain gauges to electronic system for rockets.
- 3. Large amount of Copper wires are used in various kind of electrical equipments.

Production :

Madhya Pradesh : 52 % (Balaghat mines)

Jharkhand : Singbhum, Hazaribagh and Chaibusa

Rajasthan: 1. Along the Aravali range.

2. Khetri - Singhana belt in Jhunjhunu

> BAUXITE

Bauxite is the main ore of aluminium. Bauxite deposits are formed by the decomposition of rock rich in aluminium silicates.

♦ Uses :

- 1. It is a good conductor of heat and electricity.
- 2. It is used to make cans for various beverages.
- 3. It can be pressed into a thin foil.
- 4. Because it is light and strong, it is used in space craft.
- 5. The bodies and parts of some automobilies are made from aluminium alloy.

Production :

- 1. Orissa 45 %
- 2. Gujarat 17 %
- 3. Jharkhand 14 %
- 4. Maharashtra 11 %
- 5. Other 13 % (Chattisgarh etc.)

India is the largest producer of bauxite in South Asia.

NON-METALLIC - MINERALS

♦ Mica :

It is a non metallic mineral. India is the largest producer of mica and it produces more than 60 % world's mica.

♦ Main Properties and Uses of Mica :

- 1. It is made up of a series of plates or leaves.
- 2. It can be converted into thin sheets.
- 3. It can be black, green, red yellow or brown.
- 4. It has excellent di-electric strength, low powerless factor, insulating properties and high resistance.
- 5. It is an indispensable mineral and is used in electric and electronic industries.

Production :

Northern edge : Chotta Nagpur Plateau, Koderma Gaya-Hazaribagh belt of Jharkhand.

Rajasthan : Ajmer

Andhra Pradesh : Nellore Mica belt.

ROCK MINERALS

♦ Lime Stone :

Uses and Properties :

1. It is associated with rocks composed of either calcium carbonate of magnesium, or mixture of these two.

- 2. It is found in sedimentary rocks.
- 3. It is used for variety of purposes.
- 4. It is a basic input in cement Industry.
- 5. It is also used by chemical, iron and steel industry.

♦ Distribution :

Madhya Pradesh, Andhra Pradesh, Rajasthan, Tamil Nadu and Gujarat.

CONSERVATION OF MINERALS

Minerals are considered back bone of an economy. Most of the minerals are non-renewable. So there is urgent need to conserve them.

Measures to conserve the minerals :

- 1. Minerals should be used in a planned and judicious way.
- 2. Wastage of minerals in the process of mining & processing should be minimised.
- 3. Modern technology should be used for the exploitation of minerals.
- 4. Export of minerals should be minimised.
- 5. We should think about the use of substitutes in order to save minerals.
- 6. We should encourage recycling of metals.

> ENERGY RESOURCES

Energy resources :

The resources which are used for generating energy are known as energy resources e.g. Coal, Petroleum etc.

> CLASSIFICATION OF ENERGY RESOURCES



Conventional Source :

Conventional power sources are those which are exhaustible.

- 1. Once they have been used up, they cannot be replaced. e.g. Coal, Petroleum.
- 2. They are very costly and causes pollution.
- 3. These are going to last just for 100-200 years.
- 4. These are non-renewable source of energy e.g. coal, petroleum, uranium.

♦ Non-Conventional Source :

There are resources of energy which can be renewed in a short period.

- 1. They are known as renewable resources.
- 2. They are free of cost.
- 3. They do not cause any pollution.
- 4. They are going to last forever.
- 5. e.g. wind, water, solar energy, geothermal energy.

CONVENTIONAL SOURCES OF ENERGY

1. Coal :

- 1. Coal provides a substantial part of the nation's energy need. It is used for power generation.
- 2. India is highly dependent on coal for meeting its commercial energy requirements.
- 3. Coal is formed due to compression of plant material over million of years.
- 4. Coal is formed in a variety of forms depending on the degrees of compression and the depth and time of burial.

♦ Varieities of Coal and its availability :

1. Anthracite Coal :

- 1. This is the best quality of Coal and contain over 80 % carbon.
- 2. It is very hard, compact jet black Coal having a semi metallic lustre.
- 3. It has the highest heating value and burns without smoke or root, which make it suitable for domestic use.
- 4. It is found only in Jammu Kashmir and that too in small quantity.

2. Bituminous Coal :

- 1. This is the most widely used coal and contains 60 to 80 % carbon.
- 2. It is dense, compact, brittle and is usually of black colour.
- 3. Its colorific value is very high due to high proportion of carbon and low moisture content.
- 4. It is found in Jharkhand, Bihar, Orissa, West Bengal and Madhya Pradesh.

3. Lignite :

- 1. It is also known as brown coal.
- 2. Lignite is a lower grade coal which is soft with high moisture content and contain about 60 % carbon.
- 3. Its colour varies from dark to black brown.
- 4. It is found in Palna of Rajasthan, Neyveli of Tamil Nadu, Hakhimpur of Assam and Karewa of Jammu & Kashmir.

Peat :

- 1. This is the first state of transformation of wood into coal.
- 2. It contains 50-60 % carbon.
- 3. It burns like wood, gives less heat, emits more smoke and leaves a lot of ash after burning.
- **Classification of Coal field in India :**



Gondwana Coal Field :

Gondwana coal is over 200 millions years in age gondwana coal metallurgical coal is located in Damodar valley (West Bengal Jharkhand). Jharia, Raniganj, Bokaro, Godavari, Mahanadi, Son and Wardha Valleys.

Tertiary Coal Field :

The Tertiary rock system bears coals of younger age which are only about 55 million years old and are mainly confined to the extra Peninsula. Important area of tertiary coal include parts of Assam Meghalaya, Arunachal Pradesh, Nagaland.

> PETROLEUM

The word 'petroleum' has been derived from two Latin words, Petra (meaning rock) and oleum (meaning oil). Thus petroleum is oil obtained from rocks, particularly sedimentary rocks of the earth. Therefore, its also called mineral oil. Petroleum is an inflamble liquid that is composed of hydrocarbons.

& Uses of Petroleum :

- 1. It is the major source of power for vehicles.
- 2. It provides the most important lubricating agents and is used as important raw material.

3. Petroleum refineries act as a 'nodal industry' for many industries like textile, fertilizer and chemical industry.

Sormation :

- 1. In regions of folding, anticlines or dams, oil is trapped in the crest of the upfold.
- 2. Gas, being lighter usually occurs above the oil.
- 3. 63 % of India's petroleum production is from Mumbai high, 18 % from Gujarat and 16 % from Assam.
- 4. Ankeleshwar is the most important field of Gujarat. Assam is the oldest oil producing state of India.

Famous oil field of India :

1. Digboi 2. Naharkutiya 3. Moran Hugrijan

> NATURAL GAS

♦ Advantages of Natural gas :

- 1. It can be used both as source of energy and also as an industrial raw material in petro-chemical industry.
- 2. Natural gas is found in association with or without petroleum.
- 3. It takes less time to build a power plant based on natural gas.
- 4. It is easy to transport gas through gas pipes line.
- 5. It is considered an environment friendly fuel because of low carbondioxide emissions.
- 6. It is the fuel for the present century.

Reserves :

In the Krishna-Godavari basin, the reserves of Mumbai high and allied fields are supplemented by finds in the Gulf of Cambay. Andaman and Nicobar islands are also important area having large reserves of natural gas.

♦ Gas Pipe Lines :

1700 km long Hazira - Bijapur - Jagdishpur cross country gas pipe line links Mumbai-high and Bassin with fertilizer, power and industrial complexes in Western and Northern India.

ELECTRICITY

Electricity is generated mainly in two ways.

- 1. By running water which drives hydro turbines to generate hydro electricity.
- 2. By burning of other fuels such as coal, petroleum and natural gas to drives turbines to produce thermal power.

1. Hydro Electricity :

- 1. It is generated by fast flowing water.
- 2. It is a renewable resource of energy.

- 3. India has a number of multi purpose project like the Bhakra Nangala, Damodar Valley Corporation, the Kopili Hydel Power Project etc. producing hydro electricity.
- 4. These do not cause any pollution.
- 5. These should be near the sources of energy.
- 6. Seconds for abut 25% of the total electricity produced in India.

2. Thermal Power :

- 1. It is generated by coal, petroleum and natural gas.
- 2. These are exhaustible resources of energy.
- 3. These causes pollution.
- 4. These can be set at any place.
- 5. Out of total production 70% is by thermal.

3. Nuclear or Atomic Energy :

- 1. It is obtaining by altering the structure of atoms energy is released in the form of heat and this is used to generate electric power.
- 2. Uranium and Thorium, which are available in Jharkhand and the Aravali ranges of Rajasthan are used for nuclear power.
- 3. The monazite sand of Kerala is also rich in Thorium.
- 4. It has vast potential for future development.
- 5. It is very economical.

> NON-CONVENTIONAL ENERGY SOURCES

- 1. These are non exhaustible.
- 2. They are renewable sources of energy.
- 3. They do not cause environment pollution and are freely available.
- 4. The energy resources are in great demand but production of fossil fuels is limited, so non conventional sources of energy are hope of the future.

Solar Energy :

- 1. Photovoltaic technology converts sunlight directly into electricity.
- 2. It is expected that solar energy plant will be able to minimise the dependence of rural households on firewoods and dung cake, which is turn will contribute to environmental conservation and adequate supply of manure in agriculture.
- 3. The largest solar plant of India is located at Madhopur, near Bhuj, to sterilise milk cans.

♦ Wind Power :

- 1. India now ranks as a 'wind super power' in the world.
- 2. The cost inputs are only at the initial stage and the power generation starts immediately after commissioning.
- 3. Once the generation starts, cost free power is available for about 20 years.
- 4. The largest wind farms cluster is located in Tamil Nadu from Nagarcoil to Madurai. Apart from these Andhra Pradesh, Karnataka, Gujrat, Kerala, Maharashtra and Lakshdweep have important wind farms.

♦ Biogas :

- 1. Shrubs, farms waste, animal and human waste are used to produce biogas.
- 2. Decomposition of organic matter yields gas, which has higher thermal efficiency in comparison to kerosene, dung cake and charcoal.
- 3. Biogas plants are setup at municipal, cooperative and individual level.

- 4. The plants using cattle dung are known as 'Gobar gas plant'. These provide twin benefits to the farmers in the form of energy and improved quality of manure.
- 5. It burns without smoke and is the cheapest gaseous fuel.

♦ Tidal Energy :

Oceanic tides can be used to generate electricity. Flood gate dams are built across the inlets. During high tide water flows into the inlet and gets trapped when the gate is closed. After the tides falls out side the flood gate, the water retained by the flood gate flows back to the sea via a pipe that carries it through a power generating turbine.

In India, the Gulf of Kucch, provides ideal conditions for utilising tidal energy.

♦ Geo-Thermal Energy :

Geothermal energy refers to the heat and electricity produced by using the heat from the interior of the earth. Geothermal energy exists because, the earth grows progressively hotter with increasing depth, where the geothermal grading is high, high temperature are found at shallow depth ground water in such areas absorbs heat from the rock and becomes hot and turns into steam. This steam is used to drive turbines and generate electricity.

Two experimental projects have been set up in India. One is located in the Parvati Valley near Manikaran in Himachal Pradesh and the other is in the Puga Valley, Ladakh.

> CONSERVATION OF ENERGY RESOURCES

Energy is the basic requirement for economic development. Consumption of energy in all forms has been steadily rising all over the country.

There is an urgent need to develop a sustainable path of energy development. Promotion of energy conservation and increased use of renewable energy sources are the twin planks of sustainable energy. We have to adopt a cautious approach for the judicious use of our limited energy resources.

GLOSSARY

- 1. Mineral : A substance which is found in the earth's crust and which generally has a definite chemical composition.
- 2. Mineral Ore : It is the raw material extracted from the earth mixed with soil and other impurities.
- 3. Mining : It is an economic activity of extracting minerals from the earth.
- 4. Fossil-Fuels : There are fuels formed by the decomposition of organism under the earth or sea bed.
- 5. Non ferrous minerals : Minerals devoid of iron contents are termed as non ferrous minerals. e.g. Zinc, lead.
- 6. Ferrous Minerals : There are metals which contain Iron. e.g. Iron and Manganese ore.
- 7. Thermal electricity : The electricity produced by using coal, petroleum, atomic minerals.
- 8. Hydro electricity : The electricity generated by water.
- 9. Conventional resources : These are non renewable sources of energy. e.g. coal.
- 10. Non-Conventional resources : There are renewable sources of energy. e.g. solar energy.
- 11. Galena : It is an Ore of Lead.