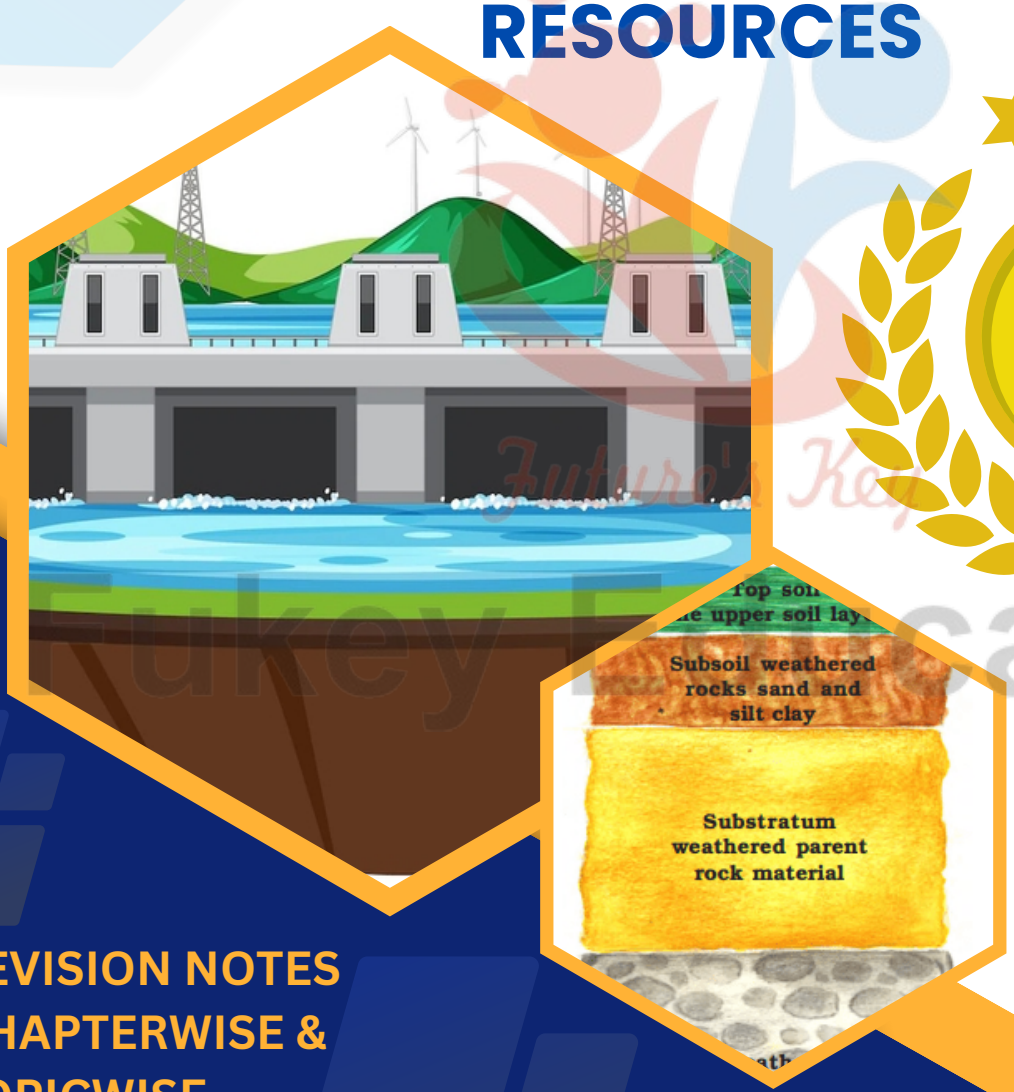
NOTES

SOCIAL SCIENCE

(GEOGRAPHY)

MINERALS AND ENERGY RESOURCES



10th

REVISION NOTES
CHAPTERWISE &
TOPICWISE

Chapter 5: Minerals and Energy Resources

Concepts Covered:

INTRODUCTION

Minerals are an indispensable part of our lives. All living things and minerals.

Life processes cannot occur without minerals. Although our mineral intake represents only about 0.3 percent of our total intake of nutrients, they are so potent and so important that without them we would not be able to utilise the other 99.7 percent of foodstuffs.

A bright smile from toothpaste and minerals

Toothpaste cleans your teeth. Abrasive minerals like silica, limestone, aluminium oxide, and various phosphate minerals do the cleaning. Fluoride, which is used to reduce cavities, comes from a mineral fluorite. Most toothpaste are made white with titanium oxide, which comes from minerals called rutile, ilmenite and anatase. The sparkle in some toothpastes comes from mica. The toothbrush and tube containing the paste are made of plastics from petroleum. Find out where these minerals are found?

What is a mineral?

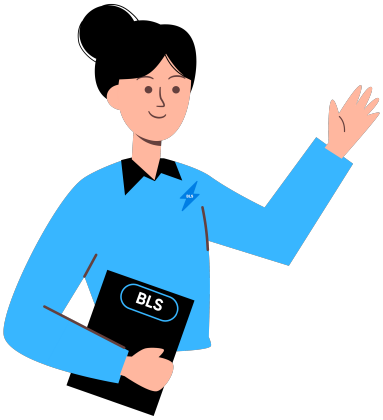
"Homogenous, naturally occurring substance with a definable internal structure is know as a mineral."

Rocks: They are combinations of homogenous minerals (one or more). Formation of rocks depends upon the physical and chemical conditions.

Geographers and Geologists

Geographers

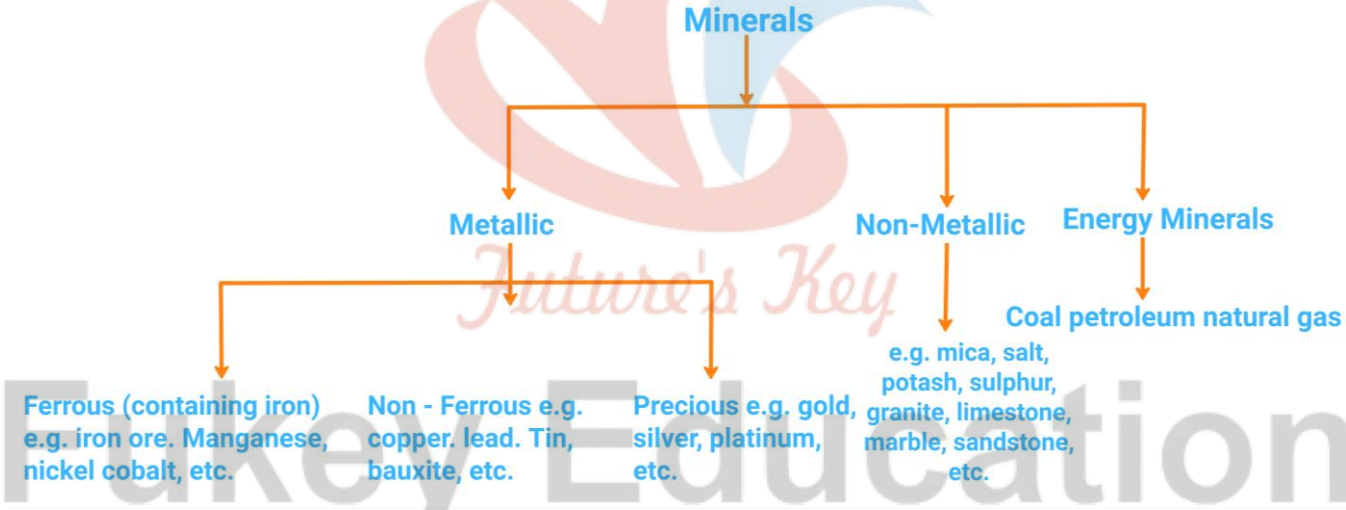
- Geographers study minerals as part of the earth's crust.
- Their area of study is Above the earth.



Geologists

- Geologist study formation of minerals, their age, physical and chemical composition.
- Their area of study is below the earth.

For general and commercial purposes minerals can be classified as under.



MODE OF OCCURRENCE OF MINERALS

Where are these minerals found?

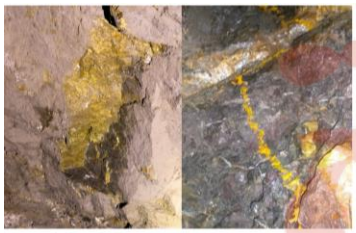
Minerals are found in the form of Ores.

Ores are accumulation of any mineral mixed with other elements.

The Extraction of ores should be commercially viable.

The type of formation or structure in which they are found determines the relative ease with which mineral ores may be mined. It is important to understand the types of occurrences of minerals.

Minerals generally occur in these forms:



Veins and Lodes

Alluvial Deposits

Ocean Water

Beds and Layers

Residual mass of weathered material

Veins and Lodes

In igneous and metamorphic rocks minerals may occur in the cracks, crevices, faults or joints.

Formation

- They are formed when minerals in liquid/ molten and gaseous forms are forced upward through cavities towards the earth's surface.
- They cool and solidify as they rise.

Example - Tin, Copper, Zinc and Lead.

Beds and Layers

- Mostly found in sedimentary rocks and formed as a result of deposition, accumulation and concentration in horizontal strata.
- Coal and iron ore (heat and pressure).
- Gypsum and Potash salt (evaporate in arid regions).

Residual mass of weathered material

- Decomposition of surface rocks.
- Removal of soluble constituents.
- Leaving a residual mass of weathered material containing ores.

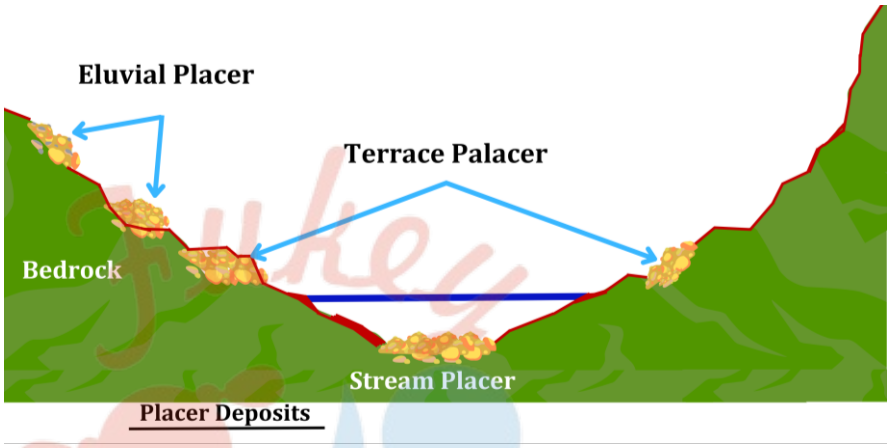
Example - Bauxite.

Alluvial deposits

Certain minerals may occur as alluvial deposits in sands of valley floors and the base of hills.

Placer deposits

These deposits generally contain minerals, which are not corroded by water.



Ocean waters

- It contains vast quantities of minerals.
- Most of these are too widely diffused to be of economic significance.

Example - Common salt, magnesium, bromine, and manganese nodules.

Distribution of mineral resources

- India have fairly rich and varied mineral resources, but these are unevenly distributed.
- Peninsular rocks contain most of the reserves of coal, metallic minerals, mica, and many other non-metallic minerals.

- Sedimentary rocks on the western and eastern flanks of the peninsula, in Gujarat and Assam have most of the petroleum deposits.
- Rajasthan with the rock systems of the peninsula, has reserves of many non-ferrous minerals.
- The vast alluvial plains of north India are almost devoid of economic minerals.

Turning a mineral 'deposit' or 'reserve' into a mine.

FERROUS MINERALS

Iron ore

Ferrous Iron

- It accounts for about $3/4$ of the total value of the production of metallic minerals.
- They provide a strong base for the development of metallurgical industries.

Iron ore

Manganese

Iron ore

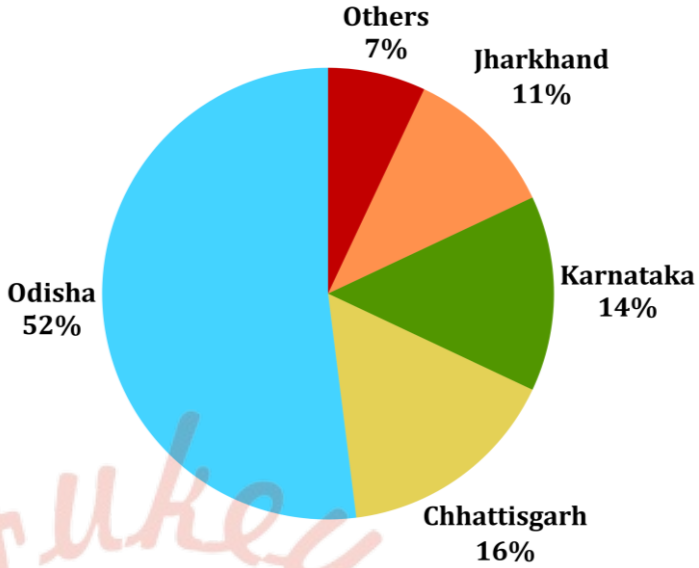
- Iron ore is the basic mineral and the backbone of industrial development.
- India is rich in good quality iron ores.

Magnetite

- It has excellent magnetic qualities.
- Valuable in the electrical industry.
- High content of iron up to 70 percent.

Hematite

- The most important industrial iron ore in terms of the quantity used.
- It has a slightly lower iron content than magnetite. (50-60 per cent).



Major iron ore belts in India

Odisha-Jharkhand belt

- In Odisha high grade hematite ore is found in Badampahar mines in the Mayurbhanj and Kendujhar districts.
- In the adjoining Singham district of Jharkhand haematite iron ore is mined in Gua and Noamundi.

Durg-Bastar -Chandrapur belt

- Very high grade hematites are found in the famous Bailadila range of hills in the Bastar district of Chhattisgarh.
- The range of hills comprise of 14 deposits of super high grade hematite iron ore.
- It has the best physical properties needed for steel making.
- Iron ore from these mines is exported to Japan and South Korea via Visakhapatnam port.

Ballari-Chitra Durga-Chikmagalur Tumkur belt

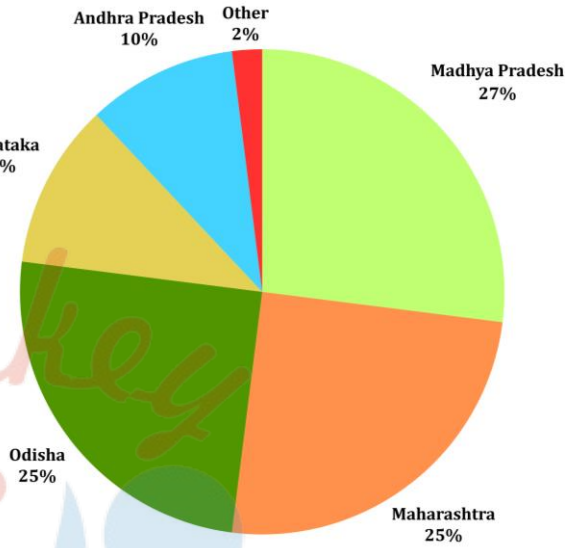
- The Kudremukh mines located in the Western Ghats of Karnataka are a 100 percent export unit.
- The ore is transported as slurry through a pipeline to a port near Mangalore.

Maharashtra-Goa belt

- Though, the ores are not of very high quality, yet they are efficiently exploited.
- Iron ore is exported through Marmagao port.

Manganese

- Manganese is mainly used in the manufacturing of steel and ferro-manganese alloy.
- Nearly 10kg of manganese is required to manufacture one tonne of steel.
- It is also used in manufacturing bleaching powder, insecticides, and paints.



NON-FERROUS MINERAL

Minerals with Non-iron content is known as Non-Ferrous minerals.

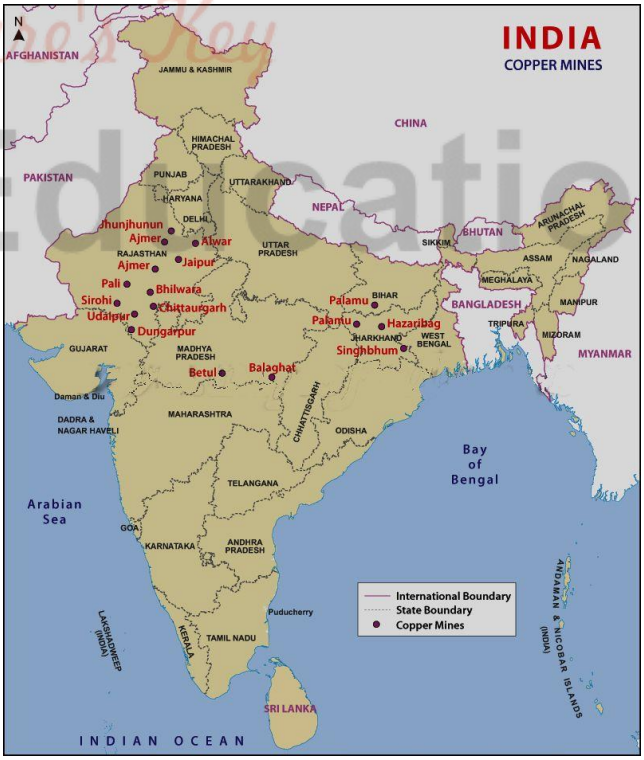
- India's reserves and production of non- ferrous minerals is not very satisfactory.
- However, these minerals, which include copper, bauxite, lead, zinc, and gold play a vital role in a number of metallurgical, engineering and electrical industries.

Copper

Bauxite

Copper

- India is critically deficient in the reserve and production of copper.
- Being malleable, ductile and a good conductor, copper is mainly used in electrical cables, electronics, and chemical industries.
- The Balaghat mines in Madhya Pradesh, Khetri mines in Rajasthan and Singh hum district of Jharkhand are leading producers of copper.



Bauxite

Bauxite:

Bauxite deposits are formed by the decomposition of a wide variety of rocks rich in aluminium silicates. It is transformed into Alumina.

Aluminium:

Aluminium is found from the ores of Alumina. It 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.

India's bauxite deposits are mainly found in the Amarkantak plateau, Maikal hills and the plateau region of Bilaspur-Katni.

1. Odisha was the largest bauxite producing state in India in 2016-17.
2. Panchpatmali deposits in Koraput district are the most important bauxite deposits in the state.

NON-METALLIC MINERALS

Those minerals which are not made-up metals is known as Non-metallic minerals.

Mica

- Mica is a mineral made up of a series of plates or leaves.
- Mica can be clear, black, green, red, yellow, or brown.
- Due to its excellent dielectric strength, low power loss factor, insulating properties and resistance to high voltage, mica is one of the most indispensable minerals used in electric and electronic industries.

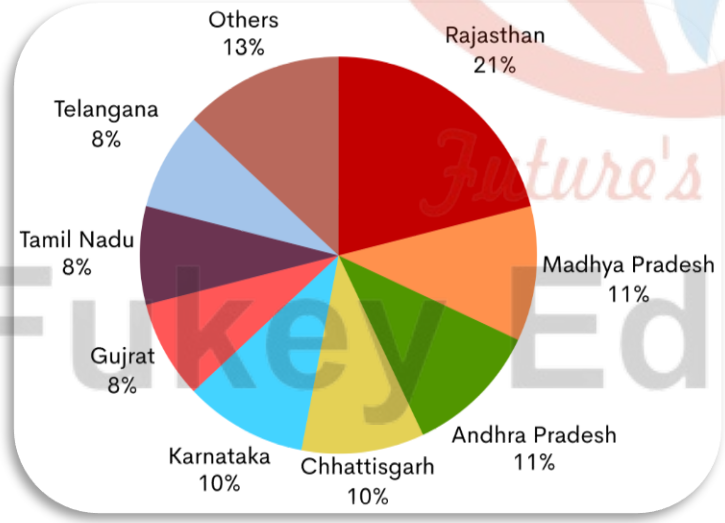
Major producing areas

- Mica deposits are found in the northern edge of the Chota Nagpur plateau.
- Koderma Gaya – Hazaribagh belt of Jharkhand is the leading producer.
- In Rajasthan, the major mica producing area is around Ajmer.
- Nellore mica belt of Andhra Pradesh is also an important producer in the country.

ROCK MINERALS

Limestone

- Limestone is found in association with rocks composed of calcium carbonates or calcium and magnesium carbonates.
- It is found in sedimentary rocks of most geological formations.
- Limestone is the basic raw material for the cement industry and essential for smelting iron ore in the blast furnace.



HAZARDS OF MINING

Impact on Miners

1. Risk of collapsing mine roofs.
2. Inundation and fire in coal mines.
3. Health issues like Dust and noxious fumes are inhaled which makes them vulnerable to pulmonary diseases.

Impact on Environment

1. Water sources get contaminated.
2. Dumping of waste and slurry leads to degradation of land, soil and increase in stream and river pollution.

Stricter safety regulations and implementation of environmental laws are essential to prevent mining from becoming a "killer industry".

Mine roof collapsing

Fire in coal mine

Bird dying due to mining

Contamination due to mining

CONSERVATION OF MINERALS

Need for Conservation

The total volume of workable mineral deposits is an insignificant fraction i.e., one percent of the earth's crust. Mineral resources are finite and non-renewable. It takes thousands of years for replenishment. Therefore, rich mineral deposits are our country's extremely valuable but short-lived possessions.

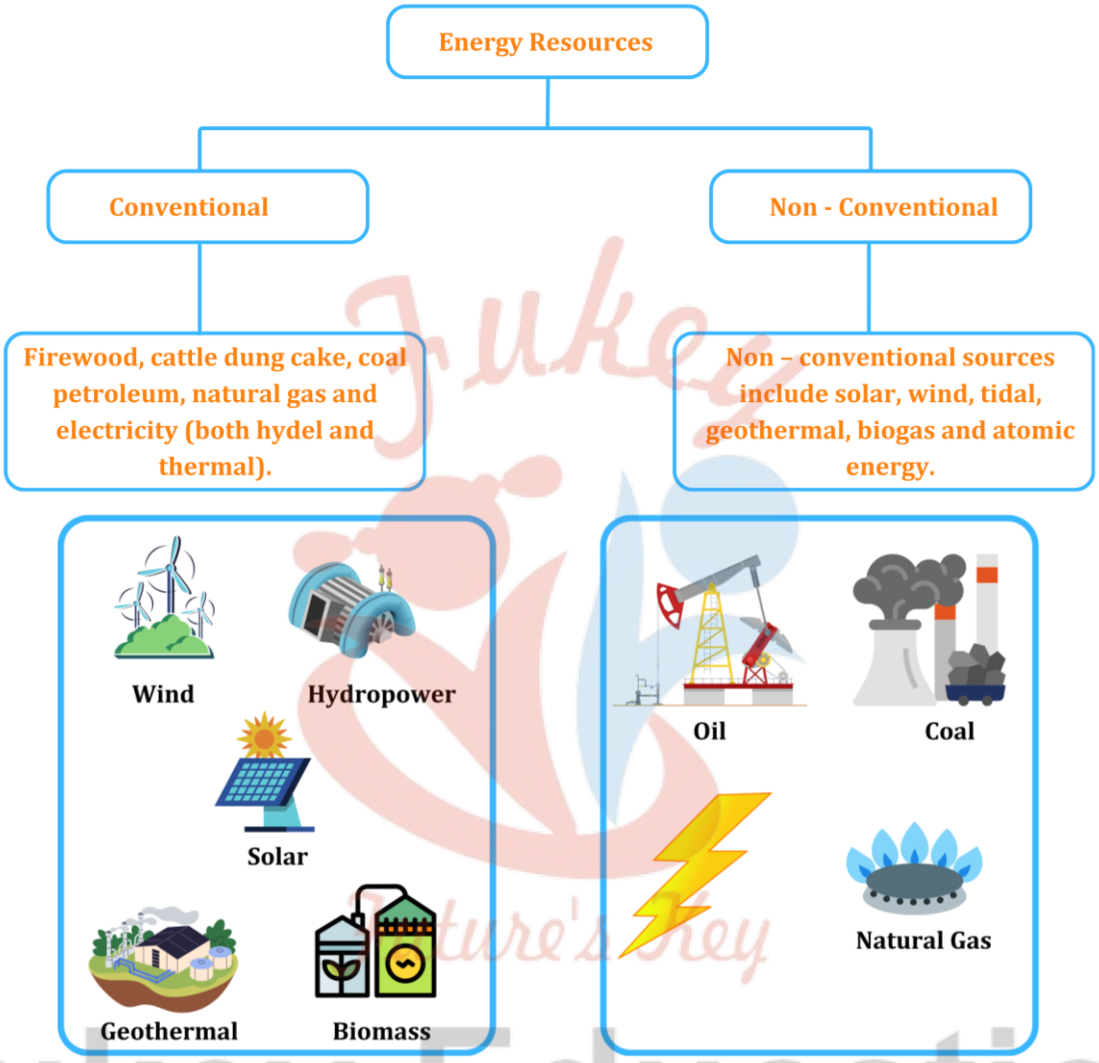
Continued extraction = Increasing costs mineral extraction comes from greater depths along with decrease in quality.

Steps taken for Conservation

- A concerted effort has to be made in order to use our mineral resources in a planned and sustainable manner.
- Improved technologies need to be constantly evolved to allow use of low-grade ores at low costs.
- Recycling of metals.
- Using scrap metals and other substitutes.

ENERGY RESOURCES

Energy can be generated from fuel minerals like coal, petroleum, natural gas, uranium and from electricity.



CONVENTIONAL SOURCE OF ENERGY

Coal

Petroleum

Natural Gas

Electricity

Coal

- Coal is the most abundantly available fossil fuel.
- It provides a substantial part of the nation's energy needs.
- It is used for power generation, to supply energy to industry as well as for domestic needs.

Formation-: Depends upon the degrees of compression and the depth and time of burial. Classification of coal on the basis of quality and age.

Types of Coal On the basis of quality

Peat	Lignite	Bituminous	Anthracite
Has a low carbon and high moisture contents and low heating capacity.	• Low grade brown coal, which is soft with high moisture content. • The principal lignite reserves are in	• Been buried deep and subjected to increased temperatures. • It is the most popular coal in commercial use.	• Highest quality • Hard coal

	Neyveli in Tamil Nadu and are used for generation of electricity.	• Metallurgical coal is high grade bituminous coal which has a special value for smelting in iron blast furnaces.	

Types of Coal On the basis of Ages

Gondwana Coal

- A little over 200 million years in age.
- Metallurgy coal
- **Area of occurrence**: Damodar valley (West Bengal Jharkhand). Jharia, Raniganj and Bokaro.

Tertiary Coal

- About 55 million years old.
- Occur in the northeastern states of Meghalaya, Assam, Arunachal Pradesh, and Nagaland.
- Coal is a bulky material, and it loses weight on use as it is reduced to ash.
- Hence, heavy industries and thermal power stations are located on or near the coalfields.

Petroleum

- The next major energy source in India after coal is petroleum.
- It provides fuel for heat and lighting, lubricants for machinery and raw materials for a number of manufacturing industries.
- Petroleum refineries act as a “nodal industry” for synthetic textile, fertiliser, and numerous chemical industries.

Occurrences: Anticlines and fault traps in the rock formations of the tertiary age.

- The oil-bearing layer is a porous limestone or sandstone through which oil may flow.
- The oil is prevented from rising or sinking by intervening non-porous layers.
- Petroleum is also found in fault traps between porous and non-porous rocks.
- Gas, being lighter usually occurs above the oil.

Petroleum production areas: Mumbai High, Gujarat and Assam are major petroleum production areas in India.

- Ankles war is the most important field of Gujarat.
- Assam is the oldest oil producing state of India.
- Digboi, Naharkatiya and Moran-Hugrijan are the important oil fields in the state.

Natural Gas

- It is a clean energy resource found in association with or without petroleum.
- Used as a source of energy as well as an industrial raw material in the petrochemical industry.
- Environment friendly fuel: Low carbon dioxide emission

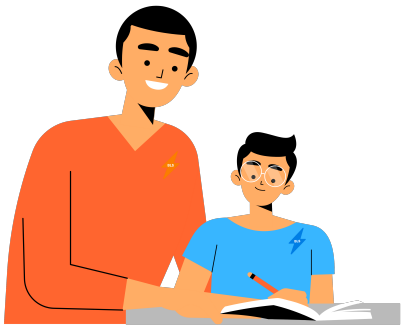
Reserves-: Krishna - Godavari basin, Mumbai high, Gulf of Cambay and Andaman and Nicobar Islands.

HVJ Pipeline

The 1700 km long Hazira-Vijaipur Jagdishpur cross country gas pipeline links Mumbai High and Bassein with the fertilizer, power, and industrial complexes in western and northern India.

Provided an impetus to India's gas production.

- The power and fertilizer industries are the key users of natural gas.
- Use of Compressed Natural Gas (CNG) for vehicles to replace liquid fuels is gaining wide popularity in the country.



Electricity

Its per capita consumption is considered as an index of development.

Electricity is generated mainly in two ways:

Hydro Electricity	Thermal Power
By running water which drives hydro turbines.	By burning other fuels such as coal, petroleum, and natural gas to drive turbines.

Hydro electricity

- It is generated by fast flowing water, which is a renewable resource.
- India has a number of multi-purpose projects like the Bhakra Nangal, Damodar Valley corporation, the Ko pili Hydel Project etc.

Thermal Electricity

- It is generated by using coal, petroleum, and natural gas.
- The thermal power stations use non-renewable fossil fuels for generating electricity.
- Major thermal power plant is - Singrauli, Namrup, Tolcher, Neyveli, narawara.

NON-CONVENTIONAL SOURCE OF ENERGY

Importance

Increase in the consumption of fossil fuels.

- Rising prices of oil and gas
- Potential shortages

Raised the uncertainties about the security of energy supply in future and caused serious environmental problems.

There is a pressing need to use renewable energy sources like solar energy, wind, tide, biomass, and energy from waste material.

India is blessed with an abundance of sunlight, water, wind, and biomass. It has the largest programmes for the development of these renewable energy resources.

Nuclear or Atomic Energy

Solar Energy

Wind Power

Bio Gas

Tidal Energy

Geothermal Energy

Nuclear or Atomic Energy

It is obtained by altering the structure of atoms.

When such an alteration is made, much energy is released in the form of heat, and this is used to generate electric power.

- Uranium and Thorium, which are available in Jharkhand.
- The Aravalli ranges of Rajasthan are used for generating atomic or nuclear power.

- The Monazite sands of Kerala is also rich in Thorium.

Solar Energy

India is a **Tropical country**

- It has enormous possibilities of tapping solar energy.
- Photovoltaic technology converts sunlight directly into electricity.
- Solar energy is fast becoming popular in rural and remote areas.

Advantages of solar power plants

Will minimise the dependence of rural households on firewood and dung cakes.

Contribute to environmental conservation and adequate supply of manure in agriculture.

Wind Power

- India has great potential of wind power.
- The largest wind farm cluster is located in Tamil Nadu from Nagercoil to Madurai.
- Apart from these, Andhra Pradesh, Karnataka, Gujarat, Kerala, Maharashtra, and Lakshadweep have important wind farms.

- Nagarcoil and Jaisalmer are well known for effective use of wind energy in the country.

Biogas

Shrubs, farm waste, animal and human waste are used to produce biogas for domestic consumption in rural areas. The decomposition of organic matter yields gas which has higher thermal efficiency in comparison to kerosene, dung cake and charcoal.

Biogas Plant

- Biogas plants are set up at municipal, cooperative and individual levels.
- The plants using cattle dung are known as 'Gobar gas plants' in rural India.

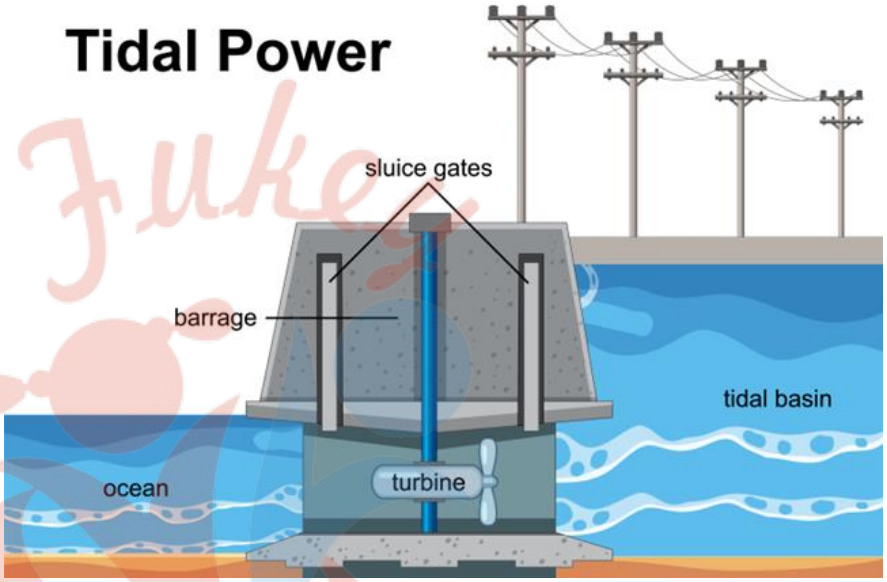
Twin benefits

1. Source of energy.
2. Provide quality of manure + prevents the loss of trees and manure due to burning of fuel wood and cow dung cakes.

Tidal Energy

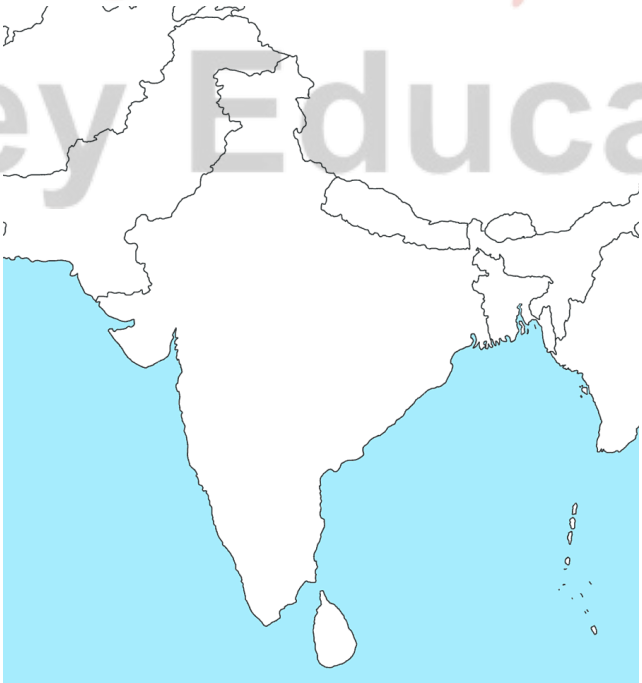
Oceanic tides can be used to generate electricity. It is known as Tidal energy.

- Floodgate dams are built across inlets.
- During high tide water flows into the inlet and gets trapped when the gate is closed.
- After the tide falls outside the flood gate, the water retained by the floodgate flows back to the sea via a pipe that carries it through a power-generating turbine.



Regions for generation of Tidal energy

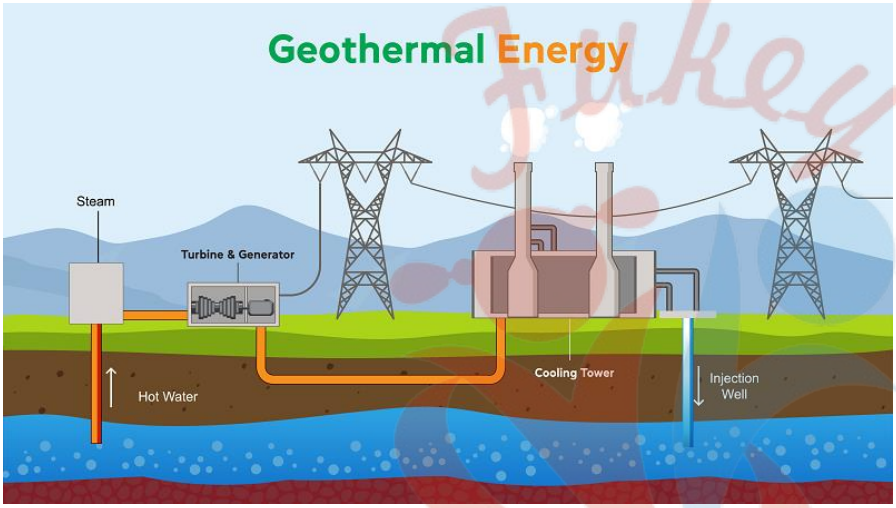
In India the Gulf of Khambhat, the Gulf of Kachchh in Gujarat on the western coast and Gangetic delta in Sunderban regions of West Bengal provide ideal conditions for utilising tidal energy.

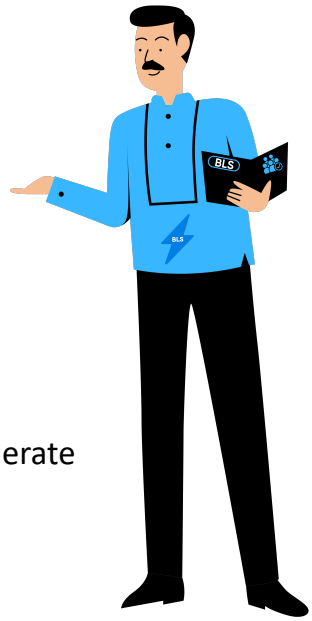


Geothermal Energy

Geothermal energy refers to the heat and electricity produced by using the heat from the interior of the Earth.

- The Earth grows progressively hotter with increasing depth.
- Where the geothermal gradient is high, high temperatures are found at shallow depths.
- Groundwater in such areas absorbs heat from the rocks and becomes hot.
- It is so hot that when it rises to the earth's surface, it turns into steam.
- This steam is used to drive turbines and generate electricity.





There are several hundred hot springs in India, which could be used to generate electricity.

Two experimental projects

The Parvati valley near Manika ran in Himachal Pradesh.

Puga Valley, Ladakh.

CONSERVATION OF ENERGY RESOURCES

Importance

Development of a country results in increase in the need for energy.

Every sector of the national economy – agriculture, industry, transport, commercial and domestic needs inputs of energy.

As a result, consumption of energy in all forms has been steadily rising all over the country.

“Energy saved is energy produced”.

- Promotion of energy conservation.
- Increased use of renewable energy sources.

We have to adopt a cautious approach for the judicious use of our limited energy resources.

- Using public transport systems instead of individual vehicles.
- Switching off electricity when not in use.
- Using power-saving devices.
- Using non-conventional sources of energy.

Class 10th Social Science (Geography)

05

MINERALS AND ENERGY RESOURCES

MIND MAP