



16



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CONSERVATION OF OTHER NATURAL RESOURCES

Resource is anything useful or can be made useful to humans to meet their needs. The resource that is directly available for use from nature is called **natural resource**, which includes air, water from rainfall in lakes, rivers and wells, soil, land, forest, biodiversity, minerals, fossil fuels etc. Thus natural resources are supplied by our environment. When human population was small and they lived a controlled and moderate life, the resource use was limited. But increasing population and economic activity resulted in excessive material consumption is putting heavy burden on natural resource base and that is causing severe damage to the environment.

Increasing growth of human population has led to deforestation, draining of wetlands and reclamation of coastal areas to build their homes, farms and factories. Huge amounts of fossil fuel are being used in industries and for transportation. Destruction of forests causes loss of biodiversity which will deprive the future generations from the treasure of biodiversity.

It is therefore, extremely important to prevent further degradation of natural resources and use them in a wise and judicious manner to ensure their sustainable utilization. Natural resource conservation involves wise use of natural resources so that they are not wasted, depleted or degraded and are available to both present and future generations.



OBJECTIVES

After completing this lesson, you will be able to:

- *explain the term resource and classify it giving examples;*
- *explain the primary energy sources and their consumptions;*
- *list various fossil fuels and their occurrence;*
- *list and describe various renewable resources;*
- *list and classify various types of mineral resources;*
- *classify minerals, give examples and their uses in Indian context;*
- *suggest ways to reduce their depletion.*



Notes

16.1 NATURAL RESOURCE AND THEIR CLASSIFICATION

The term resource means anything obtained from the living and non living environment to meet human needs and wants.

Natural resources are earth’s natural material and processes that sustain life on earth and our economies. A classification of natural resources is given in the Fig. 16.1

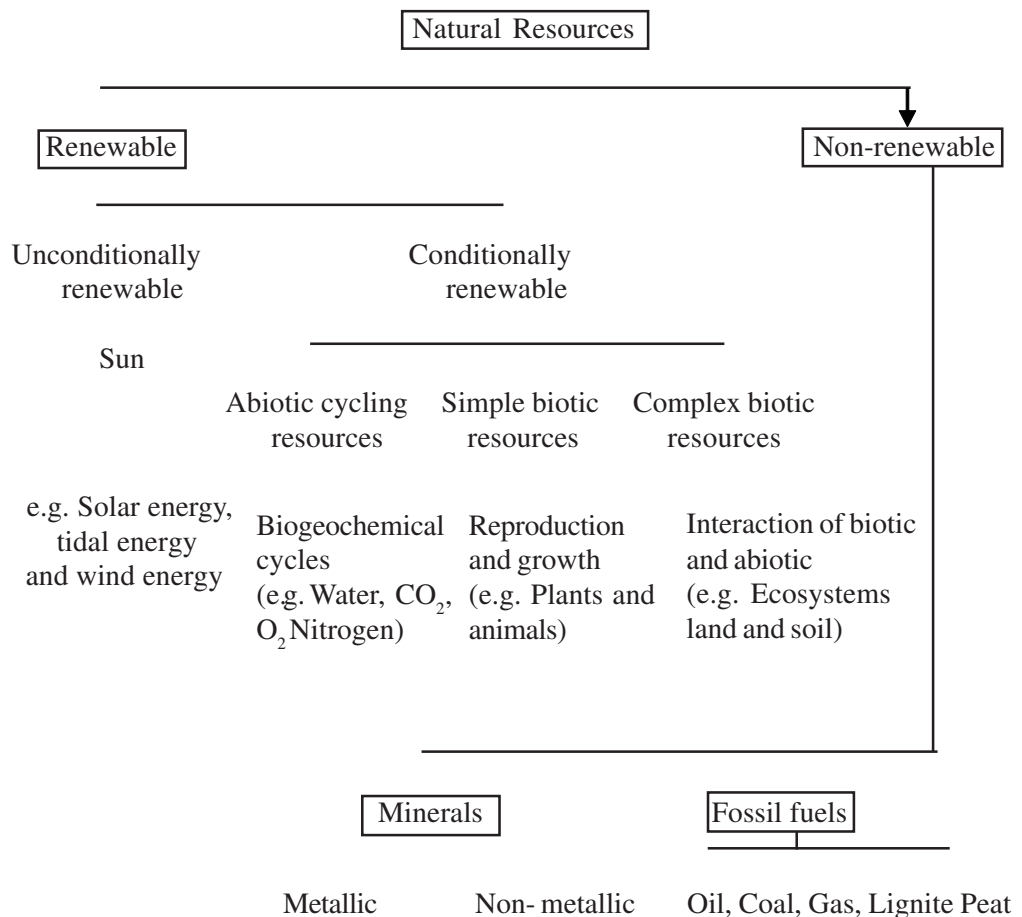


Fig. 16.1: The nature of natural resources and their classification

16.2 PRIMARY ENERGY SOURCES AND THEIR CONSUMPTION

Fossil fuel includes all forms of stored solar energy including coal, lignite, peat, crude oil (petroleum) and natural gas. These are considered primary sources of energy. These energy resources are non-renewable and exhaustible because they are found in finite quantities cannot be renewed if exhausted during one’s lifetime. Their renewal or formation may require millions of years, not within the human life scale, i.e., they are replaced slowly than they are used. Though coal, oil and natural gas are biotic in origin as they were produced



from plants and plankton that lived millions of years ago, they cannot be renewed in practical terms; at least it cannot be reproduced in our times. Once these resources are consumed, they are practically gone forever.

Consumption of oil

The global consumption of oil has grown rapidly. Although the world is not yet running out of oil but like all other non-renewable resources, oil supplies are found to decline eventually. It is believed that at the present rate of consumption oil will reach its total depletion sometime during this century. It is hard to believe the amount of oil we consume.

Just for the world to keep using conventional oil at current rate, we must discover global oil reserves that are the equivalent to a new Saudi Arabian supply every ten years.

What do we do?

We have three options (i) look for more oil, (ii) use or waste less oil (iii) use something else.

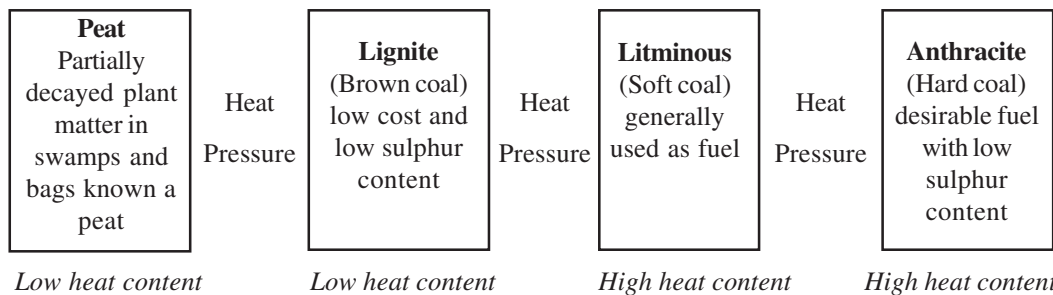
Rising oil prices when oil supply will fall short of oil demand will stimulate exploration of new reserves to meet future demand or new technology will allow to recover more oil from the existing oil wells.

China and India have started increasing their oil consumption. If everyone in the world consumed as much oil as the average American, the world's oil reserves would be gone in a decade!

16.3 FOSSIL FUELS AND THEIR OCCURRENCES

Coal, oil and natural gas are three major fossil fuels that are conventional sources of energy. Coal is the world's most abundant energy resource (fossil fuel) that is burned most to produce electricity and steel. Coal is a solid fossil fuel that was formed in several stages as the buried remains of land plants, that lived 300-400 million years ago, were processed by geological forces.

Coal formation goes through the following stages:





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USA has one fourth of world’s coal reserves, Russia has 16% and China 12%. China has enough coal reserves to last 300 years at its current rate of consumption. In India about one third of the country’s coal reserves are distributed in Jharkhand coal fields like Jharia, Bokoro, Giridih, Daltonganj, Ramgarh etc. Mining and burning of coal has severe environmental impact on air, water and land and accounts for more than one third of the world’s annual CO₂ emissions.

Petroleum or crude oil (oil as it comes out of the ground) is a thick liquid containing a complex mixture of hydrocarbons with sulphur, nitrogen and oxygen.

Deposits of crude oil and natural gas are tapped together within the earth crust or under the seafloor. The crude oil is dispersed in pores and cracks in underground rock-formations like water saturating a sponge. The oil drawn out of the rock pores and into the bottom of the well and from where it is pumped to the surface.

In India commercial oil production (extraction) is being carried out in four regions – (1) Assam Valley; (2) Gujarat region; (3) Mumbai High off shore region; (4) East coast in Krishna-Godavari and Kaveri basins. Mumbai high is the top petroleum producing region of India.

Recently petroleum has been found in Jasalmer district of Rajasthan.

For exploration of petroleum, wells were drilled in Assam valley in 1866, just seven years after the discovery of petroleum in Pennsylvania in USA. Oil was discovered in 1890 in Digboi oil field in Assam. Only Assam produced petroleum in the country until 1959.

Natural gas

Natural gas like coal, oil, was formed from fossil remains. The conditions needed for oil formation are same as those for natural gas. Natural gas is emerging as an important source of commercial energy. It is found in association of petroleum. India has a huge recoverable, reserve of natural gas. Natural gas contains methane and smaller amounts of propane and butane. When a natural gas field is tapped, propane and butane gases are liquefied and removed as liquefied petroleum gas (LPG). The rest of the gas (mostly methane) is dried to remove water vapour, cleansed of poisonous hydrogen sulphide and pumped into pressurized pipelines for distribution. At a very low temperature, natural gas can be converted into liquefied natural gas (LNG).



INTEXT QUESTIONS 16.1

1. Define resources and natural resources.

2. Give five examples of natural resource.



3. Which are our primary energy sources? How are these formed in nature?

4. Name the top petroleum producing region of India.

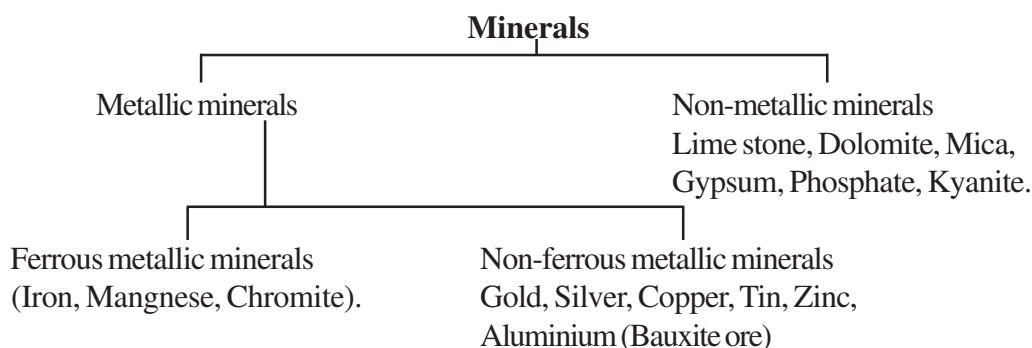
5. What are lignite and anthracite? How do they differ?

16.4 MINERAL RESOURCES – CLASSIFICATION AND THEIR USES

India has extensive and rich deposits of industrially important minerals. Minerals like water and land are invaluable treasure of the earth. Minerals play a significant role in industrialization and economic development of a country. Like oil and petroleum, minerals are non-renewable resources, hence they must be used carefully and judiciously so that they are conserved for future.

Classification of minerals

Minerals are broadly divided into two groups- metallic and non-metallic minerals. Metallic minerals are further subdivided into ferrous and non-ferrous.



16.4.1 Ferrous metallic minerals

(i) Iron-ore

They constitute most important mineral group after fuel minerals (oil and gas). They include iron, manganese, chromite, pyrite etc. These minerals contain iron in substantial quantity. These minerals provide a strong base for the development of metallurgical industries, particularly iron, steel and alloys. Most iron ores found in the country are of three types – Haematite, magnetite and limonite. Haematite is red in colour, called ‘red ore’ and has 68% iron. Magnetite is dark brown in colour called ‘black ore’ and has 60% iron. Limonite is yellow in colour and has 35% iron.

**Notes**

India has large reserve of haematite and magnetite ores, inferior quality limonite is rarely used. India has 20 % of world's total reserves of iron ore. Almost 96% of the total iron reserves of the country are in Orissa, Jharkhand, Chattisgarh, Karnataka and Goa.

(ii) Manganese ore

India ranks third in the production of manganese ore in the world. One fourth of the total production of India is exported. Manganese is an important ingredient in the manufacture of iron and steel and ferro-manganese alloy. It is also used in the manufacture of dry batteries, in photography, leather and match industries. About 85% of total manganese consumption in India is used by metallurgical industries. Important areas of production are Orissa, Madhya Pradesh, Maharashtra, Andhra Pradesh and Karnataka.

(iii) Chromite

Chromite is used in metallurgical refractory and chemical industries. Orissa alone has 98% of recoverable reserves.

16.4.2 Non-ferrous metallic minerals

These are minerals which do not contain iron. They include gold, silver, copper, tin, lead and zinc. These metals are very important in our daily life. India is deficient in all these minerals.

(i) Bauxite

Bauxite is a non-ferrous metallic mineral. It is the ore from which aluminum metal is produced. India has a rich reserve of bauxite. Aluminum extracted from the ore is used in making aeroplanes, electrical appliances and goods, household fittings, utensils etc. Bauxite is also used in the manufacture of white colour cement and certain chemicals. Major reserves of bauxite occur in Jharkhand, Maharashtra, Madhya Pradesh, Chattisgarh, Gujarat, Karnataka, Tamilnadu, Goa and Uttar Pradesh.

(ii) Copper

Copper is a good conductor of electricity. It is extensively used in the manufacture of electrical cables, wires and electrical goods. Major copper ore deposits are found in Singhbhum of Jharkhand, Balaghat of Madhya Pradesh and Jhunjhunu and Alwar (Khetri mines) of Rajasthan.

(iii) Zinc and lead

Zinc and lead have very high industrial significance. Zinc is mainly used in tyre industry. It is also used in dye, casting, dry batteries, textile etc. Similarly lead is used in electrical cables, batteries, glass, ammunition, printing, rubber industry etc. Lead and zinc reserves



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occur in Rajasthan, Gujarat, Maharashtra, West Bengal, Orissa, Madhya Pradesh and Uttar Pradesh.

(iv) **Gold**

Gold is a precious metal and is highly valued by people all over the world. It is one of the rare mineral. There are three important gold fields in the country namely- Kolar Gold Field and Hutti Gold Field both in Karnataka and Ramagiri Gold Field in Andhra Pradesh. Gold is obtained from sand deposits of rivers, is known as “placer deposits”. Small quantity of gold is produced from placer deposits in Jharkhand.

16.4.3 Non-metallic minerals

India has deposits of several non-metallic minerals. These minerals are used as raw materials, a flux minerals (substance mixed with metal to help fusion) and as refractory mineral (resistant to treatment or heat).

Only a few of the non-metallic minerals are significant in the mining economy. Limestone, phosphorite, kaolin, gypsum and magnesite are significant non-metallic minerals.

(i) **Limestone**

Limestone is a key raw material for construction, chemical and metallurgical industries. Almost 76% of country's total consumption is used in cement industry, a large amount is used in iron and steel industry. Limestone is also used by sugar, paper, fertilizer and ferromanganese industries. Large deposits of limestone are available in our country.

(ii) **Dolomite**

Dolomite is a type of limestone. Deposits of dolomite are present in almost all parts of the country.

(iii) **Mica**

India is the leading producer of sheet mica. Bihar and Jharkhand produce the high quality ruby-mica. Mica mining was mainly done for export and USA being the principal importing country. It was one of the indispensable minerals used in electrical and electronic industries till recently. However, its synthetic substitute has reduced its export as well as production considerably.

(iv) **Phosphate minerals**

These are mainly used for manufacturing of phosphate fertilizers. Rajasthan is the leading producer followed by Uttaranchal, Madhya Pradesh and Uttar Pradesh.

**Notes****Ocean a source of minerals**

Ocean mineral resources are found in sea water and on deep ocean floor. High cost of mineral extraction from sea water, where they occur in low concentration, is not economical. Only magnesium, bromine and sodium chloride are abundant enough to be extracted profitably using existing technologies.

Manganese rich nodules present on the deep ocean floor may be a future source of manganese and other important metals. They can be sucked up by giant vacuum pipes by mining ship. But because of high cost involved in the process and who owns them or the ocean have kept people away from this project. Rich deposits of gold, silver, zinc and copper are found as sulphide in the deep-ocean floor. But it costs too much to extract these minerals.

16.5 WAYS TO REDUCE DEPLETION OF MINERALS

A mineral becomes “economically depleted” when it costs more to find, extract, transport and process the remaining deposit than its worth.

- To check and reduce depletion of minerals, five choices are recycle or reuse existing supplies, wasteless, useless, find a substitute or do without.
- When a resource (mineral) becomes scarce, its price rises. This can encourage exploration of new deposits, stimulate development of better mining technology and make it profitable to mine lower-grade ores.
- It can also encourage a search for substitutes and promote resource conservation.
- Substitution of more abundant materials like plastic and glass, for scarce minerals is an important way to check depletion. The amount of lead and steel used in telecommunication have decreased with the use of plastic. Glass fibres have replaced copper wiring in telephone cables. Synthetic substitute of mica has reduced its export as well as production.
- One way to improve mining technology is to use microorganisms to extract metals from its ores known as “biomining” or ‘ecological engineering’, which may be an economical and environmentally preferable way to mine metals. Presently 30% of all copper produced worldwide, comes from such biomining. Biomining is economically feasible specially with low- grade ores.
- The science of nanotechnology have immense potential of using atoms in producing or manufacturing everything from medicines to solar cells to automobile bodies. Thus the job of many metals can be taken over by new materials produced by nanotechnology.

**INTEXT QUESTIONS 16.2**

1. How do you classify minerals.

2. What are haematite, magnetite and limonite?

3. What is limestone? What are its uses?

4. Which is the most important mica producing region of India?

5. How can you check depletion of mineral resource?

16.6 RENEWABLE RESOURCES

Renewable resources are those that can be formed or regenerated by natural processes. Air, water, soil, vegetation and animals renewable primary resources because they naturally recycle and reproduce themselves. Renewable resources can be perpetual or unconditional which will last forever on human time scale and conditional renewable resources which must reproduce and regenerate in order to last forever.

(a) Perpetual resources or unconditionally renewable resources:

Solar, winds and tidal energy are virtually inexhaustible resources on human time scale.

- **Solar energy** in the form of heat and light are delivered to the earth everyday whether we use it or not. Solar energy can be used in a regulated manner for space and water heating or it can be converted into electricity by producing steam.
- **Wind** the greater heating of earth by sun at the equator than at the poles and the rotation of the earth set up flows of air called **wind**. Thus wind is an indirect form of solar energy and can be captured by wind turbines to generate electricity.

Coastal areas of India are particularly suitable for generating electricity from wind energy.

- **Tidal** energy can be generated from high tidal waves. In India, areas identified for generating tidal energy are located in Gulf of Kutch and Cambay in Gujarat.



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**Notes****(b) Conditional renewable resources:****(i) Land and soil**

Land is a precious resource, which humans have used for agriculture, mining etc. The use of land results in changing in structure and function of the ecosystems. Human exploitation of land for various activities like agriculture, industry, housing, entertainment etc. ultimately results in the degradation of land. The degraded lands have reduced capacity to sustain healthy growth of crops and plants.

Soil formation is a natural process, so soil is a renewable resource. But formation of an inch of soil layer generally takes 200 to 1000 years and soil erosion occurs much faster as compared to the rate of soil formation, so it can become non-renewable resource as the top soil may be lost forever. Soil erosion is one of the greatest environmental problem. The main cause of soil erosion is land degradation. So, land protected by vegetation can be saved from soil erosion.

Land and soil degradation must be checked for the following reasons –

- to prevent soil erosion and land slides;
- to maintain soil fertility;
- for increasing biodiversity;
- for maintaining economic growth.(Details are given in lesson-17).

(ii) Water

Water is an invaluable resource which makes life possible on earth. We generally depend on fresh water resources for our survival which is finite in quantity. We use freshwater for drinking, irrigating the crops, and industrial uses, transportation, recreation and waste disposal. Availability of water is a powerful indicator of economic prosperity and ecological sustainability.

Fast depletion of fresh water resources must be checked and availability of water may be increased by:

- prevention of water wastage.
- increasing water use efficiency.
- recycling of water.
- capturing and storing more flood run off.
- harvesting rain water.
- desalinating seawater.



Notes**(iii) Biodiversity**

Biodiversity is valuable renewable resource. Plant and animal are able to reproduce and maintain their healthy populations. Biodiversity is of great use to humans as they derive many direct and indirect benefits from the living world. It is the source of food crops, livestock, forestry and fisheries.

Biodiversity or biological diversity includes (i) genetic diversity, (ii) species diversity and (iii) and ecosystem diversity. These three levels of biodiversity are interrelated. You have already learnt about biodiversity in lesson 15.

Biodiversity is of great use to modern agriculture in three ways:

- as a source of new crops
- as a source of material for breeding improved varieties.
- as a source of new biodegradable pesticides.

Increasing growth of human population adversely affects rich and unique habitats and their biodiversity. Over exploitation of ecosystems (forest, grasslands, oceans), habitat destruction and pollution are major causes of biodiversity loss. Over exploitation of plants and animals may lead to extinction thus a renewable resource may be lost forever. The over exploitation of living resources must be checked and stopped to conserve and maintain healthy biodiversity for the over all benefit of present and future generations.

**INTEXT QUESTIONS 16.3**

1. Write the difference between perpetual or unconditional natural resources and conditional natural resource?

2. How can soil become a non-renewable resource?

3. How is biodiversity of great significance in modern agriculture?

4. Name the major ecosystems where species live and evolve.

**Notes****WHAT YOU HAVE LEARNT**

- Resource is anything useful or can be made useful to humans to meet their needs.
- Natural resources are earth's natural material and process that sustain life on earth.
- Petroleum, natural gas and coal are major non-renewable fossil fuel. They are gradually getting depleted with high rate of consumption.
- New energy sources must be found out so that the fossil fuels can be conserved for future.
- Minerals are important non-renewable resources and are extremely important for our industrial and economic growth.
- Iron, manganese and chromite are ferrous metallic minerals. India has rich iron resources in many states.
- Gold, silver, aluminium, copper, tin, lead, zinc are non-ferrous metallic minerals.
- India has rich deposits of several non-metallic minerals like limestone dolomite, mica.
- Ocean beds or floors are rich in mineral resources. Gold, silver, copper, zinc are present in ocean floors but their extraction is very costly.
- Depletion of metals and minerals can be checked by the following methods – reuse or recycle the existing supplies, wasteless, useless, find a substitute, extract by biomining.

TERMINAL EXERCISE

1. Define natural resources. Name two unconditionally renewable natural resources.
2. How do you reduce the use of lead and steel in the communication?
3. What is the advantage of having synthetic substitute of mica?
4. Ocean floor is a rich manganese nodules but people are kept away from mining them. Give two reasons.
5. When does a mineral element become economically depleted?
6. Suggest any four ways to check and reduce depletion of minerals.
7. What is biomining and what is its advantage?
8. What are the main causes of land degradation? (Any three). Why should land degradation be checked? (Any three suggestions)



9. Which is an unconditionally renewable resource. Give two examples.
10. State any two methods to check depletion of fresh water resources.
11. Which are the three levels at which biodiversity occurs?
12. What is the major cause of biodiversity loss?



ANSWER TO INTEXT QUESTIONS

16.1

1. Resource is anything useful or can be made useful to humans to meet their needs. Resource that is directly available for use from nature is called natural resource.
2. Examples of natural resources are – fresh air, fresh water, soil, forest, minerals and fossil fuels.
3. Our primary energy sources are crude oil (petroleum), natural gas and coal. They are formed in nature when plants and planktons get compressed under hard rocks for millions of years.
4. Mumbai high is the top petroleum producing region of India.
5. Lignite is brown coal with low heat content and anthracite is hard coal with high heat content.

16.2

1. See Chart (section 16.1)
2. These are iron ores. Haematite and magnetite are rich iron ores and limonite is inferior quality ore.
3. Limestone is a non-metallic mineral. It is used in cement industry, iron and steel industry, sugar, paper, fertilizer and ferro manganese industries.
4. Bihar and Jharkhand are most important mica producing states of India.
5. Depletion of minerals can be checked by reuse, recycle of existing supplies, wasteless, useless, find a substitute.

16.3

1. Perpetual or unconditional renewable natural resources last forever on human time scale. Conditional renewable natural resources must reproduce or regenerate in order to last forever.

MODULE - 5

Environmental Conservation



Notes

2. Formation of an inch of top soil takes 200 to 1000 years and soil erosion may occur faster than rate of soil formation, thus it can become a non-renewable resource as the top soil may be lost forever.
3. Biodiversity of great significance in modern agriculture in three ways-
 - as a source of new crops.
 - as a source of material for crop improvement
 - as a source of new biodegradable pesticide