

APPOLO STUDY CENTRE

NATURAL RESOURCES - RIVERS IN INDIA

GEOGRAPHY

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6th term - II Unit - 1 Resources

- Resource is anything that fulfills human needs. When anything is of some use it becomes valuable. All resources have value. The value can be either commercial or non-commercial. Commercial resources have great economic value. (e.g.) Petroleum. The Non-commercial resources are very abundant in availability (e.g.) Air.
- Resources can be natural, man-made and human resources.

Natural Resources:

- All resources that have been directly provided by nature are called Natural resources. The air, water, soil, minerals, natural vegetation and wild life around us are all natural resources. The use of any natural resource depends on the place it is available, the form in which it is available and the technology necessary to avail it.

Classification of Natural Resources

- Natural resources can be classified into different groups depending on origin, development, renewability, distribution, ownership etc.

A. On the basis of origin: On the basis of origin, resources can be classified into biotic and abiotic resources.

- i. All living resources are biotic resources, plants, animals and other microorganisms are biotic resources.
 - ii. Abiotic resources are non-living things. Land, water, air and minerals are abiotic resources.
- The biotic resources were mere substances till they were recognized by humans. According to the human needs the substances were collected by the ancient men and preserved for use. In the beginning, man had only three basic needs-food, clothing and shelter. He collected things through primary activities such as hunting, food gathering, fishing and forestry. Later when food became scarce, they had to cultivate and that became agriculture and the cattle were also reared on their farms to fulfill their basic needs.
 - The abiotic resources were also sought after by the early men. They went in search of better landforms where they had enough water resources for agriculture and their cattle. They were in need of tools right from hunting to agriculture. Primarily the tools were only made of stones. Later man dug the earth for better abiotic resources and found copper first and iron later. He also mined precious metals simultaneously for making ornaments. Later mining became one of the leading primary activities and still holds an important place among the economic activities.

B. On the basis of development:Based on the level of development, resources can be divided into actual and potential resources.

- i. Actual resources are resources that are being used and the quantity available is known. (e.g.) Coal at Neyveli.
- ii. Potential resources are resources that are not being used in the present and its quantity and location are not known. The technology to extract such resources is also yet to be developed. (e.g.) Marine yeast found in the Bay of Bengal and Arabian Sea.

C. On the basis of exhaustibility:On the basis of renewability resources can be classified as renewable resources and non-renewable resources.

- i. Resources once consumed can be renewed with the passage of time are called renewable resources. (e.g.) Air, Water, Sunlight. Misuse of such resources can also limit its available quantity. So, they have to be used wisely.
- ii. Natural resources which are limited can be called non-renewable resources. They become exhausted after use and the time they take to replace does not match the life cycle. (e.g.) Coal, petroleum, natural gas and other minerals.

- The resources which cannot renew themselves are either scarce or totally absent. So man is in search of new resources and is conducting several researches. He confirms that a substance is a resource only after research. He tries to harness it and also searches the regions where it may be found in. They are potential resources. Wind energy is one such example. The places where the wind energy can be utilized are still unknown.

D. On the basis of distribution: On the basis of distribution, resources can be classified into localized resources and universal resources.

- i. When resources are present in specific regions they are called localized resources. (e.g.) Minerals.
- ii. Some resources are present everywhere such resources are called universal resources. (e.g.) Sunlight and air.

E. On the basis of ownership: Based on ownership resources can be classified into Individual resources, Community-owned resources, National resources and International resources.

- i. Individual resources are resources privately owned by individuals. (e.g.) Apartments.
- ii. Community-owned resources are resources which can be utilised by all the members of the community. (e.g.) Public parks.
- iii. National resources are resources within the political boundaries and oceanic area of a country. (e.g.) Tropical forest regions of India.
- iv. International resources are all oceanic resources found in the open ocean. Resources found in this region can be utilized only after an international agreement. (e.g.) Ambergris.

Man-made resources:

- Natural resources are modified or processed by technology into man-made resources. (e.g.) sugarcane processed to get sugar. All structures built by man can also be called man-made resources. (e.g.) Bridges, Houses, Roads.
- This transforming of raw materials into finished goods is called Secondary Activities. Man's skills and ideas are the basic requirements for these activities.

Human resource:

- Human resources are groups of individuals who use nature to create more resources. Though human beings are basically natural resources, we classify

human beings separately. Education health, knowledge and skill have made them a valuable resource. (e.g.) Doctors, Teachers, Scientists. Tertiary activities are basically concerned with the distribution of primary and secondary products through a system of transport and trade (e.g) Banking, Trade and Communications. The quantity and quality of institutions and organizations involved in making the professionals decide the human resource of a country.

Gandhian thought on Resources: There is enough for everybody's need and not for anybody's greed. Mahatma Gandhi blamed "human beings" for depletion of resources because of

- i. over exploitation of resources
- ii. Unlimited needs of human beings. So, conservation is very important.

Resource planning / Management

- Resource planning is a technique or skill of proper utilization of resources. Resource planning is necessary because
 - i. Resources are limited, their planning is quite necessary so that we can use them properly and at the same time we can save them for our future generation.
 - ii. Resources are not only limited but also they are unevenly distributed over the different parts of the World.
 - iii. It is essential for the production of resource to protect them from over exploitation.

Conservation of resources:

- Careful use of resources is called conservation of resources. Resources are being used at a very fast rate due to the rapid increase in population. So, natural resources are depleting fast; wisely using resources can control the depleting ratios.
- Development is necessary without affecting the needs of the future generations. If the present needs of resources are met and the conserving of resources for the future are balanced, we call it sustainable development. Sustainable development can take place when
 - i. The reasons of depletion are identified.
 - ii. Wastage and excess consumption is prevented.
 - iii. Reusable resources are recycled.
 - iv. Pollution is prevented.
 - v. Environment is protected.
 - vi. Natural vegetation and wild life are preserved.

vii. Alternative resources are used.

- The easiest way to conserve resources is to follow the '3R's: Reduce, Reuse and Recycle.

NOTE

- ❖ Anything becomes a resource only when its use is discovered. The needs of human beings are ever changing. According to the ever changing needs, resources keep changing. Time and Technology are two important factors that determine whether a substance is a resource or not. for example: Sun's energy to generate electricity was made possible after the invention of solar panels (technology); and the receding of coal and petrol was in need of an inexhaustible resource (time).
- ❖ Marine yeast have greater potential than the terrestrial yeast. They can be used in baking, brewing, wine, bio-ethanol and pharmaceutical protein production.
- ❖ Tropical rain forests are called the 'World's largest Pharmacy' as 25% of the natural vegetation are medicinal plants. (e.g.) Cinchona.
- ❖ Ambergris is an extract from the sperm whale. A pound (0.454kg) of sweet - smelling ambergris is worth US \$63,000 and used in perfume industries.

7th term - II
Unit - 1 Resources

Introduction

- A country's social, economic and political strength lies in the distribution, utilization and conservation of its resources. Anything which can be used for satisfying the human needs is called resource. Natural resources are resources that exist without action of humankind. Natural resources are obtained from environment. Many natural resources are essential for human survival. Resources always cannot be consumed in their original form, but they must be processed into usable commodities and usable things.

Importance of resource

- Natural resources satisfy daily needs of man such as food, clothing and shelter.
- Natural resources also contribute immensely to boost up a nation's economy
- On the basis of origin, resources may be divided into two types. They are:

1. Biotic resources
2. Abiotic resources

1. Biotic resources

- Biotic resources are found in the biosphere which are obtained from living and organic materials. It includes forests, crops, birds, animals, fishes, man and materials that can be obtained from them. Fossil fuels such as coal and petroleum are also included in this category because they are formed from decayed organic matter

2. Abiotic resources

- Abiotic resources are the non-living parts of an environment. Examples of abiotic resources include land, water, air, sunlight and heavy metals including ores such as gold, iron, copper, silver etc.
- On the basis of renewability, resources can be divided into two types. They are:

1. Renewable resources
2. Non - renewable resources

1. Renewable resources

- A renewable resource is a resource which can be used repeatedly and replaced naturally. Renewable resources harvested and used rationally will not produce pollution. The use of renewable resources and energy sources is increasing worldwide.

Example: solar energy, wind energy, and hydropower.

Solar energy

- The sun produces energy in the form of heat and light. Solar energy is not harmful to the environment. Photovoltaic devices or solar cells, directly convert solar energy into electricity. Individual solar cell in group panel can perform small applications from charging calculator, watch batteries, to large such as to power residential dwellings. Photovoltaic power plants and concentrating solar power plants are the largest solar applications covering acres. India, China, Japan, Italy and States of America are major utilizers of solar energy in the world

Kamuthi solar power project is one of the largest solar power projects in the world. It is situated in Ramanathapuram District in Tamilnadu. The Kamuthi solar power project was completed on 21st September 2016. Investment of this project is around 4,550 Crores. The installed capacity of this project is 648 MW.

Major wind farms in India

S. No.	Wind Forms	District	State	Installed Capacity (MW)
1.	Muppandal	Kanyakumari	Tamil Nadu	1,500
2.	Jaisalmer	Jaisalmer	Rajasthan	1,064
3.	Brahmanvel	Dhule	Maharashtra	528
4.	Dhalgaon	Sangli	Maharashtra	278
5.	Damanjodi	Damanjodi	Odisha	99

Hydropower

- Water is considered as a great source of energy. At present, water is used for producing hydroelectric power. Hydroelectricity is generated from moving water with high velocity and great falls with the help of turbines and dynamos. Hydroelectricity power is the cheapest and most versatile source of energy out of all the known energy. Hydroelectric power is a renewable resource. China, Canada, Brazil, United States of America, Russia, India, Norway and Japan are some countries producing hydroelectricity. China is the largest producer of hydro-electricity

Wind energy

- Wind power is clean energy since wind turbines does not produce any emissions. In recent years, wind energy has become one of the most economical and renewable energy technologies. The Classic Dutch windmill harnessed the wind's energy hundreds of years ago. Modern wind turbines with three blades dot the landscape today, turning wind into electricity. Major wind energy producing countries are United States, China, Germany, Spain, India, United Kingdom, Canada and Brazil.

S. No.	Hydro - electricity project	Installed Capacity (MW)	State
1.	Tehri Dam	2,400	Uttarakhand
2.	Srisaillam Dam	1,670	Andhra Pradesh
3.	NagarjunaSagar Dam	960	Andhra Pradesh
4.	SardarSarovar Dam	1,450	Gujarat
5.	BhakraNangal Dam	1,325	Punjab
6.	Koyna Dam	1,960	Maharashtra
7.	Mettur dam	120	Tamil Nadu
8.	Idukki dam	780	Kerala

S.No.	Name of the Project	Country	River	Installed Capacity in MW
1.	Three gorges Dam	China	Yangtze	22,500
2.	Itaipu Dam	Brazil and Paraguay	Parana	14,000
3.	Xiluodu Dam	China	Jinsha	13,860
4.	Guri Dam	Venezuela	Caroni	10,235
5.	Tucurui Dam	Brazil	Tocantins	8,370

Three Gorges Dam in China is the largest hydroelectricity project in the world. It's construction started in 1994 and ended in 2012. The installed capacity of the dam is 22,000MW.

Non-renewable resources

- Natural resources that once consumed and cannot be replaced is called non-renewable resources. Continuous consumption of non-renewable resources ultimately leads to exhaustion. Examples of non-renewable resources include fossil fuels such as coal, petroleum, natural gas and mineral resources such as

iron, copper, bauxite, gold, silver and others. Non-renewable resources can be divided into three types. They are:

- Metallic resources
- Non - Metallic resources
- Fossil fuel resources

Metallic resources

- Metallic resources are the type of resources that are composed of metals. These are hard substances, which are the good conductors of heat and electricity. Example for metallic resources are iron, copper, gold, bauxite, silver, manganese, etc.

Iron

- Iron is the fourth most common element in the Earth's crust and the most widely available metal. Magnetite and hematite are the common ore for iron, which occurs normally in the rocks of the crust. Iron ore is the key raw material in making steel and 98% of the iron ore extracted is used to make Steel. Pure iron ore is very soft, but its strength is increased many folds by adding small amount of carbon and manganese. Its low cost and high earth strength makes it usable in engineering applications, such as the construction of machinery and machine tools, automobiles, construction of large ships, structural components of building, bridges etc.
- Iron ore is mined in about 50 countries. Among the iron ore producing countries China, Australia, Brazil, India and Russia are the principal producers accounting for 85% of the world's total output of iron ore. These countries have 70% of the total reserves of the world. Jharkhand, Odisha, Madhya Pradesh, Chhattisgarh, Karnataka and Goa account for over 95 per cent of the total reserves of India. Iron ores found at Kanjamalai in Tamil Nadu.

Copper

- Copper is one of the first metals known and used by man. Copper ranks as the third most consumed industrial metal in the world after Iron and Aluminium. Copper is good conductor of heat and electricity. About three quarters of copper is used to make electrical wires, telecommunication cables and electronics.
- Chile is the world's number one country in the production of copper. Other copper producing countries are Peru, China, United States, Congo and Australia.

Gold

- It is a rare and precious metal. Hence, it has high demand in world markets. Formerly, it was used for minting coins, but now it is used for making ornaments and in dentistry. It is regarded as a symbol of prosperity and a form of wealth.
- China is the world's largest producer of gold. Also, Australia, Russia, United States, South Africa and Canada are the major producers of gold. Among these countries, Australia has 9500 tons reserves of gold ore and it is world's leading country in gold ore reserves. Karnataka is the largest producer of gold in India. Kolar Gold Field is one of the deepest mines of the world.

Bauxite

- Aluminium is produced from bauxite ore. There are several ores that contain aluminium but bauxite contains more aluminium. Aluminium has wide range of uses compared to other metals. Aluminium is light in weight, tough and cheaper, which makes it popular metal for constructional purpose. It is mainly used in the construction of aircrafts, ship, automobiles, railway coaches and etc. Aluminium is a good conductor of electricity and heat, hence, it is used for making electrical cables. It is highly resistant to corrosion. By the addition of small quantities of other metals to aluminium, it creates superior alloy than pure aluminium.

E.g: Duralumin.

- Australia is the world's leading bauxite producer. Apart from that, China, Brazil, India, Guinea, Jamaica and Russia also play an important role in bauxite production. One fourth of the bauxite mineral deposits found in Guinea alone. Odisha, Gujarat, Jharkhand, Maharashtra, Chhattisgarh, Tamil Nadu and Madhya Pradesh are the main bauxite producing states in India. The bauxite deposits are mainly found in the Shervaroy hills of Salem district, Tamil Nadu

Silver

- Silver is also a precious metal like gold. It has a wider variety of uses than gold. It is used in making jewellery, dentistry, photographic goods, electroplating industry and in the manufacture of luxury goods. About two-third of silver is used for monetary purposes. Like gold, silver also resists corrosion.
- Mexico is the world's leading silver producer. Following Mexico, Peru, China, Russia, Australia and Chile produce more silver. More than 50% of silver is found only in South American countries.

Manganese

- Manganese is a steel-grey, hard, shiny and brittle metal. The common ores of manganese are Pyrolusite Manganese, Psilomelane and Rhodochrosite.

Manganese is essential for the production of good quality Steel. Manganese is used in making electrical batteries. It is also used as colouring material in bricks, pottery, floor tiles. Manganese compounds are used in making disinfecting liquids, bleaching powder, fertilizers etc.

- South Africa is the world's leading producer of manganese. The significant producers of manganese in the world are China, Australia, Gabon, Brazil and India. All these producers have large reserves of manganese and are significant exporters in the world.

Non-metallic resources

- Non-metallic resources can be described as the resources that do not comprise of metals. These are not hard substances, and are not good conductors of heat and electricity. Example for non-metallic resources are mica, limestone, gypsum, dolomite, phosphate, etc.

Mica

- Muscovite and Biotite are the common ores of Mica. It is one of the indispensable minerals used in electrical and electronics industry. It is used as an insulating material in electrical industry. In powder form, it is used for making lubricating oils and decorative wallpapers.
- China is the world's top producer of mica. Russia, Finland, United States, Turkey and Republic of Korea also play a major role in the production of mica. About 95 per cent of India's mica is found in just three states of Andhra Pradesh, Rajasthan and Jharkhand.

Limestone

- Limestone is a sedimentary rock, composed mainly by skeletal fragments of marine organisms such as coral, foraminifera and molluscs. About 10% of sedimentary rocks are limestones. Mostly limestone is made into crushed stone and used as a construction material. It is used for facing stone, floor tiles, stair treads, windows sills and many other purposes. Crushed limestone is used in smelting and other metal refining process. Portland cement is made from limestone.
- China produces more than half of limestone production in the world. Beside this, United States, India, Russia, Brazil and Japan also produce more Limestone. Madhya Pradesh, Rajasthan, Andhra Pradesh, Gujarat, Chhattisgarh and Tamil Nadu Produce over three-fourths of the total limestone of India. In Tamil Nadu, Large scale limestone reserve found in Ramanathapuram, Tirunelveli, Ariyalur, Salem, Coimbatore and Madurai districts.

Fossil fuel resources

- Fossil fuel resources are normally formed from the remains of dead plants and animals. They are often referred to as fossil fuels and are formed from hydrocarbon. When fossil fuels are burned, they become a great source of heat energy. Example for fossil fuel resources are coal, petroleum and natural gas.

Coal

- This is the most abundantly found fossil fuel that forms when dead plant matter is converted into peat. It is used as a domestic fuel, in industries such as iron and steel, steam engines to generate electricity. Electricity produced from coal is called Thermal Power.

Coal is classified into four types based on carbon content. They are:

1. Anthracite
2. Bituminous
3. Lignite
4. Peat.

The leading coal producers of the world are China. Beside this, India, USA, Australia, Indonesia and Russia also produce more coal. The coal producing areas of India are Raniganj in West Bengal, Neyveli in Tamil Nadu, Jharia, Dhanbad, and Bokaro in Jharkhand.

Most of the coal deposits that we use now, were formed about 300 million years ago. Much of the earth was covered with steamy swamps. As the plants and trees are dead, their remains were buried underneath the swamps. Eventually, they were transformed into coal beneath the ground due to excessive heat and pressure.

Petroleum

- Petroleum is found between the layers of rocks and is drilled from oil fields located in Offshore and coastal areas. This is sent to refineries which process crude oil and produce variety of products like diesel, petrol, kerosene, wax, plastics and lubricants. Petroleum and its derivatives are called Black Gold as they are very valuable.
- The chief petroleum producing countries are Saudi Arabia, Iran, Iraq and Qatar. The other major producers are USA, Russia, Venezuela, Kuwait, UAE and Algeria. The leading producers in India are Digboi in Assam, Bombay High in Mumbai and the deltas of Krishna and Godavari rivers.

Natural gas

- 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.
- More than 50% of the global natural gas reserves are found in United States of America, Russia, Iran and Qatar.
- In India, Krishna and Godavari Delta, Assam, Gujarat and some areas of offshore in Mumbai have natural gas resources.

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8th vol - I
Unit 1 - Rocks and Soil

Rocks

- The rocks are the solid mineral materials forming a part of the surface of the earth and other similar planets. The earth's crust (Lithosphere) is composed of rocks. A rock is an aggregate of one or more minerals. Rock is an important natural resource and is found in solid state. It may be hard or soft in nature. An estimation reveals that there are 2,000 different types of minerals found on the earth surface out of which only 12 are the basic minerals commonly found all over the earth. Minerals are chemical substances which exist in nature. They may occur either in the form of elements or compounds.

Classification of Rocks

- According to the mode of formation the rocks are classified into three types as follows.

1. **Igneous Rocks,**
2. **Sedimentary Rocks**
- and 3. **Metamorphic Rocks**

Igneous Rocks

- The igneous rocks are formed by the solidification of molten magma. These rocks are also called as the 'Primary Rocks' or 'Parent Rocks' as all other rocks are formed from these rocks. Characteristics of Igneous Rocks
 1. These rocks are hard in nature
 2. These are impermeable
 3. They do not contain fossils
 4. They are associated with the volcanic activities
 5. These rocks are useful for construction works

Types of Igneous Rocks

1. Extrusive Igneous Rocks,
2. Intrusive Igneous Rocks

- **Extrusive Igneous Rocks:** Can you visualize the lava comes out from a volcano? Lava is actually a fiery red molten magma comes out from the interior of the earth on its surface. After reaching the earth surface the molten materials get solidified and form rocks. Rocks formed in such a way on the crust are called Extrusive igneous rocks. These rocks are fine grained and glassy in nature due to rapid solidification. Basalt found in the north western part of peninsular India is the example for this type of rock.

1. **Intrusive Igneous rocks:** The molten magma sometimes cools down deep inside the earth's crust and becomes solid. The rocks formed this way is called 'Intrusive Igneous Rocks'. Since they cool down slowly, they form large grains. Intrusive Igneous rocks are of two types. The deep seated rocks are called 'Plutonic rocks' and the ones formed at shallow depths are called 'Hypabysal rocks'. Granite, Diorite and Gabbro are the examples of plutonic rocks and Dolerite is an example of hypabysal rocks. Since the intrusive Igneous rocks consist of large crystals, they are also called as 'Crystalline rocks'.

Sedimentary Rocks

- The word 'Sedimentary' has been derived from Latin word 'Sedimentum' means settling down. The sedimentary rocks are formed by the sediments derived and deposited by various agents. Due to high temperature and pressure, the undisturbed sediments of long period cemented to form sedimentary rocks. Sedimentary rocks consist of many layers which were formed by the sediments deposited at different periods. As it consists of many strata, it is also known as 'Stratified rocks'. Characteristics of Sedimentary rocks
 1. They have many layers.
 2. They are non-crystalline rocks.
 3. They contain fossils.
 4. They are soft and get eroded easily

Types of Sedimentary Rocks

1. **Organic Sedimentary Rocks:** These rocks are formed as a result of the decomposition of dead plants and animals. It contains fossils. Chalk, Talc, Dolomite and Limestone rocks are of this category.
2. **Mechanical Sedimentary Rocks:** These rocks are formed from the disintegration of igneous and metamorphic rocks. The natural agents erode and transport these rocks and deposit them at some places. After a long period of time, they cemented to form rocks. Sandstone, Shale and Clay are the examples of rocks of this type.
3. **Chemical Sedimentary rocks:** These are formed by precipitating of minerals from water. It is formed usually through evaporation of chemical rich solutions. These rocks are also called as evaporates. Rock Salt is an example of this kind.

Metamorphic Rocks

- The word Metamorphic is derived from two Greek words "Meta" and "Morpha", Meta means change and Morpha means shape. When Igneous and sedimentary rocks subject to high temperature and pressure, the original rocks get altered to form a new kind of rock called metamorphic rocks. Metamorphism is of two

types. They are 1. Thermal Metamorphism: If the change in the rocks is mainly caused by high temperature, the process is called as thermal metamorphism. 2. Dynamic Metamorphism: If the change in the rock is mainly caused by high pressure, the process is called as Dynamic Metamorphism.

✓ **Formation of Metamorphic Rocks from Igneous rocks**

- Granite into gneiss caused by dynamic metamorphism.
- Basalt into slate caused by thermal metamorphism.

✓ **Formation of Metamorphic Rocks from Sedimentary rocks**

- Sandstone into quartz caused by thermal metamorphism.
- Shale into slate caused by thermal metamorphism.

✓ **Characteristics of Metamorphic Rocks**

- Metamorphic rocks are mostly crystalline in nature.
- They consist of alternate bands of light and dark minerals.

Rock cycle

- Igneous rocks are the primary rocks formed first on the earth. These rocks are weathered, eroded, transported and deposited at some places to form sedimentary rocks. The Igneous and Sedimentary rocks are changed into metamorphic rocks under the influence of temperature and pressure. The metamorphic rocks are also get disintegrated and deposited to form sedimentary rocks. Formation of igneous rocks takes place when there is an outflow of molten materials. Like this, the rocks of the earth crust keeps on changing from one form to another form under various natural forces and agents. The endless process is referred as Rock Cycle.

Uses of rocks

- Rocks have been used by mankind throughout the history. Rocks are highly valuable and important to almost all aspects of our economy. The minerals and metals in rocks have been found essential to human civilization. Rocks are used for many purposes in our life and some of them are given below. Rocks are useful for making

- | | |
|------------------------|---|
| 1. Cement | 6. Kerb stone, |
| 2. Writing chalk, | 7. Ornament, |
| 3. Fire, | 8. Roofing materials, |
| 4. Building materials, | 9. Decorative materials, |
| 5. Bath scrub, | 10. These are valuable source of minerals
such as gold, diamond, sapphire etc. |

Soil and its Formation

- Soil is a mixture of organic matter, minerals, gases, liquids and organisms that together support life. Soil minerals form the basis of soil. It forms on the surface of the earth. It is known as the 'skin of the earth'. Soils are produced from rocks (parent material) through the processes of weathering and natural erosion. Water, wind, temperature change, gravity, chemical interaction, living organisms and pressure differences all help break down parent material. It leads to the formation of loose material. In course of time, they further break down into fine particles. This process release the minerals locked in the rock fragments. Later on, the vegetative cover which develop in that region forms humus content in the soil. This way the soil gets matured gradually.
- **Soil Composition:** The basic components of soil are mineral, organic matter, water and air. It consists of about 45% mineral, 5% organic matter, 25% of water and 25% air. It is only a generalized fact. The composition of soil varies from place to place and time to time.
- **Soil profile:** The soil profile is defined as the vertical section of the soil from the ground surface and extends downwards.
- **Classification of soils:** Soils are classified on the basis of their formation, colour, physical and chemical properties. Based on these, soil is classified into six major types. They are: Alluvial soil, Black soil, Red soil, Laterite soil, Mountain soil, Desert soil
- **Alluvial soil:** These soils are found in the regions of river valleys, flood plains and coastal regions. These are formed by the deposition of silt by the running water. It is the most productive of all soils. It is suitable for the cultivation of sugarcane, jute, rice, wheat and other food crops.
- **Black soils:** These soils are formed by weathering of igneous rocks. Black soil is clayey in nature. It is retentive of moisture. It is ideal for growing cotton.
- **Red Soils:** These soils are formed by weathering of metamorphic rocks and crystalline rocks. The presence of iron oxide makes this soil brown to red in colour. It is usually found in semi-arid regions. It is not a fertile soil. It is suitable for millet cultivation.
- **Laterites soils:** These are the typical soils of tropical regions. These soils are found in the regions which experienced alternate wet and dry condition. As these soils are formed by the process of leaching, it is in fertile. It is suitable for plantation crops of tea and coffee.

- **Mountain soils:** These soils are found over the slopes of mountain. Soils in these regions are thin and acidic. However characteristic of soil differs from region to region based on the altitude.
- **Desert soils:** These are sandy soil found in the hot desert regions. These soils are porous and saline. Since it is infertile agriculture in these soils are not so successful.
- **Soil Erosion:** Soil erosion is the removal or destruction of the top layer of soil by natural forces and human activities. Soil erosion reduces the fertility of soil which in turn reduces the agricultural productivity. Running water and wind are the major agents of soil erosion. Sheet erosion, Rill erosion and Gully erosion are the major types of soil erosion.

Layers of Soil

O-Horizon or Humus	This layer is dominated by organic material (leaves, needles, twigs, moss and lichens).
A- Horizon or Top Soil	It is a part of top soil, composed of organic matter mixed with mineral matter.
E- Horizon or Elevated layer	E-Stands for elevated layer. This layer is significantly leached of clay, iron, and aluminum oxides, which leaves a concentration of ore
B- Horizon or Sub-soil	This layer reflects the chemical or physical alteration of parent material. Thus iron, clay, aluminum and organic compounds are found accumulated in this horizon.
C- Horizon or Parent Rock	Partially weathered parent material accumulates in this layer.
R- Horizon Parent Rock	This layer consists of unweathered part of bed rock.

Soil conservation

- Soil conservation is the process of protecting the soil from erosion to maintain its fertility. The methods that are widely practiced for conserving soil are afforestation, controlled grazing, construction of dams, Crop rotation, Strip farming, contour ploughing, terrace farming, checking shifting cultivation, wind break etc.,

Uses of soils

- Soil is one of the important natural resource. It is a basic requirement for plant growth and supports various life forms on the earth.
 - ✓ The minerals present in the soil enhance and nourishes the crops and plants.

- ✓ It is used in making of ceramics or pottery.
 - ✓ It is a source of material for construction and handicraft works.
 - ✓ It acts as natural filter of water and purifies it.
 - ✓ Soil supports ecosystem and play an important role in land management.
- Rocks and soils are the important renewable natural resources. Both of them play an important role in everyday life of human beings as well as economic development. Nowadays rock-based companies are in increase which provide employment to a sizeable population. Soils attract human settlement and other economic activities. As India is an agricultural country, the proper management of soil resource will lead to sustainable food production besides its use for various other purposes. So, the soil resources must be conserved.

NOTE

- ❖ Petrology is a branch of geology which deals with the study of rocks. 'Petrology' is derived from the Greek word "Petrus" refers to rock and "Logos" refers to study
- ❖ The word **Igneous** is derived from the Latin word 'Ignis' means 'fire'
- ❖ Some major **Active Volcanoes**: Mount Vesuvius, Mt. Stromboli and Mt. Etna in Italy and Mauna Loa and Mauna Kea in Hawaii Islands.
- ❖ Oldest sedimentary rocks of the world has been identified in Greenland and estimated as 3.9 billion years old.
- ❖ Sedimentary rocks are the important source of natural resources like coal, oil and natural gas.
- ❖ One of the world wonders TajMahal in India was built by White Marble in a metamorphic rock.
- ❖ Quartzite and Marble are the rocks commonly used for construction and sculpture works. Marbles are widely used for making beautiful statues and decorative items such as vase, tiny gift articles and grinded marble is used to produce plastics, paper etc.,
- ❖ World Soil Day is observed on 5th December, every year
- ❖ **How long does it take to form soil?**
The time needed to form a soil depends on the Climate. The environments which is characterized by mild climate, takes 200-400 years to form one cm of soil and in wet tropical area, soil formation is faster and takes upto 200 years. To become a well matured soil, it takes about 3000 years.

10th book
Unit 4. Resources and Industries

Introduction

- Any matter or energy derived from the environment that is used by living things including humans is called a natural resource. Natural resources include air, water, soil, minerals, fossil fuels, plants, wild life etc. Many natural resources are used as raw materials. They play a vital role in the economic development of any region. Natural resources are classified on several basis. Based on continued availability, the resources are categorised into two types. Renewable Resources are those which have natural regeneration after their utilisation. Solar energy, wind energy, biogas, tidal energy, wave energy etc. are the renewable resources. Non- Renewable resources are the sources that cannot be replaced again after utilisation. Coal, petroleum, natural gas etc. fall under this category.

Minerals

- Mineral is a natural substance of organic or inorganic origin with definite chemical and physical properties. The process of extracting mineral from the earth is known as mining. The mines near the earth crust are known as open pit mines while the deep mines are known as shaft mines.

Types of Minerals

- On the basis of chemical and physical properties, minerals are broadly grouped under two categories. They are metallic and non-metallic minerals.

a. Metallic Minerals

- Metallic minerals are the minerals which contain one or more metallic elements in them. Metallic minerals occur in rare, naturally formed concentrations known as mineral deposits. These deposits consist of a variety of valuable metals such as iron, manganese, copper, bauxite, nickel, zinc, lead, gold etc.

i. Iron ore

- Iron ore is the most widely distributed elements of the earth crust, rarely occurs in a free state. It enters into the composition of many rocks and minerals especially from igneous and metamorphic rocks. The total recoverable reserves of iron ore in India are about 9602 million tons of haematite and 3408 million tons of magnetite. About 79% haematite deposits are found in Assam, Bihar, Chhattisgarh, Jharkhand, Odisha and Uttar Pradesh. About 93% magnetite deposits occur in Andhra Pradesh, Goa, Karnataka, Kerala and Tamil Nadu. Karnataka alone contributes about 72% of magnetite deposits of India.

Iron ores are rocks and minerals from which metallic iron can be economically extracted. The ores are usually rich in iron oxides and vary in colour from dark grey, bright yellow, or deep purple to rusty red. The iron is usually found in following form.

Form of Iron ores	Iron Content (%)
Magnetite	72.4%
Hematite	69.9%
Goethite	62.9%
Limonite	55%
Siderite	48.2%

- Jharkhand is the leading producer of iron ore with 25% the country's production. Singhbhum, Hazaribagh, Dhanbad and Ranchi districts are its major producers. Odisha with 21% production ranks second. Sundargarh, Mayurbhanj, Sambalpur and Keonjhar districts are its major producers. The magnetite production of Chhattisgarh is 18% (Rajgarh and Bilaspur are its leadings districts) and the Karnataka is 20% (Chikmangalur, Chitradurga, Shimoga and Dharwad districts are its major producers). Andhrapradesh and Karnataka produce about 5% each. Kurnool, Guntur, Cuddapah and Anantapur districts in Andhra Pradesh and Salem, Namakkal, Tiruvannamalai, Tiruchirappalli, Coimbatore, Madurai and Tirunelveli districts in Tamil Nadu are notable for the production of iron ore. SAIL (Steel Authority of India Limited): The Ministry of Steel is responsible for planning and development of iron and steel industry in India.

ii. Manganese

- Manganese is a silvery grey element. It is very hard and brittle in nature. It is always available in combination with iron, laterite and other minerals. It is an important mineral used for making iron and steel and serves as basic raw material for alloying. It is the most important mineral for making iron and steel. Nearly 10 kg manganese is required for manufacturing one ton of steel. It is also used in the manufacturing of bleaching powder, insecticides, paints and batteries. Manganese deposits occur mainly as metamorphosed bedded sedimentary deposits. The largest deposits of manganese is found in Odisha(44%) followed by Karnataka (22%), Madhya Pradesh (12%), Maharashtra & Goa(7% each), Andhra Pradesh (4%) and Jharkhand (2%). Rajasthan, Gujarat, Telengana and West Bengal together constitute about 2% of the India's manganese resource. Nagpur, Bhandara and Ratnagiri districts in Maharastra and Balaghat and Chhindwara districts in Madhya Pradesh are the leading producers. Odisha is the third largest producer with 24% (Sundargarh,Kalahandi, Koraput and Bolangir districts are the major ones). Other producers are Andhra Pradesh (13%) and Karnataka (6%). Srikakulam, Visakhapatnam, Cuddapah and Guntur districts in Andhra Pradesh and the districts of Shimoga, Bellary, Chitradurga and Tumkur are the important districts of Karnataka. It is the most

important mineral for making iron and steel. India is the fifth largest producer of manganese in the world.

iii. Copper

- Copper is the first metal that prehistoric man has started using for many purposes. Being flexible, it can be made into utensils of any shape. Brass and Bronze are obtained when the copper alloys with zinc and tin respectively. Copper has been commonly used for making cooking utensils and other objects of common utility. In modern days, it is extensively used in vast variety of electrical machinery, wires and cables. Largest reserves of copper ore is in the state of Rajasthan (53.81%) followed by Jharkhand (19.54%) and Madhya Pradesh (18.75%). The states of Andhra Pradesh, Gujarat, Haryana, Karnataka, Maharashtra, Meghalaya, Nagaland, Odisha, Sikkim, Tamil Nadu, Telangana, Uttarkhand and West Bengal account for 7.9% of the total copper reserves of India.
- Jharkhand is the largest producer of copper with 62% of India's production. Singhbhum and Hazaribagh districts are its leading producers of copper. Odisha is the other major producer with 50.2% production. Rajasthan ranks third with 28% production. The districts of Khetri, Alwar and Bhilwara are notables in this state. The states of Uttarkhand (Dehradun and Garhwal districts), Andhra Pradesh (Guntur, Kurnool and Nellore districts), Karnataka (Chitradurga and Hassan districts) and Tamil Nadu contributes about 7% of production each.

iv. Bauxite

- Bauxite is an important ore from which aluminium is extracted. It is found in the rock consisting mainly of hydrated aluminium oxides. Bauxite is widely distributed as surface deposits in the areas of laterite soil. Being light in weight and tough, aluminium is used in the manufacture of aircrafts and automobile engines. Bauxite is also used in the manufacture of cement and chemicals. The main bauxite deposits occur in Odisha - 50.2%, Gujarat - 15.8% (Junagadh, Amreli and Bhavnagar districts), Jharkhand - 11.9% (Ranchi and Gumila districts), Maharashtra - 9.9% (Sindhudurg and Ratnagiri), Chhattisgarh - 6.2% (Ballarpur and Durg districts), and Tamil Nadu - 2.7%. Being light in weight and tough, aluminium is used in the manufacture of aircrafts and automobile engines. Bauxite is also used in the manufacture of cement and chemicals. Orissa is the largest producer of bauxite in India with approx. 1,370.5 million tonnes. India's State and Central Government is very supportive in production of Bauxite and other Industrial Minerals in Orissa, Jharkhand, Tamil Nadu.

b. Non-Metallic Minerals

- These minerals do not contain metal in them. Mica, limestone, gypsum, nitrate, potash, dolomite, coal, petroleum etc are the non-metallic minerals.

i. Mica

- In ancient time, Mica was used in ayurvedic medicine. Mica became very popular with the development of electrical industry. Abhrak is a good quality mica. It is translucent, easily splittable into thin sheets, flat, colourless, elastic and incompressible. Mica is used in making of insulating properties, as it withstands high voltage and has low power loss factor. Since it is a non-conductor of electricity, it is exclusively used in electrical goods. It is also used in making of lubricants, medicines, paints and varnishes.
- The major deposits of mica are found in Andhra Pradesh(41%) with Nellore, Visakhapatnam, West Godavari and Krishna are its major districts. Other important states in mica deposits are Rajasthan(21%) and Odisha(20%). Bhilwara, Jaipur and Ajmer are the notable districts in Rajasthan and, Rayagada, Bolangir and Sundargarh districts are the major producers in Odisha. Dhanbad, Palamu, Ranchi and Singhbhum districts are the major mica mines in Jharkhand state.

ii. Lime Stone

- Limestone is associated with rocks composed of either calcium carbonate or the double carbonate of calcium and magnesium or mixture of both. Limestone also contains small quantities of silica, alumina, iron oxides, phosphorous and sulphur. Limestone is used in the industries of chemicals for soda ash, caustic soda, bleaching powder, paper, cement, iron and steel, glass and fertilizers. The major producing areas: Andhra Pradesh produces about 20% with major concentration in Cuddapah, Kurnool and Guntur districts. Telangana also accounts for about 20% of the country's production with the districts of Nalgonda, Adilabad, Warangal and Karimnagar as major producers. Rajasthan produces about 18% (Jodhpur, Ajmer, Bikaner and Kota districts), Madhya Pradesh about 12% (Jabalpur and Satna districts) and Tamil Nadu about 8.4% (Salem, Kancheepuram, Tiruchirappalli, Thoothukkudi, Tirunelveli and Virudhunagar districts) of limestone production of India. In terms of the reserves of limestone, the state of Karnataka leads with 27%, followed by Andhra Pradesh and Rajasthan (12% each), Gujarat (10%), Meghalaya (9%), Telangana (8%), Chhattisgarh and Madhya Pradesh (5% each) and the remaining by other states.

iii. Gypsum

- Gypsum is a hydrated sulphate of calcium which occurs as white, opaque or transparent minerals in beds of sedimentary rocks such as limestone, sandstone and shale. Gypsum is used in the manufacture of cement, fertilizers, wall board, plaster of paris and in soil conditioning. The state of Rajasthan alone accounts for 81% of its reserves. 14% of its reserves is found in Jammu and Kashmir and 2% in

Tamil Nadu. The remaining 3% resources are found in the states of Gujarat, Himachal Pradesh, Karnataka, Uttarakhand, Andhra Pradesh and Madhya Pradesh. Rajasthan produces 82% of the country's production. Jodhpur, Bikaner and Jaisalmer are notable districts. Jammu and Kashmir produces 14% of country's gypsum. Baramulla, Doda and Uri districts are its major producers. The states of Gujarat (Bhavnagar and Jamnagar districts), Uttarakhand (Dehradun and Mussourie districts), Andhra Pradesh (Nellore, Guntur and Prakasam districts) and Tamil Nadu are the other producers with about 4% each.

Energy Resources

- The resources from which the electricity generated are called energy resources. Electricity is an important component of our life. No day to day activity takes without the use of this energy. It is also the key factor for all economic activities and industrial development. Energy resources can be classified into renewable and non-renewable. Coal, petroleum, natural gas and nuclear minerals are the sources of non-renewable energy. Water, sun light, wind, bio gas, tides etc., are the sources of renewable energy.

Non-Renewable Energy

a. Coal

- Coal is an inflammable organic substance composed mainly of hydrocarbons. Coal is available in the form of sedimentary rocks. It is used in the generation of thermal power. It has close association with the industrial development of any country. Since it is a valuable one, it is called as "Black Gold". Based on carbon content, it is classified into the following types.

Anthracite: contains 80 to 90% carbon

Bituminous: contains 60 to 80% carbon

Lignite: contains 40 to 60% carbon

Peat: contains less than 40% carbon

- Coal is an important source of energy in India with its varied and innumerable uses. It can be converted into gas, oil, electricity and thermal power. Besides, it forms a basic raw material for the production of chemicals, dyes, fertilizers, paints, synthetic and explosives. Indian coal is mostly associated with Gondwana series of rocks and is primarily found in Peninsular India. The states of Jharkhand, Odisha, West Bengal and Madhya Pradesh alone account for nearly 90% of coal reserves of the country. About 2% of India's coal is of tertiary type and is found mostly in Assam and Jammu & Kashmir.
- Jharkhand is the largest coal producing state in the country followed by Odisha, Chhattisgarh, West Bengal, Madhya Pradesh, Andhra Pradesh and Maharashtra. The major coal fields of Jharkhand are Bokaro, North Karanpura, South

Karanpura, Giridih, Ramgarh, Daltongunj and Rajmahal. Talcher and Ranapur in Odisha, Korba and Chirmiri in Chhattisgarh, Umari and Singrauli in Madhya Pradesh, Tander, Singareni, Kothagudem and Ramagundam in Andhra Pradesh, Wardha, Ballarpur, Chanda and Kampti in Maharashtra, Raniganj, Asansol and Meja in West Bengal are the other major coal fields of India.

- Indian lignite (brown coal) deposits occur in the southern and western parts of Peninsular India particularly in Tamil Nadu, Puducherry and Kerala. The Ministry of coal has over-all responsibility of determining policies and strategies in respect of exploration and development of coal resource in India. Coal India Limited (CIL), NLC India Limited (NLCIL) and Singareni Collieries Company limited (SCCL) are its public sector undertakings.

b. Petroleum (or) Crude oil

- The word petroleum has been derived from two Latin words petro (meaning – Rock) and oleum (meaning oil). Thus petroleum is oil obtained from rocks of the earth. Therefore, it is also called mineral oil. Petroleum is an inflammable liquid that is composed of hydrocarbons which constitute 90-95% of petroleum and the remaining is chiefly organic compounds containing oxygen, nitrogen, sulphur and traces of organo metallic compounds. Petroleum is used as a source of power and fuel for automobiles, aeroplanes, ships and locomotives. Lubricants, kerosene, vaseline, tar, soap, terylene and wax are its by-products. Oil in India is obtained from both from on-shore and off-shore areas. As of 2017, the total estimated crude oil reserves of the country is 604.10 million tons. From this, 324.24 million tons (54%) are found in onshore and 279.86 million tonnes (46%) are in offshore areas. The production of crude oil fluctuates from year to year from 2011-12 to 2017-18 but only with marginal variations. The change is invariably in negative. In natural gas production also the trend is negative except the last year. The change is high in the first three years and it is low to moderate in the remaining years.

Western coast offshore oil fields	Eastern coast offshore fields
Mumbai high oil fields (largest 65%)	Bharmaputra valley (Dibrugarh and Sibsagar districts of upper Assam.)
Gujarat coast (2 nd largest)	Digboi oil fields (oldest fields in country)
Bassein oil field, south of Mumbai high	Nahoratiya oil fields (south west of digboi)
Aliabet oil field, south of Bhavanagar	Moran – Hugrijian oil fields (sibsagar districts of assam)
Ankleshwar	Rudrasagar – Lawa oil fields (sibsagar districts of assam)
Cambay – Luni Region	Surrma valley (Badarpur, Masimpur, Patharia)
Ahmedabad Kalol Region	Offshore of Andaman and Nicobar, Gulf of mannar, Baleshwar coast, Punjab,

c. Natural Gas

- Natural gas usually accompanies the petroleum accumulations. It is naturally occurring hydro carbon gas mixture consisting primarily of methane, but commonly includes varying amounts of other higher alkanes and sometimes a small percentage of carbon dioxide, nitrogen and hydrogen sulphides. It is formed when layers of decomposed plants and animals are exposed to intense heat and pressure over thousands of years. It is used as a source of energy for heating, cooking and electricity generation. It is also used as fuel for vehicles and as a chemical feedstock in the manufacture of plastics and other commercially important organic chemicals.
- India has a very large proportion of tertiary rock and alluvial deposits particularly in the extra peninsular India. These sedimentary rocks, which were once under the shallow seas, hold the possibility of harbouring oil and gas deposits. The highest concentration of natural gas is found in the Bombay high and Bassein oil fields. Jagatia and Gogha in Gujarat, Nahorkatiya and Moran in Assam, Neypaltur, Mangmadam in Thanjavur district in Tamil Nadu, Baranura and Atharnure ranges in Tripura, Barmer and Charaswala in Rajasthan, Miao Pung and Laptang areas in Arunachal Pradesh, Firozpur district in Punjab, Mausar and Maradpur areas in Jammu and Kashmir and Medinipur in West Bengal are the other areas where natural gas reserves have been discovered. The Gas Authority of India Ltd [GAIL] is doing pioneer work in the field of natural gas exploration. Discovery of gas made rapid strides in the 1980s. Oil strikes at Cauvery offshore, at Nanda in Cambay basin and Tarot in Jaisalmer basin in Rajasthan were major discoveries during 1988-89. Recently, it has been found that Krishna- Godavari delta has reserves of Natural gas.

Conventional Energy Sources

a. Thermal power

- Thermal power is generated using fossil fuels like coal, diesel, petroleum and Natural gas. National Thermal Power Corporation [NTPC] was established in 1975. At present NTPC has 13 coal based super thermal power projects and 7 gas / liquid fuel based combined cycle projects in the states of Assam, Bihar, Jharkhand, Chhattisgarh, Mizoram and West Bengal. It accounts for over 90% of the installed capacity. Tamil Nadu produces about 5% of the total thermal electricity produced in India. Neyveli, Mettur, Thoothukudi and Ennore (Chennai) are the important thermal power stations in Tamil Nadu.

b. Nuclear power

- The energy released during nuclear fission or fusion is used to generate electricity. Nuclear energy is generated mainly from the minerals of Uranium and Thorium. Nuclear power programme in India was initiated in 1940's when 'Tata Atomic research commission was incorporated in August 1948. The first nuclear power station was setup at Tarapur near Mumbai in 1969 with the capacity of 320 mw. Later atomic reactors were installed at Rawatbhata (335 MW), near Kota in Rajasthan (100 MW), Kalpakkam (440 MW) and Kudankulam (2,000 MW) in Tamil Nadu and Narora (235 MW) in Uttar Pradesh, Kaiga in (235 MW) in Karnataka and Kakrapara (235 MW) in Gujarat.

Renewable or Non-Conventional Energy Resources

a. Hydro power

- Power generated from water is termed as hydroelectricity. Hydro power is the energy harnessed from running water. Hydro power is considered as one of the most economic and non-polluting sources of energy. It contributes nearly 7% of global electricity production. The cost of production of hydroelectricity is relatively low, making it a competitive source of renewable energy. It is also a flexible mode of power generation as the quantity of production can either be increased or decreased very quickly adapting to changing demands. India is fortunate to have a large potential of hydro- power potential. It is quite unevenly distributed in India. Of the total hydro-electric potential of the country, rivers of Assam, Arunachal Pradesh, Manipur, Nagaland and Tripura account for 30.4%, eastward flowing rivers of the peninsular India 20.9%, westward flowing rivers of the western Ghats (South of the Tapti) 10.5%, the Ganga Basin (excluding the potential of Nepal) 11.7%, the Indus Basin 16.0% and the rivers of central India 10.5%.

b. Solar Energy

- Solar Power is the conversion of sunlight into electricity, either directly using photovoltaic (PV) or indirectly using concentrated solar power (CSP). Concentrated solar power systems use lenses or mirrors and tracking system to focus a large area of sunlight into a small beam. Photovoltaic convert light into an electric current using the photovoltaic effect. The mass objectives of the solar thermal energy programme, being implemented by the Ministry of Non-Conventional Energy Source (MNES) are market development, commercialisation and utilisation of heat energy requirement of different applications in domestic, institutional and industrial sectors. Solar power is used in water heaters, refrigerators, drying, street lighting, cooking, pumping, power generator, photovoltaic cells, salon parts etc. Andhra Pradesh, Gujarat, Rajasthan, Maharashtra and Madhya Pradesh are the major solar power producers.

c. Wind Energy

- Wind energy is extracted from air flow using wind turbines. It is a cheap and pollution free source of energy. Power from wind mills are used for pumping water and to sail propel ships. Wind power is plentiful, renewable, widely distributed, clean and produces no greenhouse gas emissions during operation. These plants occupy only a less space. The development of wind power in India began in 1986 with first wind farms were set up in coastal areas of Gujarat (Okha), Maharashtra (Ratnagiri) and Tamil Nadu (Thoothukudi) with 55 KW Vestas wind turbines. The capacity has significantly increased in the last few years. India has the fourth largest installed wind power capacity in the world.

d. Biomass Energy

- Bio energy may be obtained through bio-degradable materials like animal dung, kitchen wastes, water hyacinth, agricultural residues and city wastes etc. It is clean and cheap source of energy. India has a potential of about 18 GW of energy from Biomass. Currently, about 32% of total primary energy used in India is derived from Biomass. Energy derived from biomass is mostly used for domestic purposes.

e. Tidal and wave Energy

- There are two main sources of ocean energy. They are Ocean tides and Ocean waves. It is estimated that India possesses 8,000-9,000 MW of tidal energy potential. The Gulf of Cambay is the best suited area with about 7,000 mw potential of tidal energy. This is followed by Gulf of Kachch (1,000MW) and sunder bans (100MW). At present a 900mw tidal power plant is proposed to be set up in the Gulf of Kachch region. Wave energy potential in India is estimated to be 40,000 MW. An wave energy power plant of 150 KW(maximum) has been installed at vizhinjam near Thiruvananthapuram. An another plant of this kind has been set up near Andaman& Nicobar Islands.

Industries

- It refers to the activities which converts the raw materials into finished products. This sector is called as the value addition sector. On the basis of the source of raw materials, Industries are classified into the Agro based industries, Forest based industries and Mineral based industries.

Agro based industries

- These industries draw their raw materials from agricultural sector. The following part discusses the agro based industries in India.

a. Cotton Textile Industry

- Textile is a broad term which includes cotton, jute, wool, silk and synthetic fibre textiles. This sector in India with 3400 textiles mills with installed capacity of more than 50 million spindles and 842000 rotors is the second largest in the

world. Traditional sectors like hand loom, handicrafts and small power-loom units are the biggest source of employment for millions of people in rural and semi urban areas. The cotton textile industries contribute about 7% of industrial output, 2% of India's GDP and 15% of the country's export earnings. It is one of the largest sources of employment generation in the country. With over 45 million employees, the total employment in this industry is well over 25million worker. At present there are 1,719 textiles mills in the country. Out of which 188 mills are in public sector, 147 in cooperative sector and 1,284 in private sector. Currently, India is the third largest producer of cotton and has the largest loomarc and ring spindles in the world. At present, cotton textile industry is the largest organized modern industry of India. About 16% of the industrial capital, 14% of industrial production and over 20% of the industrial labour of the country are engaged in this industry. The higher concentration of textile mills in and around Mumbai, makes it as "Manchester of India". Presence of black cotton soil in Maharastra, humid climate, presence of Mumbai port, availability of hydro power, good market and well developed transport facility favour the cotton textile industries in Mumbai. The major cotton textile industries are concentrated in the states of Maharashtra, Gujarat, West Bengal, Uttar Pradesh and Tamil Nadu. Coimbatore is the most important centre in Tamil Nadu with 200 mills out of its 435 and called as "Manchester of SouthIndia". Erode, Tirupur, Karur, Chennai, Thirunelveli, Madurai, Thoothukudi, Salem and Virudhunagar are the other major cotton textiles centres in the state.

b. Jute Textiles

- Jute is a low priced fibre used mainly for making package materials like gunny bags. Today jute is blended with cotton and wool to produce textiles. India is the largest producer of jute goods contributing 35% of the world's total output. This is the second important textile industry in India after cotton textiles. Jute is the golden fibre which meets all the standards of goods packing with its natural, renewable, bio degradable and eco-friendly products. The first jute mill in India was established at Rishra near, Kolkata in 1854 by the English man George Auckland.
- India tops in the production of raw jute and jute goods and second in the export of jute goods next to Bangladesh. Jute production includes gunny bags, canvas, pack sheets, jute web, carpets, cordage, hessians and twines. Now jute is also being used in plastic furniture and insulation bleached fibres to blend with wool. It is also mixed with cotton to make carpet and blankets. The major jute producing areas are in West Bengal and concentrated along the Hooghly river within the radius of six kilometre of Kolkata. Titagarh, Jagatdat, Budge-Budge, Haora and Bhadreswar are the chief centres of jute industry. Andhra Pradesh, Bihar, Uttar Pradesh, Assam, Chhattisgarh and Odisha are the other jute goods producing areas.

c. Silk Industry

- India has been well known for the production of silk. Since the ancient times, India is the second largest producer of raw silk next only to China. Sericulture is a labour intensive industry and provides employment to 7.56 million people make to weaker and marginalised sections of society. Karnataka is the largest producer of silk with an average of 8200 metric tons every year which is about one third of the total silk production of India. Other major producers of silk are West Bengal, Jammu Kashmir, Bihar, Jharkhand, Chhattisgarh, Uttar Pradesh, Punjab, Assam and Tamil Nadu states. India exports exclusively silk fabrics, silk scarves, dress material and sarees. It exports to the principal countries like Europe, U.S.A, U.K, Russia, Saudi Arabia, Kuwait and Singapore.

d. Sugar Industry

- Sugar can be produced from sugar cane, sugar-beets or any other crop which have sugar content. In India, sugar cane is the main source of sugar. At present this is the second largest agro based industry of India after cotton textiles. India is the world's second largest producer of sugar cane after Brazil. This industry provides employment to 2.86 lakh workers. Sugar industry is decentralized and located near the sugarcane growing areas as they are weight loosing and bulky to transport. Uttar Pradesh is the largest producer of sugar, producing about 50% of the country's total. Other major producers are Maharashtra, Uttar Pradesh, Karnataka, Andhra Pradesh, Tamil Nadu, Bihar, Punjab, Gujarat, Haryana and Madhya Pradesh states. These states account for more than 90% of the sugar mills and sugar production.

Forest based industries

- Forest provide us with different types of material which are used as raw material for certain industries like paper, lac, sports goods, plywood etc.

a. Paper industry

- Paper Industry has emerged as a diversified and specialized industry in India that produces numerous types of papers that comes in various use such as sheet paper, paper boxes, tissues, paper bags, stationery, envelopes and printed-paper products such as books, periodicals, and newspapers. In India the Soft wood is the principal raw material used for making paper especially newsprint and high class printing papers. Paper is the pre-requisite for education and literacy and its use is an index of advancement in these two fields as well as the overall well-being of the society.
- The first successful effort was made in 1867 with the setting up of the RoyalBengal paper mills at Ballyganj near Kolkata. Subsequent successful efforts were made at Lucknow in 1879, Titagarh in 1882, Pune in 1887, Raniganj in 1892, Kankinra in 1892 and Naihati in 1918.The raw materials for paper industry

includes wood pulp, bamboo, salai and sabai grasses, waste paper and bagasse. West Bengal is the largest producer of paper in the country followed by Madhya Pradesh, Odisha and Tamil nadu states.

Mineral based industries

- Mineral based industries use both metallic & non-metallic minerals as raw materials. The major mineral based industry of country is the iron steel industry

a. Iron and steel industries

- Iron and steel industry is called a basic metallurgical industry as its finished product is used as raw material by host of other industries. Several industries like engineering, heavy machines and machine tools, automobile, locomotives and railway equipment industries use iron and steel as their primary raw material. Due to this, the steel producing capacity of a country is generally taken as an indicator of its level of industrial development. The modernization of the industry was started in 1907 with the establishment of Tata Iron and Steel Company at Sakchi, now called Jamshedpur. Iron and steel industry of India is mainly concentrated in the states of Jharkhand, West Bengal and Odisha. Proximity to the coal fields of Jharia, Raniganj, Bokaro and Karanpura and the iron ore mines of Mayurbhanj, Keonjar and Brona are responsible for this. This area also has sufficient deposits of limestone, dolomite, manganese, silicon and dolomite which are required for the industry.

S.N O	Name of Industry	Place	Establishment year	Product
1.	Tata Iron and Steel Company (TISCO)	Jamshedpur, Jharkhand	1911	Pig Iron
2.	Indian Iron and steel Company (IISCO)	Burnpur, Hirapur, Kulti, West Bengal	1972	Pig Iron & Crude steel
3.	Visweshwaraya Iron Steel Ltd (VISL)	Bhadravati, Karnataka	1923	Alloy and Sponge steel
4.	Hisdustan Steel Ltd (HSL) Collaborated with Russia	Bhilai, Chattisgarh	1957	Railway Equipment's and Ship Building
5.	Hindustan Steel Ltd (HSL) Collaborated with Germany	Rourkela, Odisha	1965	Hot and Cold rolled sheets, Galvanized sheets and electrical plates
6.	Hindustal Steel Ltd (HSL) Collaborated with United Kingdom	Durgapur, west Bengal	1959	Alloy steel, Construction materials and railway equipment's
7.	Hisdustan Steel Ltd (HSL) Collaborated with	Bokaro, Jharkhand	1972	Sludge and Slog

	Russia			
8.	Salem Steel Ltd	Salem, Tamil Nadu	1982	Stainless Steel
9.	Vijayanagar Steel Plant	Tornagal, Karnataka	1994	Flat steel and Long Steel
10.	Visakhapatnam Steel Plant (VSO)	Visakhapatnam, Andhra Pradesh	1981	Hot Metal

Automobile Industry

- India is set to emerge not only as a large domestic market for automobile manufacturers, but also as a crucial link in the global automotive chain. It is one of the most dynamic industrial groups in India. The first automobile industry of India was started in 1947. The industry is the Premier Automobiles Ltd located at Kurla (Mumbai). It was followed by the Hindustan Motors Ltd at Uttarpara (Kolkata) in 1948. At present, India is the 7th largest producer of automobile manufacturers which include two wheelers, commercial vehicles, passenger car, jeep, scooty, scooters, motor cycles, mopeds and three wheelers. Major centres are at Mumbai, Chennai, Jamshedpur, Jabalpur, Kolkata, Pune, New Delhi, Kanpur, Bengaluru, Sadara, Lucknow and Mysuru. Tata Motors, Maruti Suzuki, Mahindra & Mahindra and Hindustan Motors are the largest passenger car manufacturers of Indian companies in the country. Presence of foreign car companies such as Mercedes Benz, Fiat, General Motors, Toyota and the recent entry of passenger car manufacturers BMW, Audi, Volkswagen and Volvo makes the Indian automobile sector a special one. Tata Motors, Ashok Leyland, Eicher Motors, Mahindra & Mahindra and Ford Motors are the major Indian companies which manufacture commercial vehicles. MAN, ITEC, Mercedes-Benz, Scania and Hyundai are the foreign companies engaged in the manufacture of commercial vehicles. Two-wheeler manufacturing is dominated by Indian companies like Hero, Bajaj Auto and TVS.
- The automobile industries are found in four clusters viz; Delhi, Gurgaon and Manesar in North India, Pune, Nasik, Halol and Aurangabad in West India, Chennai, Bengaluru and Hosur in South India and Jamshedpur and Kolkata in East India. Electrical and Electronic

Industries

- Heavy electrical industries manufacture equipment used for power generation, transmission and utilization. Turbines for steam and hydro power plants, boilers for thermal power plants, generators, transformers, switch gears etc. are the chief products of this industry. The most important company in the field of heavy electrical is Bharat Heavy Electricals Ltd (BHEL). It has its plants at Hardwar, Bhopal, Hyderabad, Jammu, Bengaluru, Jhansi and Tiruchirappalli. This Industry covers a wide range of products including television sets, transistor sets, telephone exchanges, cellular telegram, computers and varied equipment's for

post and railway, defence and meteorological department. Bengaluru is the largest producer of electronic goods in India, hence it is called as the “Electronic Capital of India”. The other major producers of electronic goods centers are Hyderabad, Delhi, Mumbai, Chennai, Kolkata, Kanpur, Pune, Lucknow, Jaipur and Coimbatore.

Software Industry

- India is home to some of the finest software companies in the world. The software companies in India are reputed across the globe for their efficient IT and business related solutions. The Indian Software Industry has brought about a tremendous success for the emerging economy. In India, software industry began in 1970 with the entry of Tata Consultancy Services (TCS). Along with this, L & T, InfoTech, i-Flex, Accenture, Cognizant, GalaxE Solutions India Pvt Ltd and ITC InfoTech are the major software industries in the country. At present, there are more than 500 software companies all over India. It exports software service to nearly 95 countries in the world. The main centres of IT parks are located in Chennai, Coimbatore, Thiruvananthapuram, Bengaluru, Mysuru, Hyderabad, Visakhapatnam, Mumbai, Pune, Indore, Gandhi Nagar, Jaipur, Noida, Mohali and Srinagar.

Major challenges of Indian Industries

Industries in India face many problems. Some major problems are listed below.

- Shortage and fluctuation in Power Supply.
- Non- availability of large blocks of land.
- Poor access to credit.
- High rate of interest for borrowed loan.
- Non- availability of cheap labourers.
- Lack of technical and vocational training for employees.
- Inappropriate living conditions nearby industrial estates.

NOTE

- ❖ The organisations associated with minerals in India are the Geological Survey of India (Headquarter is at Kolkata), Indian Bureau of Mines (Headquarter at Nagpur) and Non-Ferrous Material Technology Development Centre (NFTDC), located at Hyderabad. The Ministry of Mines is responsible for the administration of all mines and minerals (Development and Regulation Act, 1957).
- ❖ MOIL- Manganese Ore India Limited state-owned manganese-ore mining company headquartered in Nagpur. With a marketshare of 50%, it was the largest producer of manganese ore in India.
- ❖ Hindustan Copper Ltd is a Government-owned corporation in the central public Enterprise under the Ministry of mines, India. HCL is the only vertically integrated copper producer in India engaged in a wide spectrum of activities

ranging from Mining, Beneficiation, Smelting, Refining and Continuous Cast Rod manufacturer. Bauxite is an oxide of aluminium; the name has been derived after the French word *Le Baux*.

- ❖ National Aluminium Company Limited, abbreviated as NALCO, (incorporated 1981) has units in Odisha at places like Angul and Damanjodi. It was incorporated as a public sector enterprise of the Ministry of Mines, Government of India in 1981.
- ❖ Coal India Limited (CIL) is an Indian state-controlled coal mining company headquartered in Kolkata, West Bengal, its field offices are located at Dhanbad, Ranchi, Bilaspur, Nagpur, Sambalpur, Kothagudam and Asansol. It is the largest coal-producing company in the world.
- ❖ The Ministry of Petroleum and Natural Gas (MOP&NG) is a ministry of the Government of India. It is responsible for the exploration, production, refining, distribution, marketing, import, export, and conservation of petroleum, natural gas, petroleum products, and liquefied natural gas in India.
- ❖ Gail (India) Limited (GAIL) (formerly known as Gas Authority of India Limited) is the largest state-owned natural gas processing and distribution company in India. It is headquartered in New Delhi. It has the following business **segments**: natural gas, liquid hydrocarbon, liquefied petroleum gas transmission, petrochemical, city gas distribution, exploration and production, GAILTEL and electricity generation.
- ❖ Compressed natural gas (CNG) (methane stored at high pressure) is a fuel which can be used in place of gasoline, diesel fuel and propane/LPG. In comparison to other fuels, natural gas poses less of a threat in the event of a spill, because it is lighter than air and disperses quickly when released. Biomethane – cleaned-up biogas from anaerobic digestion or landfills – can be used. Natural gas vehicles are increasingly used in Delhi, Ahmedabad, Mumbai, Pune, Kolkata Lucknow, Kanpur, Varanasi, etc.
- ❖ The Nuclear Power Corporation of India Limited (NPCIL) is an Indian public sector undertaking based in Mumbai, Maharashtra. It is wholly owned by the Government of India and is responsible for the generation of nuclear power for electricity. NPCIL is administered by the Department of Atomic Energy (DAE) is responsible for designing, and operating the nuclear power stations in India.
- ❖ NHPC Limited (National Hydroelectric Power Corporation) is located in Faridabad, India
- ❖ The first hydro-electric power station in India was established at “Darjeeling” in 1897.
- ❖ Solar Energy Corporation of India Limited (A Government of India Enterprise) head quarter is located at New Delhi.
- ❖ Tamil Nadu has the largest installation of wind turbines in the country in the
- ❖ Muppandal-Perungudi area near Kanniyakumari is the largest concentrations of wind farm capacity at a single location in the world.
- ❖ The National Institute of Wind Energy (NIWE), Chennai was established in Tamil Nadu in 1998 as an autonomous institution under the administrative control of the Ministry of New and Renewable Energy. CIWE main activities include resource assessment and testing & certification.

- ❖ The first cotton textile mill was established at Fort Gloster near Kolkata in 1818.
- ❖ Byssinosis, also called “brown lung disease” or “Monday fever”, is an occupational lung disease caused by exposure to cotton dust in inadequately ventilated working environments.
- ❖ National jute board is headquarter at Kolkata.
- ❖ Ginning is the process of cotton fibre is separated from the cotton seed.
- ❖ The first attempt to produce iron and steel unit was set up at Porto Novo in Tamil Nadu in 1830.
- ❖ CSTRI is the only research institute in the country dedicated to the Research & Developmental activities related to silk technology. CSTRI was established in the year 1983 by the Central Silk Board, Ministry of Textiles, Govt. of India having head quarter at Bangalore
- ❖ Development Commissioner for Handlooms was set up as an attached non-participating office on 20th November, 1975 under the Ministry of Commerce. At present it is functioning under the Ministry of Textiles having headquarters at UdyogBhawan, New Delhi.
- ❖ The first paper mill of India was started in 1812 at Serampore in West Bengal.
- ❖ National Newsprint and Paper Mills (NEPA) is at Neapanagar in Burhanpur District of Madhya Pradesh.
- ❖ Chennai is nicknamed as the “Detroit of Asia” due to the presence of major automobile manufacturing units and allied industries around the city. Make in India program was launched in 2014 to put India on the world map as a major hub for global design and manufacturing.

12th book
Unit 3. RESOURCE

Introduction

Have you heard about **Voyager 1** launched in 1977 still is travelling at the speed of **62140 km/ hour or 17 km/sec.?** Do you know what fuel is used in it? It is **hydrazine**. What, do you think, would be the future fuel? It is certainly going to be **hydrogen**. Think about how hydrogen stands as an important future fuel.

- A resource is a naturally occurring exploitable material that a society perceives to be useful to its economic and material wellbeing. Willing, healthy and skilled workers also constitute a valuable resource, but without access to materials such as fertile soil or petroleum, human resources are limited in their effectiveness.
- Resources are the basis of the economic development of any nation. Different countries are at different levels of economic development primarily because of the variation in the availability of natural resources. The US and west European countries are economically prosperous because they possess vast natural and human resources and technology. On the other hand, in most parts of Africa and Asia, though they are naturally rich in resources, due to their lack of knowledge, the resources are unutilized and they are not used in the service of man.

Classification of Resources

- Resources are classified on various bases. Based on the continual availability, resources are classified in to **renewable** and **non-renewable resources**.
- The resources which can always be used again and again are known as **renewable resources**. It means these resources have natural regeneration and are inexhaustible. Air, water, solar energy etc. are examples of renewable resources. **Non-renewable resources** are available in finite quantities and cannot be obtained once if they are utilized. If these resources are used in large scale, they will get exhausted soon and as such these resources are called as **exhaustible resources**. Coal, oil and minerals are examples of this type.
- On the basis of origin, the resources are classified in to **biotic** and **abiotic resources**. When a resource is originated from living organism, the resource is known as **biotic resource**. Coal, mineral oil and forests are examples of biotic resources. **Abiotic resources** are composed of non-living inorganic matter. Air, land, water and minerals are examples of this type.
- On the basis of status of development, the resources are classified in to **potential resources** and **developed resources**. Potential resources are those which are known to exist and may be used in the future. Until the resource is extracted and put in to use, it remains a potential resource. **Developed resources** are those which have been surveyed and their quality and quantity have been determined

for utilisation. The development of resources depends on technology and level of their feasibility. Petroleum resource from Mumbai High is an example of Developed resources.

- Apart from the above classifications, the resources which are available in nature are known as **natural resources** and the one created by man is known as **man-made resource**. Similarly the air like resources which exist everywhere is called as **ubiquitous resources** and the resources which are concentrated only at specific places are known as **localised resources**. This kind of resource may exercise great influence on the economic development of the respective regions.

Mineral Resources

- A homogeneous, naturally occurring substance which has a definite chemical composition is called a mineral. They can be identified by their physical properties and chemical components. Minerals exist in different types based on their formation. Minerals play an indispensable part of our daily activities. Almost everything we use, from a tiny particle to a huge building or a big ship all, is made up of minerals. Minerals are one of the most valuable resources of the earth. All the stages of human development or progress have been named after them. For example, stone age, copper age, bronze age and Iron Age.
- They are exhaustible or non-renewable. Besides, they are distributed very unevenly. They are generally found in the form of ores. The ore contains several impurities. Minerals are separated from the ores involving a number of distinct processes.
- A country's economic development is depending on the minerals. There are several types of minerals, but according to their characteristics and commercial use.

Uses of Minerals

- Minerals are basic and essential raw materials in our daily lives and are vital for economic, social and technological development. They are used,
 - ❖ In the construction of buildings, bridges and settlement.
 - ❖ As raw materials in industries
 - ❖ As fuels
 - ❖ In the manufacture of defence equipment's.
 - ❖ In the field of communication like manufacturing telephone, wires, cables, electronic devices etc.
 - ❖ In making of alloys for various purposes.
 - ❖ In making of ornaments.
 - ❖ In the manufacture of fertilizers, pesticide, fungicides etc.

Mode of Occurrence of Minerals

- Minerals are generally found in 'Ores'. It is actually an accumulation of any mineral mixed with other elements. Minerals generally occur in many forms. They are

1. Veins and lodes

- Minerals generally occur in the cracks, crevices, faults and joints of the igneous and metamorphic rocks. Minerals in smaller occurrence are called a 'Vein' and a larger occurrence is called a 'lode, for example, Copper and Gold are found in lodes and veins.

2. Beds or Layers

- Minerals that are formed as a result of deposition, accumulation and concentration generally occur in horizontal layers. E.g. Coal, Potash, etc.

Residual mass of weathered particles

- When the decomposed rocks are washed away by water, the soluble particles are removed, leaving a mass containing ores. Such occurrences are called residual mass. E.g. Bauxite

3. Alluvial deposits or placer deposits

- These are the deposits found in the sands of valley floor and at the foot hills. These deposits consist of the minerals such as Gold, Silver and Platinum.

The world distribution of minerals

- **Metallic Minerals** The minerals which contain metal in them are called as metallic minerals.

Iron - Ore

- It is the basic mineral and the backbone of industrial development of the world. Iron Ore is the most widely distributed element of the earth's crust and it rarely occurs in a free state. It is found as the composition of many rocks and minerals. Iron-ore makes up 4.6% of the earth crusts. Iron is found in the form of Iron - ore. They are classified into 4 categories.

- (i) Magnetite: It is red in colour and has 72% of pure Iron
- (ii) Hematite: It is black in colour and has 70% of pure Iron

- (iii) Limonite: Its colour varies from dark brown to yellow and has 50% of pure iron.
- (iv) Siderite: It is brown in colour and contains only 30% of pure iron is present.

- The iron content of these ores is highly variable. If the iron content is less than 30% in an ore, it is considered to be uneconomical. Iron is mixed with fixed proportions of Manganese, Nickel, Chromium or Vanadium to make different varieties of steel.

Distribution of Iron ore

- Iron - ore is unevenly distributed in the world. Good quality Iron ore is found in Australia, Brazil, Russia, China, USA, Ukraine, Canada, etc. Russia has the largest proven reserves of iron ore in the world.
- Australia is the largest producer of Iron ore in the world. Other leading producers are China, Brazil, India and Russia. The Majority of Iron ore is (84%) produced by 5 countries alone.

Iron ore

Rank	Country	Production (metric ton)	Share (%)
1	Australia	531,075,350	33.72
2	China	345,841,000	21.99
3	Brazil	271,275,900	17.22
4	India	124,852,650	7.93
5	Russia	55,550,000	3.53
	Others		15.64

Major Iron Ore Fields in the World

Country	Iron ore fields
Australia	Mt. Bruce, Mt. Goldsworthy, Mt. whaleback, etc.
China	Manchuria Region, Shandong, Sinkiang region, etc.
Brazil	Itabria in south east region.
India	Chhattisgarh and Baster region, Odisha, Chitradurg, Kdermukh, Mayurbbanj, region etc.
Russia	Ural region, Kuzbas, Angara, etc.
U.S.A	Messabi range, Marquette range, cornwall, Albama, Appalachin region, etc.
Germany	Rhur basin.
Ukraine	Krivoi rog.

Manganese ore

- It is a kind of Ferro-alloy used to manufacture the special quality steel. A little manganese added to iron, removes gases and acts as a 'Cleanser' in the manufacturing process. Nearly 6 Kg of manganese is used for making one ton of steel.
- Manganese is used for special quality steel making; it makes steel anti - corrosive, hard and clean. It helps to increase toughness, strength and durability to resist oxidation in blast furnaces. It is used to produce alloys with Copper, Bronze, and Nickel. It is used for producing heavy machinery, tools, bleaching powder, insecticides and paints.

Distribution and production of Manganese ore

- South Africa, Australia, China, Gabon, Kazakhstan, Brazil, India, Ghana, Ukraine and Mexico are the major countries possessing manganese ore. South Africa is the largest producer of manganese ore in the world, followed by Australia. The other leading manganese producers are China, Gabon and Brazil. India is the 8th largest producer of manganese in the world though it possesses the largest reserves of manganese in the world.

Manganese-Ore Production

Rank	Country	Production (metric ton)	Share (%)
1	South Africa	4,754,560	30.84
2	Australia	2,388,500	15.50
3	China	2,150,000	13.95
4	Gabon	1,658,500	10.76
5	Brazil	1,141,684	7.04
	others		21.54

Copper

Rank	Country	Production (metric ton)	Share (%)
1	Chile	5,552,600	27.20
2	Peru	2,353,859	11.53
3	China	1,851,000	9.10
4	United states	1,430,000	7.00
5	Congo	1,035,631	5.07
	Others		40.13

Copper

- It is a non - ferrous, soft brown metal. It is a good conductor, with high luster, density and melting point. Copper occurs in three forms as native metal in its pure state, as oxides and as sulphide.
- The chief ore of copper is copper pyrite. It yields nearly 76% of the world production of copper. Copper is extracted by the process of crushing, concentration, roasting, smelting and refining. It was discovered in the earliest stage of civilization. Copper is one of the first metals known and used by man. It is found in the igneous and metamorphic rocks. Copper is unfortunately very soft, but by mixing with tin, bronze can be obtained and mixing with zinc, brass can be obtained which is harder and tougher than pure copper. Copper is used in
 - (i) Electrical Engineering
 - (ii) Metallurgical Industries
 - (iii) Making of alloys and making tubes, pipes, pumps, radiators and boilers. They are also used in the production of a wide range of ornamental materials.

Production and distribution of Copper

- Copper deposits are found in almost every country. The main producers are Chile, Peru, China, USA and Congo. Chile is the largest producer of Copper in the world. It produces 27.20% of the world Copper, followed by Peru, which produces 11.53%. India holds 35th rank and it produces only 0.15% of the world's production.

Bauxite

- Bauxite is an important ore which is the main source of Aluminum. It is an impure raw material. It generally occurs as an ingredient of chemical compounds in highly complex minerals such as Cryolite, Corundum and Kaolin. Bauxite occurs quite near the surface and is generally mined by open cast method. It has a wide range of applications which include construction of buildings, utensils and airplane parts.

Production and world distribution of Bauxite

- The main Bauxite producers are Australia, China, Brazil, Guinea and India. The World's greatest Bauxite producers and exporters are the countries located in the tropical and sub-tropical region. Australia is the largest producer of bauxite in the world. India is the 5th largest producer of bauxite in the world.

BAUXITE (ORE)

Rank	Country	Production MT	Share in %
1	Australia	83,516,578	29.31
2	China	65,000,000	22.81
3	Brazil	39,244,200	13.77
4	Guinea	31,117,131	10.92
5	India	24,644,632	8.66
	others		14.53

Gold

- Gold is a precious metal which occurs in alluvial or placer deposits or as reefs or lodes in the underground. Gold is used extensively for jewellery and also in dentistry, glass and porcelain dyes, in medicines and other industries. The purity of gold is expressed in terms of carat. China, Australia, Russia, USA and Canada are the leading producers of gold in the world. India ranked 33rd position in the gold production in 2016.

GOLD

Rank	country	Production	Share in %
1	China	453,500	14.11
2	Australia	282,421	8.79
3	Russia	262,380	8.16
4	United states	222,211	6.91
5	Canada	165,034	5.13
	Others		56.90

Do you know?

Fool's Gold refers to pyrite of Iron Sulphide because of its similarity in shape and colour to actual gold.

Platinum

- Platinum is a rare metal. It is costlier than gold. It has a very high melting point. It is a heavy, malleable, ductile, highly inactive, silverish, white transition metal. It is one of the densest metal almost twice as dense as lead. Platinum is found with other rare metals such as osmium, Palladium, Iridium and rhodium. Platinum is also used in industrial applications. South Africa is the largest producer of platinum in the world. The other leading producers are Russia, Zimbabwe, Canada and USA.

Platinum

Rank	Country	Production Kg	Share in%
1	South Africa	133,241	71.75
2	Russia	21,860	11.77
3	Zimbabwe	15,110	8.14
4	Canada	9,300	5.01
5	USA	3,891	2.10
	Others		1.33

Non- metallic minerals

- The minerals which do not contain metal in them are called as non-metallic minerals.

Mica

- Mica is a Latin word micare means to shine, to flash or to glitter. Mica has a crystalline and layered structure and can be split into very thin sheets. It does not react to water, acids, oil or solvents. It is lightweight, flexible and strong. It can resist extremely high temperatures or sudden changes in temperature and is able to withstand high voltages and insulate with low power loss. It can absorb or reflect light, which enables a decorative effect and protects against ultra-violet (UV) light.

Major Uses of Mica

- Mica has several applications. There are several main sectors where the use of mica is identified. They are the paint and coatings sector, Cosmetics and personal care companies, Plastics and printing ink manufactures the electronics sector, the automotive sector, the construction industry and the oil industry.

Phosphate

- Phosphate occurs in the sedimentary rocks or as phosphate nodules. Another source is bird dropping of Guano. It is the most important source of phosphorus. It is mainly used in fertilizer. China is the largest producer of Phosphate in the world. The other leading producers are Morocco, USA, Russia and Peru. The Guano deposits are found in Peruvian and Chilean deserts in South America. India is the 20th largest producer of Phosphate in the world.

Phosphate (2016)

Rank	Country	Production	Share in %
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		MT	
1	China	43,319,400	51.58
2	Morocco	8,601,000	10.24
3	USA	7,615,000	9.07
4	Russia	48,36,00	5.76
5	Peru	4,103,220	4.78
	Others		18.57

Do you know?

Agencies involved in the exploration of minerals in India. GSI, ONGC, MECL, NMDC, IMB, BGML, HCL, NALCO are the departments involved in mining in different states of India.

Energy Resources

- Resources may be classified into renewable and non-renewable resources. Mineral resources like coal, Petroleum and natural gas are the exhaustible or non-renewable resources. They cannot be replaced once they are consumed. Coal and petroleum are the fossil fuels, on which the modern culture relies so much.
- Energy gives motion to our industrial machines and vehicles. It is the primary input in the production of goods and services. The wheel of progress moves with the flow of energy. The energy resources may be classified into two types.

(i) Nonrenewable sources of Energy

- Once these resources are used, they cannot be regained again. In other words, they are exhaustible. They are coal, Petroleum natural gas and atomic fuels.

Coal

- Coal is a fossil fuel. It is a flammable, black or brown sedimentary rock and is mainly composed of carbon. It is the altered remains of prehistoric vegetation that originally accumulated in swamps and peat bogs. The dense forest plants were converted into coal due to intense pressure and heat inside the earth by the process of carbonization. Most of the coal resources of the world were formed during the carboniferous period (280 to 350 million years ago). The quality of the coal is determined by its carbon content. The following types of coal have been identified on the basis of their physical properties. They are,

(i) **Peat** is the first stage of transformation of wood into coal and it has only 30 to 35% of carbon.

(ii) **Lignite or Brown** coal is the inferior quality and contains 35-45% carbon

(iii) **Bituminous or coking coal** is the second best variety of coal and contains 70-90% of carbon. It is the most widely spread and most widely used variety of coal. It is the most popular coal in commercial use.

(iv) **Anthracite** is the best quality coal, which contains more than 95% of carbon. It is very hard but emits very less smoke and leaves very less ash. However its deposits are limited.

Production and world distribution of Coal

- Coal reserves are found in more than 70 countries of the world but the major coal reserves occur in the USA, Russia, China and South Africa. China is the largest producer of steam coal in the world followed by India. The other leading producers of steam coal are USA, Indonesia, and South Africa etc.

Steam coal - It is used for producing steam and it has high sulphur content.

Steam Coal

Rank	Country	Production (metric ton)	Share in %
1	China	2,49,793,000	47.42
2	India	601,131,000	11.44
3	United states	553,936,000	10.54
4	Indonesia	459,469,000	8.74
5	South Africa	253,452,000	4.82
	others		17.04

HOTS

Why is hydrogen used as fuel in rockets?

China was the largest producer of coking coal in the world in 2016 followed by Australia. The other leading producers of coking coal are Russia, India and USA.

Cooking Coal

Rank	Country	Production MT	Share in %
1	China	591,998,000	54.67
2	Australia	189,302,000	17.48
3	Russia	83,800,000	7.74
4	India	61,661,000	5.69
5	United states	50,645,000	4.68
	Others		9.74

Major Coal Mining Centres

Country	Mining centers
China	Shansi, shantung, Fushun, Shenyang, etc.
India	Bokaro, jaria, korba, ranikanch, singerni, etc.
U.S.A	Arkansas, colorodo, illionions, Indiana, Michigan etc.
Australia	Bowen basin, Brisbane, Canberra, Sydney, New-castle, Tasmania, etc.
Russia	Moscow-Tula region, Chokot, basin, Ob basin, etc.

Trade

- The main exporters of coal in the world are Australia, Indonesia, Russia, Colombia and South Africa and the main importers are China, India, Japan, Korea and Germany.

Uses of Coal

- Man has used coal for hundreds of years. But it has gained importance only after industrial revolution. It contributes about 25% of global energy demand. Coal is used for various purposes. It is used as a source of steam energy, electrical energy, domestic fuel, metallurgical coke, chemical industries and byproducts such as Ammonium sulphate, Naphthalene, Phenol, Benzene, etc.

Petroleum (or) Mineral oil

- Petroleum is a mineral that exists under the surface of the earth in liquid, solid and gaseous forms. Liquid petroleum may be in the form of crude oil. The solid form may be mineral waxes or asphalts. The gaseous form is natural gas. It is a main source of energy in the World due to its multiple uses. The human activities are directly or indirectly depend on the use of petroleum or its sub products.

Formation and occurrence of mineral oil

- It is formed by slow chemical and bio chemical decomposition of the remains of organic matter in sedimentary rocks. It is found in the pores of the sedimentary rocks. Oil is lighter than water hence, floats over water. Drilling of oil wells is the hole drilled in the earth's crust and when it reaches the rock cap, the natural gas comes out first with a great pressure. When the pressure of gas subsides, petroleum starts flowing out when the pressure of natural gas is released.

Petroleum reserves of the world

- The west Asia or Middle East is has the largest petroleum reserves, which is about 60% of the world's oil reserve. The total estimated world's oil reserves in

2008 were 1,243 (109 bbl). Saudi Arabia, Canada, Iran, Iraq and Kuwait have large reserves of petroleum.

Production and world distribution of petroleum

- The petroleum producing countries of the world can be grouped in to five geographical regions:
 1. West Asia (or) Middle East region
 2. American region
 3. Russian region
 4. East & south Asian region and
 5. African region

- Saudi Arabia is the largest oil producer of the world with 13.62% of the world output of oil. Russia is the second largest producer in the world. India is placed at 24th position in petroleum production in the world. The distribution of oil is naturally uneven; Middle East contains 60% of global reserves and rest of the world only 40%.

Petroleum

Rank	Country	Share in %
1	Saudi Arabia	13.62
2	Russia	12.72
3	USA	12.62
4	Iraq	5.09
5	Iran	5.03
6	china	4.64
	Others	46.28

Trade

- The world leading exporters of petroleum are Saudi Arabia, Russia, Iraq, UAE and Canada and the main importers are USA, China, India, Japan and Korea.

Do you know?

OPEC is the short form of the “Organisation of Petroleum Exporting Countries. It was formed in 1960 at Bagdad convention. Initially it comprised of Saudi Arabia, Iran, Iraq, Kuwait and Venezuela. Later on added in eight countries Libya, Algeria, Qatar, UAE, Nigeria, Ecuador and Angola, Indonesia left from OPEC in recently.

Major Petroleum Production Centres

Country	Production centres
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Saudi Arabia	Ghawar, Abquiaq, Abuhadriya, etc.
Russia	Volga-Caspian region, Kamchatka- Sakhalin region, Ob Lena basin.
U.S.A	Tennessee- new york, ohino, Indiana, Pennsylvania, Texa, Mississippi, gulf of California, etc.
Iraq	Kirkuk, Mosul, Daura, etc.
China	Taching, Chinchou, Yemen, south china sea, etc.

Natural Gas

- It is the cheapest source of energy. It is found along with or without petroleum. It is considered as an environment friendly fuel because of its low carbon dioxide emissions. Therefore, this is the only fuel for the present century and it is also called green energy. A powerful odorant, ethanethiol is added, so that leaks can be detected easily. It is prepared by refining petroleum or wet natural gas.

Natural gas reserves and Production

- The known natural gas reserve in the world is about 6254 trillion cubic feet. Most of these reserves are found in Russia, Iran, Qatar, UAE, Saudi Arabia, USA etc. USA has the largest reserve and is the leading producer of natural gas in the world followed by Russia. India is the 28th producer of natural gas in the world. It is widely used as a fuel in industries and domestic cooking purposes. Petrochemical industries use it as fuel and raw material. It is also used in chemical industries, artificial rubber, plastic, fertilizers, ink, and carbon and as artificial lighting.

Natural Gas

Rank	Country	Production (metric ton)	Share (%)
1	United states	755,010	20.56
2	Russia	641,000	17.45
3	Iran	202,440	5.51
4	Qatar	181,250	4.94
5	Canada	157,179	4.28
	Others		47.28

Trade

- Russia, Qatar, Norway, Canada and Algeria are the leading exporters of Natural gas in the world. Japan, Germany, China, Italy and Turkey are the leading importers of natural gas.

Nuclear Energy

- It is commonly said, this energy holds the key of future. Energy contained within the nucleus of an atom is called nuclear energy. Heavy metals like Uranium, Thorium, Radium, Plutonium and Lithium are the main sources of nuclear energy. However Uranium is the most important source of nuclear energy. The nuclear energy production was started first in USA in 1950. Nuclear energy now provides about 11% of the World's electricity. At present there are more than 450 operable fission reactors in the world. The world's first commercial nuclear power station Calder Hall at Wind scale, England was opened in 1956.

Uranium (U₃O₈)

Rank	Country	Production (metric ton)	Share (%)
1	Kazakhstan	29,113	38.89
2	Canada	16,666	22.26
3	Australia	7,352	9.82
4	Namibia	4,302	5.75
5	Niger	4,101	5.48
	Others		17.80

Do you know?

Most devastating nuclear accidents

- Three mile Island- March 28, 1979 USA
- Chernobyl - April 29, 1986, Russia
- Fukushima Daiich- March 11, 2011, Japan

Renewable sources of Energy:

- All regions of the world are facing the twin problems of fast increasing demand for energy and limited supplies and rapidly depleting conventional sources of energy. Under these circumstances, non-conventional sources of energy are getting more importance. These sources are renewable, clean and non-polluting. They are solar, wind, geothermal, wave, tidal energy, bio-gas etc.

Hydel Power

- Hydro electricity is produced by using the potential energy of water falling from a certain height. The falling water spins the turbine blades and energy is produced. It is a clean eco-friendly and renewable source of energy. It contributes nearly 7% of the world electricity production. China has the largest potential followed by Brazil, Indonesia, Canada and Zaire. China is the largest producer of Hydroelectricity in the world, followed by Canada.

Solar energy

- It is based on mechanical conversion of solar energy into electricity. It is available in abundance but only in the recent period it gets more importance due to technological development. Solar energy is used for various purposes.

Do you know?

Noor Complex is the world's largest concentrated solar power (CSP) plant, located in the Sahara Desert.

Kamuthi, the world's largest single solar power plant

Kamuthi Solar Power Project is a photovoltaic power station spread over an area of 2,500 acres (10 km²) in Kamuthi, Ramanathapuram district. The project was commissioned by Adani Power. With a generating capacity of 648 MW at a single location, The Kamuthi Solar Power Project was completed on 21 September 2016. Around 8,500 workers installed an average of 11 MW of capacity per day to complete the project within 8 months. The entire solar park is connected to a 400 kV substation of the Tamil Nadu Transmission Corp. The solar panels are cleaned daily by a self-charged robotic system.

- USA is the major producer of solar cells at present. It is simply the energy provided by the sun, which makes production of solar electricity possible. **Solar power in India** is a fast developing industry. The country's solar installed capacity reached 26 GW as of 30 September 2018. India expanded its solar-generation capacity 8 times from 2,650 MW on 26 May 2014 to over 20 GW as on 31 January 2018. The country added 3 GW of solar capacity in 2015-2016, 5 GW in 2016-2017 and over 10 GW in 2017-2018, with the average current price of solar electricity dropping to 18% below the average price of its coal-fired counterpart.

Wind Energy

- The wind is a clean, free and readily available renewable energy source. Wind turbines are capturing the wind's power and converting it to electricity. Wind power has become a pillar in their strategies to phase out fossil and nuclear energy. Wind energy is now the second fastest growing source of electricity in the world. It fulfills about 5% of world's electricity demand. The world's largest wind farm is in Altamont pass in California. India is emerging as a major wind power producer of world. The important wind farms in India - (i).The largest wind farms in India are Muppandal in Kanyakumari District of Tamil Nadu and Jaisalmer wind park in Rajasthan. They are the first and second largest wind farms of India. Based on the location of its generation it is classified into:
 1. Onshore wind energy and
 2. Offshore wind energy

1. Onshore wind energy -Energy generated from the plants located on the land is known as onshore wind energy. Onshore wind has the advantage of being one of the most affordable renewable energy sources. It is cheaper than any other renewable source of energy but it requires more area to install than any other energy.
2. Offshore wind energy -It refers to the use of wind farms developed in seas and oceans. The largest offshore wind farms are currently in the U.K and Germany. These two countries installed 2/3 capacity. London Array is the largest offshore wind farm in the world. The first offshore wind farm is planned near Dhanuskodi in Tamil Nadu.

Tidal energy - It is a renewable energy powered by the natural raise and fall of ocean water. Its production is very small. The first tidal power station was located in La Rance in France. The largest tidal power station is at Sihwa Lake in South Korea and it is the largest tidal power producer in the world. There are three different category of sources from which the tidal energy is generated. The sources are tidal streams, barrages and tidal lagoons.

- India's first attempt to harness tidal power for generating electricity would be in the form of a 3MW plant at the Durgaduani creek in Sunderbans delta of West Bengal. The Gulf of Kutch and Cambay in Gujarat and the Ganges delta in Sunderbans, the world's largest mangrove, are the 3 sites identified as potential areas for tidal power generation in India.

Geo Thermal Energy

- Geo thermal energy is derived from the natural heat of the earth. The United States is the world's largest producer, and the largest geothermal development in the world is The Geysers north of San Francisco in California, the U.S.
- In India, exploration and study of geothermal fields started in 1970. The GSI (Geological Survey of India) has identified 350 geothermal energy locations in the country. The most promising of these is in Puga valley of Ladakh. The estimated potential for geothermal energy in India is about 10000 MW. There are seven geothermal provinces in India: the Himalayas, Sohana, West coast, Cambay, Son-Narmada-Tapti (SONATA), Godavari, and Mahanadi.

Conservation of Resources

- It takes millions of years for the formation of minerals. Compared to the present rate of consumption, the replenishment rate of minerals is very slow. Hence, mineral resources are finite and non-renewable. Due to this, it is important to conserve the mineral resources.

Ways of Conserving Resources

- ❖ Controlling population growth will reduce the demand for resources.
 - ❖ Creating social awareness regarding the importance of conservation of resources
 - ❖ Reusing and recycling of resources.
 - ❖ Using the renewable source of energy as an alternative to non- renewable resources.
 - ❖ Developing the usage methods which minimize the wastages.
 - ❖ Propagating the environmental ill effects caused by various products.
 - ❖ Choosing the products with less packaging.
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