

CHAPTER 3-MINERAL AND POWER RESOURCES

Relevance rating: 3.5/5

- Civil services syllabus – Economic geography
- The concepts of this chapter make you understand the basics of minerals and power resources.
- Nowadays UPSC is focussing on sustainable development and understanding the nature of mineral and power resources form an important component of this.
- From the Indian perspective also, transformation in energy and mineral technologies is one of the important policy initiatives.

Chapter Overview:

This chapter deals with

- Types, distribution of minerals across the globe
- Conservation of minerals
- Conventional and non-conventional power resources
- Important characteristics of power resources and their distribution across the world.

Note: This summary should be supplemented with basic reading of NCERT.

❖ **MINERALS**

- **A naturally occurring substance** that has a definite chemical composition created by natural processes.
- **Unevenly distributed**, formed in different types of geological environments, under varying conditions
- **Concentrated in a particular area or rock formations**
- **Identified on the basis of their physical properties** such as colour, density, hardness and chemical property such as solubility.

➤ **Types of minerals**

- On the basis of composition, minerals are classified mainly as **metallic and non-metallic minerals**.



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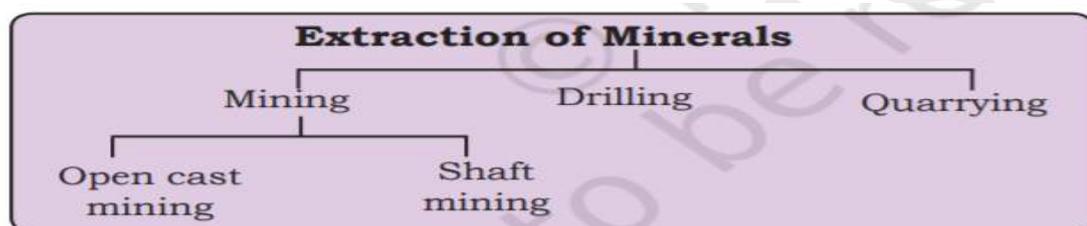
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- **Metallic minerals contain metal in raw form.** Metals are hard substances that conduct heat and electricity and have a characteristic lustre or shine. Iron ore, bauxite, manganese ore are some examples.

Metallic minerals are of two types:

1. Ferrous: These minerals like iron ore, manganese and chromites contain iron.
 2. Non-ferrous mineral: It does not contain iron but may contain some other metal such as gold, silver, copper or lead.
- **Non-metallic minerals do not contain metals** e.g. Limestone, mica and gypsum. The mineral fuels like coal and petroleum are also non-metallic minerals.

▪ Techniques for extraction of minerals



Mining: The process of taking out minerals from rocks buried under the earth's surface.

- Open-cast mining: Minerals that lie at shallow depths are taken out by removing the surface layer
- Shaft mining: Deep bores (shafts) have to be made to reach mineral deposits that lie at great depths.

Drilling: Petroleum and natural gas occur far below the earth's surface. Deep wells are bored to take them out.

Quarrying: Minerals that lie near the surface are simply dug out by this process.

➤ **Worldwide distribution of minerals:**

- Metallic Minerals: These minerals are thin Generally and are found in igneous and metamorphic rock formations that form large plateaus
E.g. Iron-ore in north Sweden, copper and nickel deposits in Ontario.
- Non-Metallic Minerals: Sedimentary rock formations of plains and young fold mountains contain like limestone.
E.g. Limestone deposits of Caucasus region of France, manganese deposits of Georgia and Ukraine

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ASIA:

- *Iron ore deposits* - China and India
- *The world's leading tin producers* - China, Malaysia and Indonesia.
- China also leads in production of lead, antimony and tungsten.
- Asia also has deposits of manganese, bauxite, nickel, zinc and copper.

EUROPE:

- Europe is the *leading producer* of iron-ore in the world.
- The countries with large deposits of iron ore are Russia, Ukraine, Sweden and France.
- Minerals deposits of copper, lead, zinc, manganese and nickel are found in Eastern Europe and European Russia

NORTH AMERICA:

- Iron ore, nickel, gold, uranium and copper are mined in the Canadian Shield Region, coal in the Appalachians region.
- Western Cordilleras have vast deposits of copper, lead, zinc, gold and silver.

SOUTH AMERICA:

- *Brazil is the largest producer of high grade iron-ore in the world.*
- Chile and Peru are leading producers of copper.
- Brazil and Bolivia are among the world's largest producers of tin.
- South America also has large deposits of gold, silver, zinc, chromium, manganese, bauxite, mica, platinum, asbestos and diamond.
- Mineral oil is found in Venezuela, Argentina, Chile, Peru and Columbia.

AFRICA:

- It is the *world's largest producer of diamonds, gold and platinum.*
- South Africa, Zimbabwe and Zaire produce a large portion of the world's gold.
- The other minerals found in Africa are copper, iron ore, chromium, uranium, cobalt and bauxite.

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- Oil is found in Nigeria, Libya and Angola.

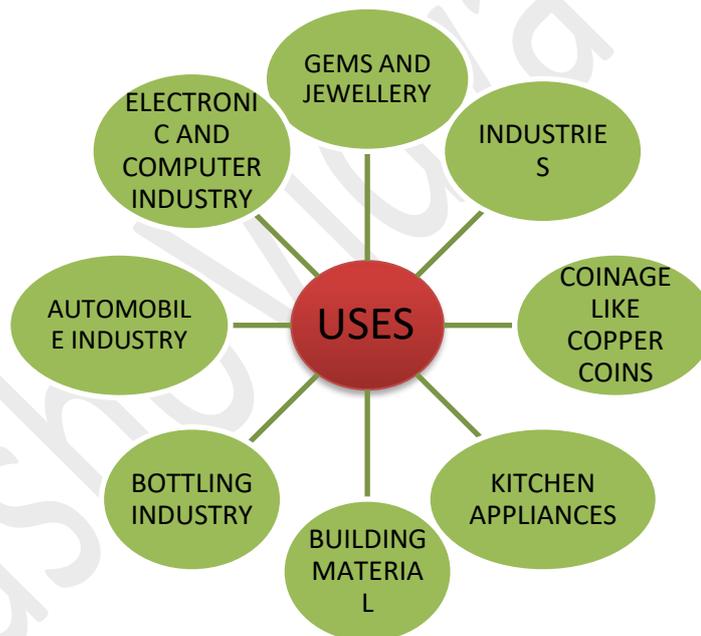
AUSTRALIA:

- Australia is the largest producer of bauxite in the world.
- It is a leading producer of gold, diamond, iron ore, tin and nickel.
- It is also rich in copper, lead, zinc and manganese.
- Kalgoorlie and Coolgardie areas of Western Australia have the largest deposits of gold.

ANTARCTICA:

- The geology of Antarctica is sufficiently well known to predict the existence of a variety of mineral deposits, some probably large.
- Significant size of deposits of coal in the Transantarctic Mountains and iron near the Prince Charles Mountains of East Antarctica is forecasted.
- Iron ore, gold, silver and oil are also present in commercial quantities.

➤ Multiple uses of minerals:



➤ Conservation of minerals:

- Minerals are a **non-renewable resource**.
- It takes thousands of years for the formation and concentration of minerals. *The rate of formation is much smaller than the rate at which the humans consume these minerals.*
- It is necessary to **reduce wastage** in the process of mining.
- **Recycling of metals** is another way in which the mineral resources can be conserved.



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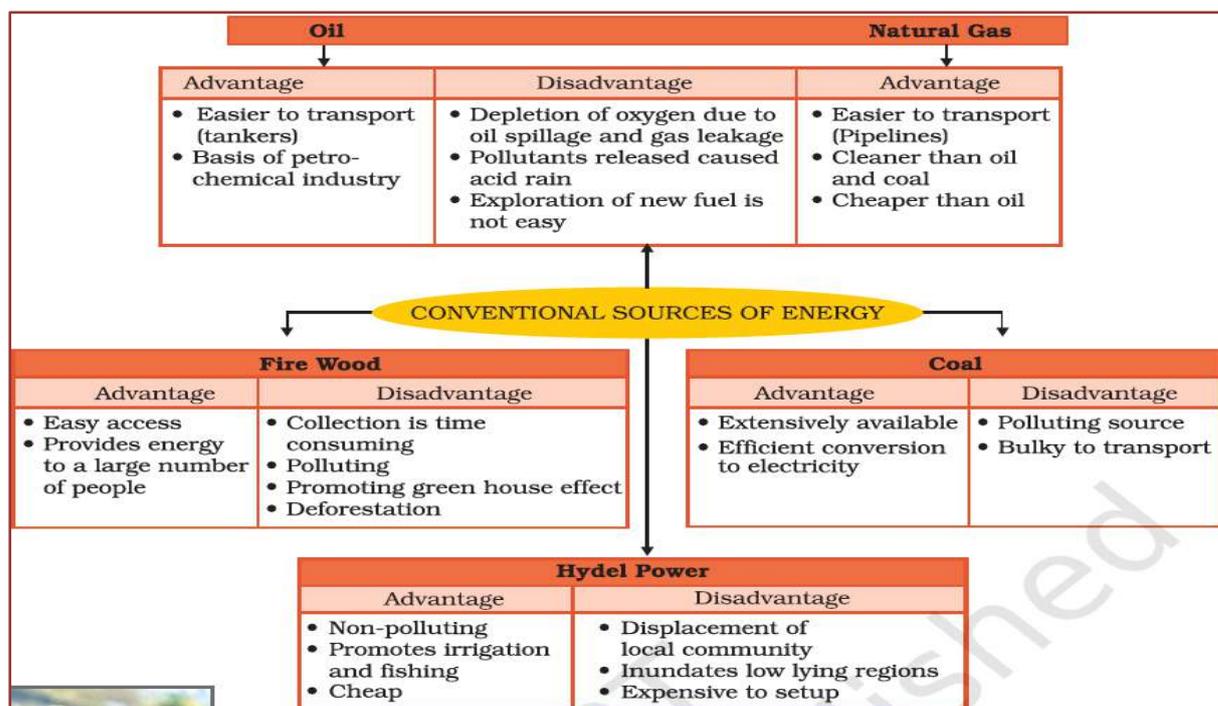
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❖ POWER RESOURCES:

Broadly categorised as conventional and non-conventional resources.

➤ **Conventional Sources:** Which have been in common use for a long time.

For example- Firewood, coal, petroleum, Natural gas.



Fossil fuel: Remains of plants and animals which were buried under the earth for millions of years got converted by the heat and pressure into fossil fuels.

a) Coal	<ul style="list-style-type: none"> Most abundantly found fossil fuel. It is used as a domestic fuel, in industries such as iron and steel, steam engines and to generate electricity. Electricity from coal is called thermal power. Buried Sunshine: The coal which we are using today was formed millions of years ago when giant ferns and swamps got buried under the layers of earth. The leading coal producers of the world are China, USA, Germany, Russia, South Africa and France. The coal producing areas of India are Raniganj, Jharia, Dhanbad and Bokaro in Jharkhand.
b) Petroleum	<ul style="list-style-type: none"> It is found between the layers of rocks and is drilled from oil fields located in off-shore and coastal areas. This is then sent to refineries which process the crude oil and produce a variety of products like diesel, petrol, kerosene, wax, plastics and lubricants. Petroleum and its derivatives are called Black Gold as they are very valuable Chief petroleum producing countries - Iran, Iraq, Saudi Arabia and Qatar. The other major producers - USA, Russia, Venezuela, and Algeria.

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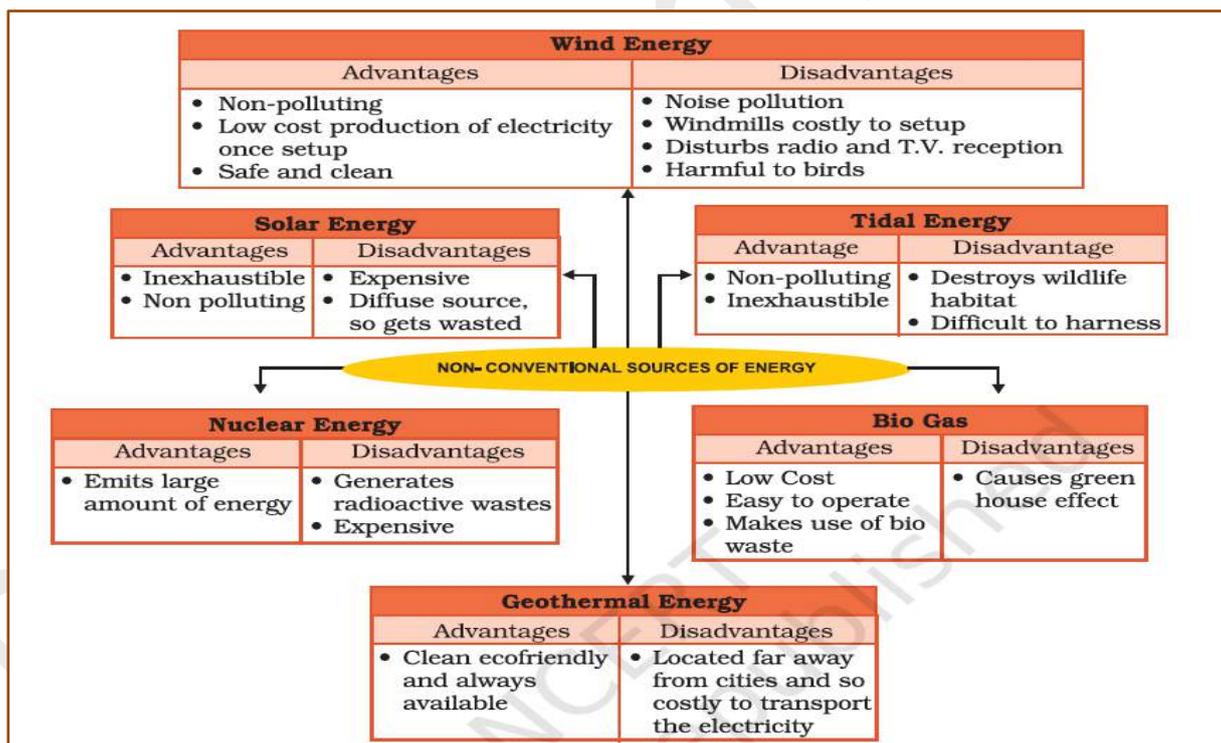
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	<ul style="list-style-type: none"> The leading producers in India - Digboi in Assam, Bombay High in Mumbai and the deltas of Krishna and Godavari rivers.
c) Natural Gas	<ul style="list-style-type: none"> Natural gas is found with petroleum deposits and is released when crude oil is brought to the surface. It can be used as a domestic and industrial fuel. Russia, Norway, UK and the Netherlands are the major producers of natural gas. In India Jaisalmer, Krishna Godavari delta, Tripura and some areas off shore in Mumbai have natural gas resources.

Hydel Power:

- Rain water or river water stored in dams is made to fall from heights.
- The falling water flows through pipes inside the dam over turbine blades placed at the bottom of the dam.
- The moving blades then turn the generator to produce electricity.

➤ Non-conventional sources:



Solar energy

- Many solar cells are joined to make solar panels to generate solar power.
- It is used in solar heaters, solar cookers, solar dryers besides being used for community lighting and traffic signals.

Wind Energy

- An inexhaustible source of energy
- Windfarms are found in Netherlands, Germany, Denmark, UK, USA and Spain are noted for their wind energy production.

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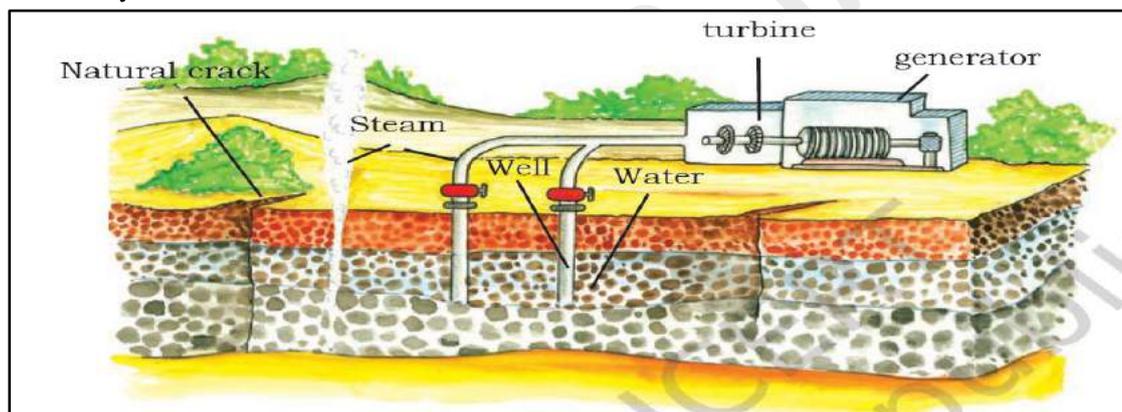
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Nuclear power

- Nuclear power is obtained from energy stored in the nuclei of atoms of naturally occurring radioactive elements like uranium and thorium.
- The greatest producers of nuclear power are USA and Europe.
- In India Rajasthan and Jharkhand have large deposits of Uranium.
- Thorium is found in large quantities in the Monozite sands of Kerala.

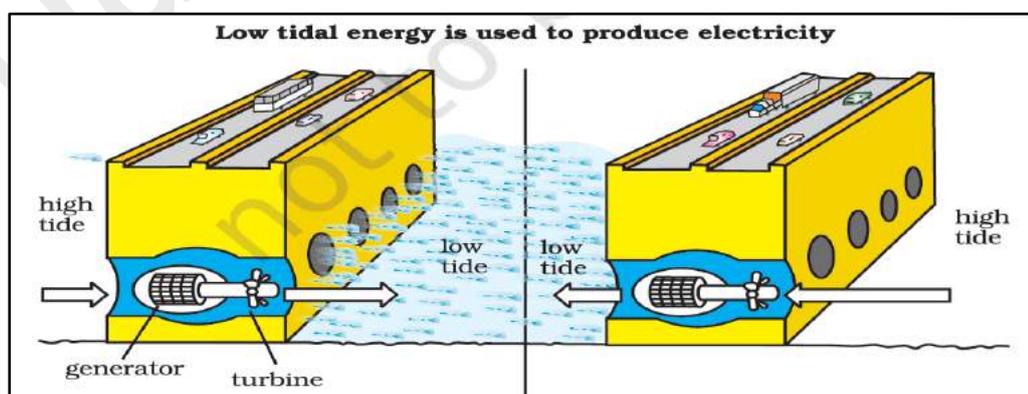
Geothermal Energy

- Energy is obtained from the earth
- The temperature in the interior of the earth rises steadily as we go deeper. Sometimes this heat energy may surface itself in the form of hot springs.
- USA has the world's largest geothermal power plants followed by New Zealand, Iceland, Philippines and Central America.
- In India, geothermal plants are located in Manikaran in Himachal Pradesh and Puga Valley in Ladakh.



Tidal Energy

- Energy is generated from tides.
- During high tide the energy of the tides is used to turn the turbine installed in the dam to produce electricity. Russia, France and the Gulf of Kachchh in India have huge tidal mill farms.

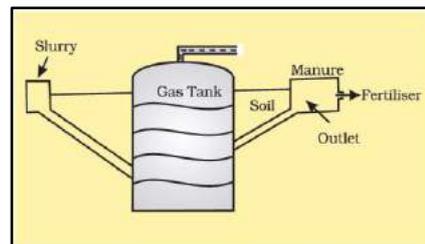


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Biogas

- Organic waste such as dead plant and animal material, animal dung and kitchen waste can be converted into a gaseous fuel called biogas.
- The organic waste is decomposed by bacteria in biogas digesters to emit biogas which is essentially a mixture of methane and carbon dioxide.



Key Takeaways:

- Minerals are naturally occurring substance that has a definite chemical composition created by natural processes.
- Minerals are unevenly distributed and are broadly classified as metallic and non-metallic minerals.
- Important mineralised regions of the world are Ural Mountains, Appalachians, Chhotanagpur, Central Asia and African plateaus.
- Power resources are broadly classified as conventional and non-conventional sources of energy.
- Coal, petroleum and natural gas are the examples of conventional sources of energy.
- Biogas, geothermal, solar and wind energy are the examples of non-conventional sources of energy.