

Minerals and Energy Resources (Easy Notes for Class 10th)

Introduction:

As it is clear from the title, we are going to discuss about Minerals and energy resources in this post. This chapter deals with all the resources on our Earth which have become an inseparable part of our daily life. We extract these resources, convert them and finally make use of them. These resources help us earn livelihood, develop the economy and make life on earth blissful. So let us understand them in an elaborate manner.

Minerals:

Geologists define mineral as a "**Homogenous, naturally occurring substance with a definable internal structure.**"

- A mineral is a natural substance with different chemical and physical properties, composition and atomic structure.
 - These kinds of distinctions result in a wide range of colors, hardness, crystal forms, lustre and density.
- Minerals can be classified on the basis of composition:-
 1. **Metallic Minerals:**
 - *Ferrous (containing Iron):* Iron ore, Manganese, nickel, cobalt, etc.
 - *Non-Ferrous:* Copper, lead, tin, bauxite, etc.
 - *Precious:* Gold, silver, platinum, etc.
 2. **Non Metallic Minerals:** Mica, salt, potash, sulfur, granite, limestone, marble, sandstone, etc.
 3. **Energy Minerals:** Coal, Petroleum, Natural gas.

Mode of Occurrence of Minerals:

- Minerals are usually found in "ores". The term ore is used to describe an accumulation of any mineral mixed with other elements.
- These ores should have sufficient concentration of mineral content to make its extraction commercially viable.
- Therefore, it is important to know the types of formations or structures in which minerals occur.
 1. **Veins and lodes:** In Igneous and metamorphic rocks, minerals may occur in the cracks, crevices, faults or joints in the form of veins (small occurrences) and lodes (large occurrences).
 - *For Example:* tin, copper, zinc and lead etc.
 2. **Beds or layers:** In sedimentary rocks a number of minerals occur in beds or layers. They have been formed as a result of deposition, accumulation and concentration in horizontal strata.
 - *For Example:* Gypsum, potash salt and sodium salt.
 3. **Residual mass of weathered material:** It occurs when the surface rocks decompose and

leave no soluble constituents.

- *For Example:* Bauxite.

4. **Alluvial deposits:** Certain minerals may occur as alluvial deposits (also known as 'Placer deposits') in sands of valley floors and the base of hills. They generally contain those minerals which do not corrode in water.

- *For Example:* Gold, silver, tin and platinum.

5. **Ocean waters:** They contain vast quantities of minerals. Since they are spread over a wide area, they are not economically viable.

- *For Example:* Common salt, magnesium and bromine.

- Three important factors which affect economic viability of a reserve are:-
 - The concentration of minerals in the ore, the ease of extraction and closeness to the market.

Distribution of Minerals in India:

India has rich and varied mineral resources. However, their distribution is uneven. For example, **peninsular rocks** contain most of the reserves of coal, metallic minerals, mica and many other non-metallic minerals. **Gujarat and Assam** have most of the petroleum deposits. **Rajasthan** has reserves of many non-ferrous minerals. And lastly, the vast **alluvial plains** of north India are almost devoid of economic minerals.

Major Minerals in India:

Metallic Minerals:

Ferrous Minerals:

- Ferrous minerals account for about three-fourths of the total value of the production of metallic minerals.
- They provide a strong base for metallurgical industries.
- India exports substantial quantities of ferrous minerals after meeting her internal demands.

Iron Ore:

- Iron ore is the basic mineral and the backbone of industrial development.
- It is an abundantly available resource in India.
- India is rich in good quality iron ores.
- Iron ore is of two types on the basis of quality and quantity.
- **Magnetite:**
 - Magnetite is a finest iron ore with a very high content of iron up to 70%.
 - It has excellent magnetic qualities.

- It is especially valuable in the electrical industry.

- **Hematite:**

- Hematite ore has 50 to 60% iron content.
- It is the most important industrial iron ore in terms of quantity used.

- The major iron ore belts in India are:-

1. **Odisha-Jharkhand belt:**
2. **Durg-Bastar-Chandrapur belt:**
3. **Ballari-Chitradurga-Chikkamagaluru-Tumakuru belt:**
4. **Maharashtra-Goa belt:**

Manganese:

- Manganese is mainly used in the manufacturing of steel, ferro-manganese alloy, bleaching powder, insecticides and paints.
- Odisha is the largest producer of manganese ores in India.

Non-Ferrous Minerals:

- India's reserves and production of non-ferrous minerals is less.
- However, minerals like copper, bauxite, lead, zinc and gold play a vital role in a number of metallurgical, engineering and electrical industries.
- The major minerals in India are:-
 - **Copper:** India is critically deficient in the reserve and production of copper.
 - Copper is mainly used in electrical cables, electronics and chemical industries as it is malleable, ductile and a good conductor of electricity.
 - The Balaghat mines in Madhya Pradesh, Khetri mines in Rajasthan and Singhbhum district of Jharkhand are leading producers of copper.
 - **Bauxite:** It occurs due to the decomposition of a wide variety of rocks rich in aluminium silicates.
 - Aluminium is an important metal because it combines the strength of metals such as iron, with extreme lightness and also with good conductivity and great malleability.
 - Its deposits are mainly found in the Amarkantak plateau, Maikal hills and the plateau region of Bilaspur-Katni.
 - Odisha was the largest bauxite producing state in India. It had 34.97 % of the country's total production in 2009-10.
 - Panchpatmali deposits in Koraput district are the most important bauxite deposits in Odisha.

Non-Metallic Minerals:

Mica:

- Mica is a mineral made up of a series of plates or leaves.

- It splits easily into thin sheets.
- It can be clear, black, green, red, yellow or brown.
- Mica is one of the most indispensable minerals due to its various features.
 - It has excellent di-electric strength.
 - Low power loss factor.
 - insulating properties and resistance to high voltage.

Note: *Chota Nagpur is a storehouse of minerals as it is rich in minerals like [bauxite](#), iron ore, copper etc. And Mica is one of them (mainly in the Hazaribagh region of Jharkhand).*

- The leading producers of mica are **Jharkhand** (Koderma Gaya-Hazaribagh belt), **Rajasthan** (around Ajmer) and **Andhra Pradesh** (Nellore mica belt).

Rock minerals:

- **Limestone:** It is a sedimentary rock consisting of calcium carbonates (calcite) or calcium and magnesium carbonates (dolomite).
- It is a basic raw material for the cement industry and essential for smelting iron ore in the blast furnace.

Hazards of mining: *Although mining has helped in improving our quality of life, it has some bad impacts too. It is a highly risky job and causes pulmonary diseases in miners. It is also causing environmental pollution.*

Therefore, we need to implement strict safety regulations and environmental laws in order to prevent this industry from becoming a 'killer industry'.

Conservation of Minerals:

- Mineral resources are finite and non-renewable (take thousands of years to form). And Rich mineral deposits are our country's extremely valuable but short-lived possessions. Therefore, they need not be used excessively.
 1. We should use our mineral resources in a planned and sustainable manner.
 2. There should be the use of improved technologies to allow the use of low grade ores at low costs.
 3. We can also recycle the metals to conserve minerals.
 4. Lastly, We can make use of other alternatives as well.

Energy Resources:

- Energy resources help in generating electricity, heating and many other activities.
- These resources can be classified as conventional and non-conventional sources.
 - **Conventional sources:** natural gas, firewood, cattle dung cake, coal, petroleum and

electricity (both hydel and thermal).

- **Non-conventional sources:** solar, wind, tidal, geothermal, biogas and atomic energy.

Note: More than 70% rural people use firewood and cattle dung which are conventional sources of energy.

Conventional Sources of Energy:

Coal:

- Coal is the most abundantly available fossil fuel in India.
- It accounts for 55% of the nation's energy needs.
- It is used for power generation, to supply energy to industry as well as for domestic needs.
- India is highly dependent on coal for meeting its commercial energy requirements.
- On the basis of **degree time and depth**, coal can be classified in four types:-
 1. **Peat:** Decaying *plants* in swamps produce peat.
 - It is a soft brown coal with 60% organic matter.
 - It has a low carbon and high moisture contents and low heating capacity.
 2. **Lignite:** It is a *sedimentary rock* that is formed from naturally compressed peat.
 - It is a low grade brown coal, which is soft with high moisture content.
 - The principle lignite reserves are in Neyveli in Tamil Nadu. and are used for generation of electricity.
 - However, this type of coal is very harmful to health.
 3. **Bituminous:**
 - It is black in color which has high carbon content.
 - It is the most popular coal in commercial use.
 4. **Anthracite:** It is a hard *metamorphic rock* which is black in color.
 - It is a very light weight coal due to little moisture content.
 - Moreover, anthracite has the highest heat content.
- In India coal occurs in rock series of two main geological ages:-
 - **Gondwana coal** (200 million years old): They are located in Damodar valley (West Bengal-Jharkhand), Mahanadi, Son, and Wardha valley.
 - The important coal fields are:- Jharia, Raniganj, Bokaro.
 - **Tertiary coal** (55 million years old): They occur in the north eastern states of Meghalaya, Assam Arunachal Pradesh and Nagaland.

Note: Weight losing material should be near to the market.

Petroleum:

- Petroleum or mineral oil is the next major energy source in India after coal.
- It provides fuel for heat and lighting, lubricants for machinery and raw materials for a number of manufacturing industries.
- Furthermore, Petroleum industry acts as a '**nodal industry**' for synthetic textile, fertilizer and numerous chemical industries.

- Most of the petroleum deposits are found in **anticlines** and **fault traps**.
- The producers of petroleum are **Mumbai High** (63%), **Gujarat** (18%), **Assam** (16%).
 - **Ankeleshwar** is the most important field of Gujarat.
 - Assam is the oldest oil producing state of India. It has three important oil fields; **Digboi**, **Naharkatiya** and **Moran-Hugrijan**.

Natural Gas:

- Natural gas is an important **clean energy resource** found in association with or without petroleum.
- It is used as a source of energy as well as an industrial raw material in the petrochemical industry.
- The power and fertilizer industries are the key users of natural gas.
- In addition, it is **environment-friendly fuel** as it has low carbon dioxide emissions.
 - This is why the use of **Compressed Natural Gas (CNG)** for vehicles has gained wide popularity.
- Larger reserves of natural gas have been discovered in the **Krishna-Godavari basin**.
- Some other reserves are:- West Coast of Mumbai High and Andaman and Nicobar islands.

Electricity:

- There are mainly two ways for generating electricity:-
 1. **Hydro electricity**: Electricity generated from fast flowing water.
 - *For Example*: Bhakra Nangal, Damodar Valley corporation, the Kopili Hydel Project etc.
 2. **Thermal electricity**: Electricity generated from coal, petroleum and natural gas.
 - Interestingly, there are over *310 thermal power plants* in India.

Non-Conventional Sources of Energy:

- Increase in the level of consumption and dependency on resources like coal, oil and gas is leading the country towards **serious environmental problems**, **shortage of valuable but limited resources** and **price rise** (For e.g. oil & gas).
- Thus, we need to **use other alternatives** (renewable sources of energy) such as solar energy, wind, tide, biomass and energy from the waste material.
- Fortunately, in India, **renewable energy sources** like sunlight, water, wind and biomass are abundantly available.

Nuclear or Atomic Energy:

- Nuclear energy is produced when the nuclei of atoms are either split or combined. This process releases the heat and helps in generating power.
 - For example: Uranium and Thorium.
- Moreover, these radioactive heavy metals are available in Jharkhand, Aravalli ranges of Rajasthan.

Note: *Monazite sand of Kerala is also rich in Thorium.*

Solar Energy:

- It is energy from the sun which is another form of **electricity generation** through renewable sources.
- Photovoltaic technology converts sunlight directly into electricity.
- India is a tropical country therefore, can make use of solar energy as an alternative source.
- It can help in minimizing the dependence of rural households on firewood and dung cakes.
- Additionally, it is an **environment-friendly** source of energy.

Wind Energy:

- Wind energy is the 2nd fastest growing source of electricity in the world.
- India is one of the major producers of wind power in the world.
- The largest wind farm cluster is located in **Tamil Nadu** (from Nagercoil to Madurai), **Andhra Pradesh, Karnataka, Gujarat, Kerala, Maharashtra and Lakshadweep**.
- Furthermore, Nagercoil and Jaisalmer are well known for effective use of wind energy in the country.

Biogas:

- Biogas is another form of *renewable source* of energy.
- The sources of biogas are shrubs, farm waste, animal and human waste.
- Decomposition of organic matter yields gas, which has higher thermal efficiency in comparison to kerosene, dung cake and charcoal.
- The plants using cattle dung are known as '**Gobar gas plants**' in rural India.
- These plants provide twin benefits to the farmer in the form of *energy and improved quality of manure*.

Tidal Energy:

- Oceanic tides (at the time of rise and fall) can be used to generate electricity.
- Places which provide ideal conditions for utilizing tidal energy are:- *The Gulf of Kambhat, The Gulf of Kachchh* in **Gujarat** on the western coast and *Gangetic delta in Sundarban regions* of **West Bengal**.

Geothermal Energy:

- Geothermal energy refers to the heat and electricity produced by using the heat from the interior of the Earth.
- **Two experimental projects** have been set up in India to harness geothermal energy.
 1. In the Parvati valley near Manikaran in Himachal Pradesh.

2. In the Puga Valley, Ladakh.

Conservation of Energy Resources:

- Energy is a basic requirement for economic development.
- Every sector of the national economy-agriculture, industry, transport, commercial and domestic-needs inputs of energy.
- However, India is presently one of the least energy efficient countries in the world.
- Thus, it is important for us to make judicious use of limited energy resources.
- To conserve energy resources, we should take following steps:-
 1. We should use public transport systems instead of individual vehicles.
 2. We should promote energy conservation.
 3. Use of non-conventional sources of energy should be encouraged.
 4. Lastly, we should use power saving devices
- After all, **"energy saved is energy produced"**

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