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Natural Resources (Mineral and Power Resources)

Lesson Plan

Contents

- ▶ An overview of the natural resources available as minerals and power
- ▶ Understanding the manner in which human beings have processed these natural resources to add value to them

Objectives

- ▶ To understand the availability and use of minerals and power resources
- ▶ To learn about the use and processes that add value to these resources
- ▶ To know about the locations and form in which they are found
- ▶ To appreciate the utilisation of the mineral and power resources available

■ Teacher's Aids

- ▶ Globe
- ▶ Pictures, charts, atlas and wall maps
- ▶ Blackboard
- ▶ Internet

■ Tips for Teacher

- ▶ Explain the sources of minerals and power and about their location, extraction, processing, usage and protection.
- ▶ Students should be encouraged to know places, locations and their placement on the maps.

■ Background and Reading

- ▶ Read the lesson aloud and explain, sharing the aids, etc., pausing to examine and explain the data in the boxes.
- ▶ Particularly focus on the various kinds, their extraction, processing and usage, while emphasising that these are non-renewable resources.

Mineral and Power Resources

- ▶ Economic status and development of country–based on its capacity to convert natural resources into useful goods–basis for industries being its minerals and power resources.
- ▶ Rocks–composed of one or more minerals–no fixed chemical composition of rocks, but of minerals–one or two elements identified by their physical and chemical properties–most are solid and inorganic materials except fossil fuels–unevenly distributed and with variety of impurities–provide us metals and chemicals.
- ▶ Different rocks–different types and quantities of minerals–some rocks with a large quantity of particular mineral–called ore of that mineral–no country with all minerals–minerals are exhaustible and non-renewable–scientist who studies composition and of the Earth is called a geologist.

Types of Minerals

- ▶ About 3000 minerals in lithosphere–each with distinct characteristics–on basis of composition, classified as metallic and non-metallic minerals.
- ▶ Metallic minerals normally found in igneous rocks–contain metal in ore form–hard substance having a typical lustre or shine–iron, gold, silver, etc.–can be ferrous [having iron] like iron, manganese, tungsten, chromites–or non-ferrous [without iron] like gold, silver, copper or lead.
- ▶ Non-metallic minerals found in sedimentary rocks–contain no metals–limestone, mica, gypsum, nitrate, potash, sulphur, etc.–mineral fuels like coal and petroleum.
- ▶ Ores taken out of the Earth–have large amounts of impurities–to convert into useful materials have to remove impurities–dug out by mining, quarrying, drilling–process of removing called mining–raw materials important for economic development–so now go into greater depths to mine–earlier man performed activity himself, now huge automatic machines used to obtain large quantities of minerals.
- ▶ Mining–(a) Open-cast mining or quarrying–ore at shallow depth–close to Earth’s surface–rocks or soil cover removed and ore excavated by digging or cutting (b) Shaft mining–vertical or slanting shafts and horizontal tunnels–interconnected with larger corridors–lifts used to bring ores to surface–costlier than open-cast mining (c) Drilling–petroleum and natural gas found at great depth–deep wells drilled to take them out.

Distribution of Minerals

- ▶ Rocks often have more than one mineral–may or may not be commercially gainful–only rich ores mined–not evenly distributed on Earth.
- ▶ Iron–makes up 5% of Earth’s surface–ores that can be commercially exploited found in some regions–high metal content: Russia, China, India, USA, Ukraine, Canada, Sweden, Germany, South Africa, Brazil, Australia, Liberia–Russia largest reserves and China largest producer–demand for iron ore increasing in world–because it can be hammered, rolled, cast, drawn into wires, welded or combined with other metals to form alloys.
- ▶ Manganese–widely used in making good quality steel and alloys–other uses: manufacture of enamel, dry batteries, glazed pottery, plastics, chemicals, glass and varnishes–Russia

largest producer—other producers: India, Brazil, China, Mexico, South Africa, Australia, Morocco, Ghana, Congo and Japan.

- ▶ Copper—in use since ancient times—used to make alloys—bronze, brass, German silver, etc.—also good conductor of electricity—occurs in combination with silver, gold, lead, etc.—Chile, USA, Russia, Canada, Zaire, Zambia, Australia, Peru, China—India does not produce enough copper.
- ▶ Bauxite—ore of aluminium—obtained by refining bauxite—light weight, good conductor of heat and electricity—mainly used for making railway coaches, aeroplane bodies, utensils, chemicals, transmission wires, building construction, pipes, boats, etc.—refining needs cheap and abundant supply of electricity—main producers: Australia, Suriname, Jamaica, Indonesia, Russia, Guyana, Venezuela, Malaysia, India and Greece.
- ▶ Tin—used in galvanising and soldering—also making alloys like bronze and type metal—half the world’s tin production used for making tin plates—Malaysia, China, Bolivia, Indonesia, Thailand, Nigeria, the Democratic Republic of Congo, Australia, Brazil and Zaire.
- ▶ Nickel—hard silvery metal that does not rust—found in association with copper—nearly half the world’s nickel output used for steel-making, especially stainless steel—Canada largest producer—others: Russia, Australia, Cuba, Philippines, South Africa, Indonesia.
- ▶ Gold—known and used from ancient times for high metallic lustre and attractive reddish-yellow colour—major use for jewellery—South Africa largest producer—others: Canada, Japan, USA, Philippines, Zimbabwe, Ghana, Australia, Russia, Mexico, China, Indonesia, India.
- ▶ Mica—non-conductor of electricity—used in electrical goods industry—can be split into very thin sheets—smaller blocks also used in the making of paints, varnishes, medicines, lubricants—India, Norway, South Africa, Brazil, Malaysia, Canada, USA, Russia—USA largest consumer of mica.

Power Resources

- ▶ Early man depended on muscle power—gradually used animal power—then used water and wind power by inventing water wheel and windmill.
- ▶ New sources of power—coal, petroleum, natural gas, electricity, etc.—used in agriculture, industry, transport, communication, and domestic needs—grouped as conventional and non-conventional resources.

Conventional Power Resources

- ▶ The sources in use for a long time—firewood, coal, petroleum, natural gas and electricity.
- ▶ Firewood—most important single use of wood is as fuel—people in under-developed countries use it for domestic cooking and heating—India: Tribals and villagers use it—tropical countries have high consumption of firewood.
- ▶ Fossil fuels—plants and animals buried millions of years ago by forces of nature—the heat and pressure inside the Earth converted them into fossil fuels like coal, petroleum and natural gas—main sources of conventional energy—reserves of fossil fuels limited and finite—consumption increasing more rapidly than formation—likely to be exhausted—cannot be replenished—must develop alternate sources of power.

- ▶ Coal—used for centuries for domestic purposes—in 18th century it was used for producing steam power—basis for Industrial Revolution—remained most efficient fuel for running factories and railway locomotives—also used to generate thermal electricity—coal we mine and use today generated millions of years ago—embedded between layers of sand, silt and clay.
- ▶ Four varieties: Peat, lignite, bituminous and anthracite based on its carbon content and amount of impurities in it.
- ▶ Mining—methods depend on nature of coal occurrence; thickness of coal seams; type of coal and mode of operation—mined either on surface or underground with minor variations according to locality.
- ▶ Countries—China, USA, Russia, Germany, Poland, UK, South Africa and India—Jharkhand in India—main centres Raniganj, Jharia, Dhanbad and Bokaro.
- ▶ Petroleum—mineral oil—used in Iraq and Egypt in ancient times—modern petroleum industry began 1859—first oil well drilled in Pennsylvania, USA—found in sedimentary rocks—crude oil taken out by drilling wells—refined to make many products—petrol, diesel, kerosene, wax, plastics, lubricants, etc.—valuable, so called Black Gold.
- ▶ More than half the total reserves located in the Middle East countries of Asia—Saudi Arabia largest reserves—producers: Saudi Arabia, Iran, Iraq, Qatar, UAE, USA, Mexico, China, Venezuela, UK, Nigeria, Kuwait, Libya, Russia, Indonesia, India—Digboi in Assam, Mumbai High, Gujarat, deltas of Krishna and Godavari rivers.
- ▶ Natural Gas—Associated with mineral oil in most oilfields—released during drilling—earlier allowed to go waste—now used as domestic and industrial fuel—Russia, USA, Netherlands, China, Iran, UK and India—USA also the largest consumer—India efforts being made to find new reserves—Gujarat, Tamil Nadu and the Krishna and Godavari region.
- ▶ Hydel Power—Force of running water used to drive paddle wheels—invention of turbine and dynamo—possible to use water to generate electricity—source of water power inexhaustible—amount of energy in water depends on volume of water and velocity of current—water discharged from turbine after generating hydroelectricity used for irrigation—USA, Canada, Russia, China, India, Sweden, UK, New Zealand, Australia, South Africa—India—many multi-purpose projects across rivers—generate electricity and cover river basin—Bhakra Nangal, Damodar Valley, Koyna, Tehri, etc.

The Non-Conventional Sources of Power

- ▶ Major change from firewood—increase in the amount of energy man uses—almost all from fossil fuels that cannot be replaced—shortage facing the world—need for increased use of non-conventional energy sources.
- ▶ Solar Energy—sun radiates enormous energy—if a small portion of that energy could be captured and converted into electricity, the Earth’s energy needs would be satisfied cheaply and easily, without damage to environment—converted using solar cells—made mostly of silicon—helps tropical countries—but solar cells very expensive.
- ▶ Wind Energy—used for centuries to drive mills and pumps—used to move blades of windmills—some windmills used to generate electricity—now wind farms established in many places—work best on mountaintops, sea coasts and open plains where strong steady winds blow—Netherlands, Germany, Denmark, UK, USA, Spain, India, etc.

- ▶ Nuclear Energy – produced when changes made in the nucleus of an atom – energy produced by splitting nucleus into two or more smaller nuclei in process called fission – atom used for fission comes from uranium or thorium – fission takes place in nuclear reactors – waste produced is radioactive and dangerous – first nuclear plant set up in UK in 1956 – now in USA, UK, Russia, Japan, China, Germany, France, Canada, Australia, Sweden and India, etc.
- ▶ Geothermal Energy – energy that comes from heat produced inside the Earth – from the magma or molten rock under the crust – heats groundwater to manifest as hot springs or geysers – can be used for heating houses – widely used in Iceland – USA, New Zealand, Italy, Philippines and Central America – freely available, causes little or no pollution when electricity generated.
- ▶ Tidal Energy – energy produced by the rise and fall of the tides called tidal energy – a dam used to trap water at high tide and released at low tide – plant operating rising and falling water can run generators and produce electricity – Russia, France, UK and India have developed tidal mill farms.
- ▶ Biogas – gaseous fuel obtained from organic waste – includes dead plants, animal dung, kitchen waste – biogas a mixture of methane and carbon dioxide gases – released due to the decomposition of organic waste – can also produce organic manure – gas used for cooking, heating, lighting.

Distribution of Minerals in India

- ▶ Iron – vast reserves of iron ore: Jharkhand, Odisha, Chhattisgarh, Madhya Pradesh, Goa, Karnataka – centres: Singhbhum, Keonjhar, Mayurbhanj, Bokaro, Bailadila, Ratnagiri, etc.
- ▶ Manganese – vast deposits – mostly associated with iron ore areas – Madhya Pradesh, Odisha, Karnataka, Maharashtra, Andhra Pradesh, Jharkhand.
- ▶ Bauxite – extensive deposits – Madhya Pradesh, Jharkhand, Gujarat, Odisha, Chhattisgarh, Maharashtra, Karnataka, Goa, Tamil Nadu.
- ▶ Mica – Jharkhand, Andhra Pradesh, Rajasthan – Hazaribagh, Gaya, Munger, Nellore, Guntur, Ajmer – 50% comes from Jharkhand alone.
- ▶ Copper – not rich in copper – production mainly from Rajasthan, Madhya Pradesh, Jharkhand, Karnataka, Andhra Pradesh – Khetri has a big processing plant.
- ▶ Gold – Kolar mines in Karnataka used to produce gold – small quantity found in Anantapur in Andhra Pradesh.

Assessment Corner

Oral Assignment

- A. Ask for answers at random from the students. Confirm the right answers. Let them write down the correct answers if they like in their books.

Written Assignment

- B–F. The teacher has two options—(i) Either do these exercises orally first and then ask the students to write them down. OR (ii) Ask the students to write the answers on their own. Then the teacher can announce the correct answers to the students and they can ask their partners to cross-check them.

In either case, the answers can be written as homework and the teacher can check them in the class.

Think Tank

- G. **HOTS questions:** Discuss the questions in the class and let the students write the answers to G and H as homework. Teacher should assess individual work.