# UNIT 2: NATURAL RESOURCES

## UNIT STRUCTURE


2.1 Learning Objectives

2.2 Introduction

2.3 Natural Resources

2.4 Types of Natural Resources

2.5 Forest Resources

2.6 Water Resources

2.7 Mineral Resources

2.8 Food Resources

2.9 Energy Resources

2.10 Land Resources

2.11 Conservation of Natural Resources

2.12 Sustainable Development

2.13 Let Us Sum Up

2.14 Further Reading

2.15 Answers to Check Your Progress

2.16 Possible Questions


## 2.1 LEARNING OBJECTIVES

After going through this unit, you will be able to :

- get some idea about what is meant by natural resources
- discuss the different types of natural resources
- distinguish between renewable and non-renewable sources of energy
- reflect on the problems of deforestation
- acquire knowledge about the proper use of water resources
- realize the dangers of over exploitation of mineral resources
- get an idea about food resources and food-chain equilibrium
- discuss energy resources and their use for the welfare of human beings

- discuss how land resources can be properly utilized for agriculture
- discuss why natural resources should be conserved
- describe sustainable development and its necessity

## 2.2 INTRODUCTION

The world we live in is full of different resources. These resources are naturally created or produced. The various requirements of man can be fulfilled through these natural resources. Some of these resources are exhaustible and some are inexhaustible. Of the exhaustible resources, some are renewable and some non-renewable. Water resources, air, rainfall, solar energy etc are inexhaustible. Man cannot exhaust these through continuous use although he can degrade them or make them scarce through his harmful activities. Water, wood, grasslands, forests, wild animals, soil and biotic matter etc are recreated by nature. On the other hand, fossil fuels such as coal, petroleum, natural gas are never reproduced. So these are called non-renewable resources.

The continuation of mankind and the human civilization depends upon proper use of natural resources. Therefore, it is essential to have a holistic knowledge about the suitable use of natural resources for the development of man. This unit deals in detail with some of the above mentioned issues.

## 2.3 NATURAL RESOURCES

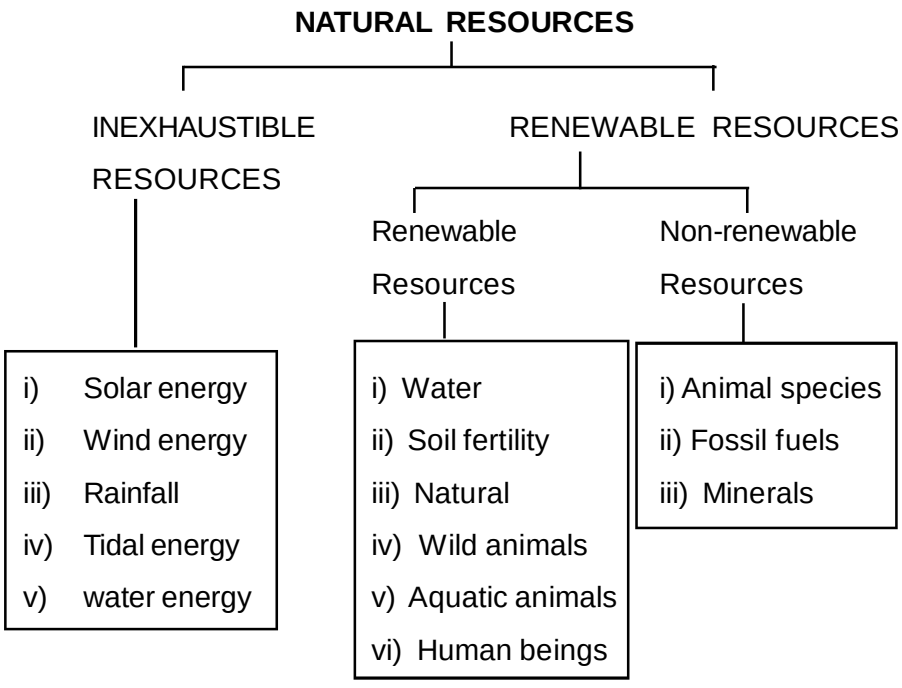
Resources are the storehouse of supply. The necessary requirements of men which can be fulfilled from materials derived from nature are called natural resources. The basic needs of men such as food, clothes and shelter can be met from natural resources.

## 2.4 TYPES OF NATURAL RESOURCES

Depending on their availability, natural resources can be divided into two types— Inexhaustible resources and Exhaustible resources.

- **Inexhaustible Resources:** These resources are in great abundance. Men cannot exhaust them even through their continuous use. Air, sand and solar radiation are some examples of inexhaustible sources of energy.
- **Exhaustible Resources:** These are of two types –
  - Renewable Resources
  - Non-renewable Resources.
  - *Renewable Resources* : As these resources are relentlessly used by men, nature keeps renewing these resources. For example, – water, wood, natural grasslands, soil and bio-elements, forest, wild animals etc. The resources are renewed as a result of sudden relocation, rebirth, change and reformation within a certain period of time.
  - *Non-renewable Resources:* These resources do not reappear once it is exhausted and nature also does not reproduce them. For example - fossil fuels (coal, petrol), minerals like copper, iron, animal species, etc.

**Figure 2.1: Division of Natural Resources**



## 2.5 FOREST RESOURCES

The biological group which consists of trees, shrubs, vines and other plants and which forms a thick canopy over the earth's surface, sometimes preventing light from penetrating below, is called forests.

40% of the earth's surface is covered by forests. The open and closed forests constitute 1/3rd of the earth's land mass. India is rich in flora and fauna, and most of these species are to be found in forests. There are different kinds of trees in forests. The forest resources of the world shown in the table below.

**Table 2.1 : Change in Forested Land 1990-2000 by Region**

| Region | total land area (million ha) | total forest 1990 (million ha) | total forest 2000 (million ha) | % of land forested in 2000 | change 1990-2000 (million ha) | % change per year |
|---|---|---|---|---|---|---|
| Africa | 2 963.3 | 702.5 | 649.9 | 21.9 | -52.6 | -0.7 |
| Asia and the Pacific | 3 463.2 | 734.0 | 726.3 | 21.0 | -7.7 | -0.1 |
| Europe | 2 359.4 | 1 042.0 | 1 051.3 | 44.6 | 9.3 | 0.1 |
| Latin America and the Caribbean | 2 017.8 | 1 011.0 | 964.4 | 47.8 | -46.7 | -0.5 |
| North America | 1 838.0 | 466.7 | 470.1 | 25.6 | 3.9 | 0.1 |
| West Asia | 372.4 | 3.6 | 3.7 | 1.0 | 0.0 | 0.0 |
| **world** | **13 014.1** | **3 960.0** | **3 866.1** | **29.7** | **-93.9** | **-0.24** |

*Source: compiled from FAO 2001b Note: numbers may not add due to rounding*

- **Uses of Forest Resources:** The main uses of forests are –
  - *Food:* The tribal people acquire their staple food – like roots, shoots, leaves, fruits – from the forests.
  - *Fuel:* The wood required for cooking and protection from cold are derived from forests. Nearly 1500 million people around the world depend upon forests for their livelihood. Almost 1000 million tons of wood are used as fuel around the world.
  - *Wood:* The wood required to build houses, bridges, different kinds of furniture, doors and windows, berths in trains, boats, ships, sports goods, agricultural equipment etc are collected from forests.
  - *Paper:* Bamboo pulp is used to produce different types of paper like newsprint, packing paper, papers for writing etc.

- *Necessary Materials:* The flora and fauna of the forest provide the raw materials for different kinds of essential goods. e.g. different kinds of oil (pure sandal) for the production of camphor, soaps and cosmetics, gum and soap based materials like shikakai etc for industrial use; worms and insects needed to produce lac, honey, wax, silk etc; horns and hides; Ivory etc. The raw materials for the production of different medicines, spices, poisonous substances, insecticides etc are derived from forests.
- *Protection of the Environment:* Forest cools the climate of the environment and controls the rainfall. The moist climate of summer is conducive for the survival of plants.
- *Oxygen Production:* When plants produce food through photosynthesis, they also at the same time release the necessary oxygen for animals to breathe.
- *Shelter:* The trees in the forests provide shelter and support to different species like insects, reptiles, birds, mammals, moss and lichen, creepers etc.
- *Soil Conservation:* Forests prevent soil erosion. The reasons are –
  - Roots hold the elements of the soil.
  - The fallen leaves reduce the surface runoff.
  - The trees also help to reduce the speed of winds.
- *Soil Fertility:* The decomposition of fallen leaves creates a layer of humus and this increases soil fertility
- *Control of Water-cycle:* The layer of humus in the forests keeps the currents of rivers, streams, lakes etc. under control. It acts like a giant sponge and absorbs a lot of water, and releases it slowly
- *Reduction of Pollution:* The carbon dioxide gas used during photosynthesis reduces air pollution.
- *Necessary for Beautification:* The natural beauty of forests has recreational and aesthetic value.

- **Over Exploitation:** The forest area is dwindling as a result of man's increasing pressure on it. The reasons for this are –
  - Over population of men and animals

- The demand for immense quantities wood for fire and industries. (The value of the international wood industry is 40 million US dollars yearly.)
- Requirements of food, clothes and shelter.
- Requirements of land for agriculture and grazing.
- Mining, construction of roads, and river valley construction projects.

- **Deforestation:** According to a survey, the forests of India dwindled from 7000 million hectares in 1900 to 2890 million hectares in 1975. This further came down to 2300 million hectares in 2000. Tropical rainforests are the most productive regions of the world. In 1975, this region saw a decrease from 1600 million hectares to 938 million hectares.
  - *The Main Causes of Deforestation are:*
    - Forests are cleared in order to meet the food requirements of the increasing population in the developing countries of the world.
    - Forests are exploited to procure the wood necessary for establishing industries, construction of roads and buildings.
    - Forest fires also destroy trees.
    - Some insects and pests eat the leaves, spread diseases, and destroy trees.
    - Grazing animals and those that live underground feed upon tender, unripe plants.
    - Forests are also reduced as a result of jhum cultivation in different states which consume 5 lakh hectares of the forest area yearly.
  - *The Results of Deforestation are:*
    - There is always a possibility of loss of land due to deforestation
    - Possibility of floods and drought.
    - Loss of animals and plants.
    - Shortage of wood and energy sources.
    - Negative effects on climate and less rainfall leading to increase in atmospheric temperature.



**CHECK YOUR PROGRESS**

**Q 1.** What are the exhaustible and inexhaustible resources?

.....

**Q 2.** What are the effects of deforestation?

.....

.....

## 2.6 WATER RESOURCES

Water is a renewable source. Like air, water is also extremely essential for the various physical, biological and chemical processes of plants and animals. Water is always necessary for human beings to live, and also for their economic development. Three-fourths of the earth's surface are covered with water. Water also constitutes 60-70% of man's total weight.

- **Types of Water:** Water is generally found in two states – Groundwater and surface water,
  - *Underground Water :* Ground water constitutes 9.86% of the total freshwater. ***Aquifer*** is a sediment or rock layer which is highly permeable. This layer contains water and transmits water. Sand and gravel are good examples of aquifer. Aquifer is of two types – unconfined aquifer and confined aquifer.
    - Unconfined Aquifer: In unconfined aquifer permeable materials are laid and it gets rechanged by rainfall and seasonal melt waterthat seeps down.
    - Confined Aquifer: Confined aquifers are pereable aquifers like sand that lie between two impermeable layers of rock and sediment.

      If withdrawal of ground water is more than the recharged water, sediments get compacted which leads to ground subsidence. Following situations may occur in ground subsidence –



***Aquifer :*** a body of rock that holds water or through which water flows

(a) Land surface may sink

(b) Damage of structure in building

(c) Pipes may rupture

(d) Reverse flow may occure in sewers and canals

(e) Tidal flood may occur

- *Surface Water:* Surface water is found in various states like streams, rivers, lakes, ponds, wetlands, artificial water reservoirs, etc. When rainwater and water from melting snow do not penetrate below the earth's surface, they flow as surface runoff or accumulate in the depression on the surface of the earth, and form the surface water.

  Surface water is used for different purposes. Some of them are– (a) Public water supply, (b) Irrigation, (c) Industrial use, (d) water transport.

- **Floods:** In 90% of the regions in our country rainfall occurs in certain months of the year (generally from June to September). Rainfall is not equal throughout the year. During the monsoons, due to excessive rain, the rivers overflow and create floods. There are many reasons because of which floods occur. Those which are worth mentioning are –
  - Excessive rainfal
  - Drainage cougesion
  - Deforestation
  - Excessive animal grazing
  - Urbanization and Industrialization
  - Global warming.

- **Drought:** When evaporation of water is more than the amount of rainfall, then a drought situation occurs. The scarcity of water leads to drought. If rainfall is 75% less than the normal rainfall, drought occurs. The main causes of drought are as follows :
  - Less rainfall
  - Increase of population in drought areas and decrease in soil fertility
  - Deforestation, excessive animal grazings, mining etc. which create a desert like situation.

- Excessive drought reduces the water levels in streams and other water bodies.

The following steps need to be taken in order to control drought situation:

- Growing mixed crops
- Social forestry and water land development
- Stop plantation of eucalyptus and similar kinds of trees – as these species of trees lower the surface water levels.

- **Water Disputes:** Water is very essential for plants and animals to survive. The unequal distribution of water in the countries and states leads to disputes. Some of the disputes which have occurred because of water are:
  - *Middle-East Water Dispute:*
    - There are continuous raging disputes among Jordan, Syria, Israel, etc regarding the water distribution of the Jordan river.
    - The Middle-Eastern countries share the water of the Jordan, Tigris- Euphrates and Nile rivers. The excess water used by Ethiopia and Sudan has led to scarcity in the desert regions of Egypt. If all the current projects of 22 dams for generation of hydro-electricity starts, then Turkey will reduce the amount of water flow into countries like Syria and Iraq. Turkey is trying to acquire power using an immense volume of water resources
  - *Indus River Treaty:* According to the Indus River Treaty of 1960, Indus, Jhelum and Chenab were included within Pakistan. India gained acquisition over Shatadru, Ravi and Bipasha rivers. The treaty propounds that India cannot practically use the river water included within Pakistan. As a result of the construction of Chakkur dam over the Jhelum (1932), the Ghulam Mohammed Dam in Kotry (1958) and the Tarbela and Chasma dams over the Jhelum river, the Indus river peninsula has faced water scarcity.
  - *Shatadru-Yamuna River Canal Dispute:* On 15 January 2002, the Supreme Court of India ordered the Punjab Government to complete the Shatadru-Yamuna river canal project within one year, in order to divide the waters of the Ravi-Bipasha rivers and for the Shatadru-

Yamuna river canal. However, this dispute has led to the scarcity of water in Haryana. The request from the Punjab Govt. to the Supreme Court to reconsider its decision has fallen on deaf ears.

- *The Proposed Dam Over the Brahmaputra River by the Chinese Govt.:* The recent reports regarding this problem have contended that if dams are constructed in the upper reaches of the Brahmaputra, then it will lead to reduction in the water level of the Brahmaputra in its lower reaches like Assam. Moreover, it will also create problems for the people of Assam as well as the entire North-Eastern region.

- **Dams:** If proper design, safe locations and possible impacts on environment and society in the downstream areas are considered during the planning, construction and operation stage of the projects, then river dams may provide the following advantages.
  - *Advantages:*
    - Reduce shortage of energy through hydro-electricity generation.
    - Employment for the local people.
    - Economic development and progress.
    - Control of floods and drought.
    - Irrigation system in the plains.
    - Supply of drinking water, improvements in water transport, fishery.
  - *But River Dams Have also the Following Disadvantages:*
    - Destruction of forests, plants and animals
    - Negative impact on the local people – their livelihood and security.
    - Fundamental changes in the climate
    - Spread of diseases like malaria etc.
    - Formation of water puddles,
    - Possibility of earthquakes due to the influence of water reservoirs.
    - Increase in salt-content due to excessive irrigation.
    - Decrease in soil fertility due to holding back of nutrients in the down reservior.



**CHECK YOUR PROGRESS**

**Q 3.** How low should be the amount of rainfall for a drought situation to occur?

.....

**Q 4.** Mention four problems of big dams.

.....

.....

## 2.7 MINERAL RESOURCES

The discovery, extraction, purification and use of mineral resources is a great means of support for developing countries, including India. These minerals normally have characteristic chemical and physical properties.

- **Types of Mineral Resources:** Mineral resources are of two types –
  - *Non metallic* e.g. Diamonds, graphite, quartz.
  - *Metallic*, e.g. Bauxite, pyrita etc.
- **Extraction and Use of Mineral Resources:** Minerals are found in ores. The ores are extracted from the earth's crust, and after purifying and refining them through different processes, the minerals become suitable for use, Minerals are used for different purposes. Examples–
  - For industrial purposes and development of mrchanical systems.
  - Used in coal, lignite and uranium energy production
  - Making of weapons and ammunition
  - For cable, telephone and other communication systems
  - Preparing medicines
  - For making gold, silver and diamond jewellery
  - Use of silver in preparing photographic plates, electronics and jewellery.
  - For use as fertilizer and insecticide in agriculture.
- **Environmental Impact of Mineral Extraction and Use:** After mining and extraction, when minerals are disposed of, it leads to pollution of air, water and soil. Some examples of the ill-effects of mining are as follows :

- Because of the uranium mining field in Jaduguda, the people of Jharkhand and nearby areas are in danger of being exposed to nuclear radiation.
- Because of fire outbursts in the coal mines, the people around the Jharia coalmine region have been forced to flee to other places.
- In Karnataka's Kudremukh region, iron ore mining has led to pollution of rivers.
- Because of open-cast mining in the coal mines of upper Assam, the environment of the surrounding areas has been polluted to a great extent. The sulphur content in ground water has increased.

  There are two types of mining –

  (a) Surface mining

  (b) Underground mining

- **Harmful Effects of Mining:** The harmful environmental effects of mining are as follows –
  - Destruction of plants
  - Geographical changes
  - Depression of the earth surface
  - Pollution of ground water
  - Air pollution.
  - Surface water pollution
  - Affecting the health of miners.

  The harmful effects of mining are to be controlled in order to keep the environment clean. Mining should always be conducted keeping in view the health of the environment. Microbial backing process is used when extracting minerals from low quality ores. Trees should be planted in the regions where mining takes place. The flow of toxic substances after refining the ores should be controlled.

  There are gold mines in Karnataka and Kerala. When the minerals available for the usage of human beings are measured against the timeline, it is called "the lifetime of earth's minerals".

**Table 2.2 : Essential Minerals and their Lifetime**

| Minerals | Lifetime |
|---|---|
| Coal, Iron, Chromium | 2500-2800 AD |
| Aluminum, Cobalt, Manganese | 2100-2200 AD |
| Crude oil, natural gas, Uranium, lead, Zinc, gold, Silver, tin | 2000-2100 AD |



**CHECK YOUR PROGRESS**

**Q 5.** What are the different types of mineral resources?

.....

.....

**Q 6.** Mention some of the environmental impacts of mining.

.....

.....

## 2.8 FOOD RESOURCES

Food is a basic necessity for living beings. Only green plants can produce their own food. Food contains carbohydrates, proteins, fats, bio-acids, vitamins, mineral salts etc.

According to the Food and Agricultural Organization (FAO), the minimum calorie intake for a person is 2500 calories per day, Malnutritioned people get only 80-90% of this amount. People suffering from severe malnutrition get even less than 80% of the daily calorie intake.

Deficiency of the required nutrition is called malnutrition. Lack of adequate quality and quantity of the requisite food leads to malnutrition. World Health Organization is an international organization.

- **World Food Problem:** Even though food production in the developing countries is increasing, it is not yet proportionate to the increasing population. The result is that some people do not get a balanced diet and suffer from lack of nutrition. Lack of nutrition creates physical disorder in human beings. This is known as nutritional deficiency

disease. 300 million people in Indian suffer from malnutrition. There is a direct relation between population explosion and food problem.

Some harmful effects of malnutrition are as follows :

- Increase in child mortality
- Increase in mother mortality
- Retarded brain development
- Low academic performance

In the World Food Summit held in 1996, a resolution was taken to the effect that by 2015, the percentage of people suffering from malnutrition will be reduced by half. Poverty is the main cause of malnutrition. The parents of poor families cannot provide the requisite food to their children.

- **Agricultural Methods:** In the prehistoric age, people procured the necessary food by hunting wild animals and eating edible plants. They made different stone implements using great skill in order to hunt animals. They led a nomadic life as they were continuously in search of food. They spent most of their time in hunting animals and procuring food. Agriculture means cultivating and growing crops in a piece of land. As time passed, the prehistoric people learnt to produce their own food, and consequently they changed from "food gatherers" to "food producers". It has been found that agriculture was first started in Thailand. Excavation works in Thailand have revealed the remains of rice and soybean cultivation. These are said to be 10000 years old.

  Traditional agricultural methods have three harmful effects:- Deforestation, Soil erosion, Decrease in nutrition

  - *Effects of Modern Agricultural Methods:*The Green Revolution is a success story of Indian agriculture. Its sucess was due to the following reasons :
    - Use of more productive seeds
    - Use of skilled machinery
    - Use of fertilizers, pesticides and nutritional aids for irrigation.

  But the use of modern agricultural methods has also created some problems. They are–

- When highly productive seeds are sown equally in all the plots of land, the chances of the spread of diseases in them are relatively high.
- Two problems arise when chemical fertilizers are used –
  (a) Blue Baby syndrome as a result of nitrate pollution.
  (b) Eutrophication : If huge amounts of nitrate from the fertilizers are dissolved in water, it creates a thick layer of algae. These algae use a lot of liquefied oxygen in the water. Consequently, the living beings in the water get less oxygen and suffer untimely death. The decreased productivity in the ponds and lakes is due to increasing of algae and weeds called eutrophication. Eutrophication has resulted in the decrease of the area of Srinagar's Dal Lake from 15 $km^2$ to 12 $km^2$.
- Some of the problems arise due to the use of pesticides. For example, the excessive use of DDT can create certain pesticide resistant insects. Besides, the use of pesticide beyond the permissible limit may cause death to lives.
- Lack of proper drainage system and accumulation of water due to excessive irrigation.
- Increase in soil salinity when saline compounds like sodium chloride, sodium sulphate, calcium chloride etc. are deposited in the soil. When saline water is used for irrigation, the effect is doubled. The saline soil decreases crop productivity. Different methods can be used to reduce soil salinity –
  (a) Use of better quality water
  (b) Spreading the inland network through open canals.

The Central Soil Saline Research Institute in Kerala has succeeded in making a saline village called Jarika Biran into a salt free one. This has made the village richer in crop production.

Excessive animal grazing has also adversely affected the soil. For example, the quality of soil is degraded, useful plants become extinct and various harmful plants like parthenium, lantina and jenthiam and other cacti prosper.



**CHECK YOUR PROGRESS**

**Q 7.** What are the different types of food?

.....

.....

**Q 8.** What methods can be used to make the soil less saline?

.....

.....

## 2.9 ENERGY RESOURCES

The capacity to do work is called energy. The economic development of a country depends on the per capita energy use. Nobody can seize energy; it can only be used for work. Energy is never destroyed; rather it transforms from one state to another.

There are different types of energy –

- Solar energy
- Hydro power
- Nuclear energy
- Wind energy
- Bio mass energy

The main sources of energy like the physical energy of men and animals, wind energy, the oils produced from wood and forest reserves etc. do not create pollution. But after the industrial revolution, industries extracted energy from the sources like coal, crude oil, natural gas etc. When these products are burnt it creates pollution of the environment. In trade and industry, 95% of the energy comes from fossil fuels. But in the near future, fossil fuels will face the danger of extinction. The total national production in case of countries like America, Switzerland, Norway etc. is quite high. In these developed countries, the per capita use of energy is 250000 kg calories. In that case, in a developing country like India, the per capita use of energy is 10000 kg. calories.

- **Sources of Energy:** There are two sources of energy :Renewable

source and Non-renewable sources.

- *Renewable Source:* These resources do not dwindle even with continuous use, as these are replenished by nature. These resources are inexhaustible e.g., solar energy, wind energy, tidal energy, geo-thermal energy, biogas etc.
- *Non-renewable Sources:* These resources are exhaustible, and once the sources are finished, they can never be replenished. Nature also cannot replenish such resources, e.g. coal, petroleum and petroleum products, nuclear minerals like uranium and thorium.

- **Renewable Source:**
  - *Solar Energy:* Among the nonconventional sources of energy , solar energy constitutes a large part. The heat and light radiated from the sun is called solar energy. The amount of the sun's radiation on the earth's atmosphere is 170 trillion kilowatt. We get the sun's rays profusely for at least 250-300 days of the year. The easiest and simplest mode of using solar energy is through the solar heat conversion method. Solar energy is already used in cookers, heaters, solar batteries etc. Efforts have been made to use solar energy refrigerators, airconditioners etc. Street lamps run with solar power are available in the market today. The quality of these products needs to be improved and the prices should be reasonable so that the common man is able to purchase them.
  - *Wind Energy***:** Wind energy can be used in the production of power and for spraying water. Wind energy can be converted to mechanical and electrical energy. Wind driven water pipes have been installed. Since in the coastal areas like the Kutch region of Gujarat, Okha, Puri and Tuticorin, the wind speed is very high, wind driven turbines are used to generate electricity.
  - *Tidal Energy:* In Gujarat's Kutch region and west Bengal's Sundarban Delta, experiments are being made on the usefulness of tidal energy. The most powerful tidal energy production centre in the world is located in France.
  - *Hydro Power:* Dams are constructed in fast flowing rivers in order

to create hydro energy. River water is collected by constructing dams. The accumulated water is allowed to flow through the dams where the water energy is converted from static to dynamic form. These rapid flowing waters start rotating the turbines and the attached generators which lead to electricity production. The amount of hydroelectricity production in India is nearly 23800 megawatt.

Some problems arising out of hydroelectricity generation through dams are –

- The flow of water may be stopped if sediments accumulate in the dams.
- Obstruction due to migration of fish
- Preventing river water flow, and preventing the use of higher lands due to floods.

- *Ocean Thermal Energy:* The energy which is created due to fluctuations in temperature between the surface and depth of the oceans is called ocean thermal energy. This energy is used to generate electricity.
- *Geothermal Energy:* The heat generated by the hot molten materials inside the earth's core is called geo-thermal energy. Hot springs are to be found in Manikaran, Kullu (Himachal Pradesh), Sohna (Haryana), Garampani (Assam) etc. The warm water which flows at high pressure can sometime be used to rotate the turbine in the generator in order to produce electricity.
- *Biomass Energy:* Biotic elements like wood, garbage, agricultural wastes etc. constitute the biomass The energy released from these elements are as follows–
  - Energy Producing Agriculture Lands: Photosynthesis uses carbon dioxide and water, and through solar energy, transforms it into essential foods. Through this process, solar energy is transformed into bio mass energy. Some fast-growing plants are also directly burned to produce energy. Decomposition turns it into fuel.

- Petro-plants: Plants like euphorbias, Jatropha have been identified as the source of liquid hydrocarbons. It supplements liquid fuel. These oily particles can be used to produce diesel or gasoline. Liquid fuel can also be extracted from the seeds of the 'nahar' tree.
- Agricultural and urban refuse, when burnt, produces energy which can be used for different purposes.

- *Bio-gas:* The reaction of bacteria on biomass produces bio gas. The number of biogas plants in India is 30,00,000. Bio gas is formed from a mixture of methane, carbon dioxide, hydrogen sulphide and ammonia. The composition of plant and animal refuse also creates these gases.

  In different parts of the country dung cakes are used for cooking and other purposes. The wastes of animals contain certain nutrients which are helpful if returned to the soil. The dung cakes do not get fully burnt, and therefore, they create a lot of smoke, and pollute the air. Instead of directly burning the dung cakes, it helps to transform it into biogas first. This fuel is clean and also generates heat. While producing fuel, the residue left behind can be used as fertilizer for agriculture.

- *Bio-gas Project:* The plant and animal waste rot easily in water when microbes work on them. This process also produces methane, carbon dioxide, hydrogen and hydrogen sulphide gases. The mixture of these gases is called bio-gas. Methane constitutes 65% of this gas. It is one of the best fuels. This mixture of dung and water, when poured into a part of the project, produces a gas which is let out through an outlet pipe for the users. In order to have a continuous supply of biogas, it is necessary to fill the mixture room with wastes from the biotic community. Human waste can also be added to it. In some places, household refuse can also be used as raw material for the biogas project. In our country, we have basically two types of biogas projects– (i) Fixed pile bio gas project, (ii) Floating gaseous biogas project.

- Advantages of Bio-gas Project:
  (a) Its use in gas stove
  (b) Its use in street lights and mechanical engines.
  (c) It prevents water pollution
  (d) The burning of biogas does not produce smoke, but produces much heat.
  (e) The residue left after the extraction of gas can be used as fertilizer. It contains a lot of nitrogen and phosphorous compounds.

- *Bio Fuel :* Types of alcohol like ethanol and methanol can be produced by the decomposition of biotic microorganism. Ethane can be produced from sugarcane. Like ethanol, methanol is also a clean, non- polluting fuel. Methane can be produced frome woody plants. It burns in a lower temperature than gasoline and diesel. The mixed product of ethane and methane is gasoline. In many countries, it is also used as car fuel.
- *Hydrogen:*The burning of hydrogen in the atmosphere creates a lot of energy. Hydrogen can be produced through two methods – a) Thermal dissociation and b) Photolysis or electrolysis of water.
  - The advantages of the use of hydrogen as fuel :
    a. It is non polluting.
    b. It can be produced very easily
    c. Since it has a huge amount of improved calories, it is suitable for use as fuel.
  - The disadvantages are as follow :
    a. It is highly inflammable and explosive
    b. it is difficult to store and transport

- **Non-renewable Sources of Energy:**
  - *Coal :* Energy produced through the burning of coal can be used in various ways. Coal is a non renewable source. The earth's crustal layer contains nearly 6000 million tons of coal. Till now, almost 200 million tons have already been used for various purposes. Some of the big coal mines in our country are – Raniganj, Jharia, East Bokaro,

West Bokaro, Pulse Kungkom, Singrauli, Talser, Chanda, The states which have huge amount of coal are – Bihar, Orissa, West Bengal, Madhya Pradesh, Andhra Pradesh, and Maharastra. Assam and Meghalaya also have coal. India constitutes 5% of the world's coal. Coal is of 3 types – a) Anthracite (Hard coal), b) Bituminous (Soft coal) c) Lignite.

Coal is a huge source of energy and is very useful for industries. The amount of coal at present in India is about 123000 million tons. 75% of the produced coal is used in trains, industries and thermo-electric projects.

- *Petroleum:* It has been estimated that the crude oil source will last only for the next 40 years or so. The 13 countries of the OPEC constitute 67% of the world's petroleum. Saudi Arab contains 25% of the crude bio resourse.

  Crude oil is refined through the partial distillation process and thereby different fuel products such as petrol, diesel, kerosene gasoline, plastic etc are produced. Compared to coal, petroleum is a clean fuel and can also be transported.
- *Liquefied Petroleum Gas ( LPG)*: Petroleum gas can be liquefied through high pressure. This is known as LPG, which is used as cooking fuel. Now-a-days, it is also used to run vehicles.
- *Natural Gas:* Natural gas mainly contains methane but also some amount of propane and ethane, In India, natural gas is a gift of nature. It can be used both as an energy source and as industrial raw material in petrochemical industries. Natural gas is also used in fertilizer production centres. This gas burns without producing smoke. Natural gas is of two kind – Compressed Natural Gas and Synthetic Natural Gas.
  - Compressed Natural Gas (CNG): CNG is presently used as fuel for vehicles. Use of CNG in Delhi has reduced pollution to a large extent.
  - Synthetic Natural Gas (SNG): SNG is produced from a mixture

of carbon monoxide and hydrogen. Low quality coal can be converted into artificial gas.

- *Nuclear Gas:* A very little amount of radioactive products can produce a large amount of energy. Atomic energy is produced through nuclear emission. Two methods are used to produce energy. These are– nuclear fission and nuclear fusion. In India, there are 4 nuclear energy production centres, and these produce 2005 megawatt energy. Nuclear energy is used for –
  - Electricity production
  - Fuel for ocean liners
  - Heat producers in chemical reaction projects.
  - To fly aeroplanes



**CHECK YOUR PROGRESS**

**Q 9.** How many kinds of energy are there and what are these?

.....

.....

.....

**Q 10.** Mention the types of coal.

.....

.....

## 2.10 LAND RESOURCES

The upper surface of the earth is called land. Everything that is required for sustenance on this earth can be acquired from it. 43% of India's land mass is constituted by plains, 27% by plateaus and 30% by mountains. When physical elements like eroded hills, rain, air, temperature etc. react with biotic elements like plants, animals, and micro organisms, land is formed. There are four elements which constitute land –

| | | |
|---|---|---|
| Mineral elements | – | 50-60% |
| Biotic elements | – | 10% |

| | | |
|---|---|---|
| Water | – | 25 – 35% |
| Air | - | 15-25% |

600 million hectares of agricultural land in India are ruined due to various factors such as – soil erosion, increased salinity in the soil, mixing of poisonous substances with the soil etc.

- **Soil Erosion:** Soil ersion is the transference of the upper part of the soil from one place to another. It is only after 500-1000 years that one inch thick layer of the earth's surface is formed. Today, soil erosion is a worldwide problem.
- **Types of Soil Erosion:**
  - *Natural or Geological Erosion:* When erosion occurs naturally without human interference, it is called natural or geological erosion.
  - *Rapid Soil Erosion:* When men and other animals interfere with nature, then soil erosion becomes more rapid. Excessive grazing, deforestation, mining etc contribute to the speedy erosion of soil. Soil erosion occurs due to various factors. For example –
  - *Through Water:* Water erodes soil in four ways – Erosion of the land surface, Erosion through streams, Erosion by creating canals, Erosion of the river banks
    - Erosion of the Land Surface: This occurs when heavy rainfall completely washes away the surface layer of the soil.
    - Erosion through Streams : When heavy rainfall cuts through the soil then it erodes the soil.
    - Erosion by Creating Canals: When water flows swiftly, it sometimes erodes land by creating wells and canals.
    - Erosion of the River Banks: Rivers which have strong currents erode the nearby areas under water and as a result, the upper surface becomes unstable and gets washed away. Thus, the river banks get eroded.
  - *Erosion by Wind:* Barren lands or land with few trees suffer from erosion by air. Particularly the desert and dry lands suffer from this problem. In India, Rajasthan, the Kutch region, and the arid region of Madhya Pradesh, have this problem. The fine dust particles are

blown away from one place to another by storms and heavy winds. When the wind stops or is obstructed, the loose particles create sanddune. The causes for the formation of dune are – saltation, suspension and surface creep.

- **Soil Conservation Practices:** The objective of soil conservation is to keep the soil as it is and to preserve soil fertility in order to make it conducive for agriculture. The easiest and cheapest way to conserve soil is to plant trees. There are also other methods of soil conservation. They are –
  - *Farming Plots of Land One by One:* If rice, wheat and pulses are cultivated in turns, it helps soil conservation.
  - *Preserving Soil Fertility:* Infertile lands are easily eroded by air and water. Therefore, in order to prevent soil erosion, it is necessary to protect soil fertility using fertilizers and planting pulse like crops which can protect soil fertility.
  - *Afforestation:* When water falls down a precipice, soil erosion occurs more quickly. In order to prevent the erosion trees, grass should be planted. When huge trees like 'Shirish', 'Palash', 'Sonaru' etc. are planted, the falling leaves form a thick layer of humus on the surface of the soil.
  - *Terrace Cultivation:* When a mountain slope is cultivated in small parts step by step, it is called terrace cultivation. When a slope is thus cultivated by cutting it into parts, the flow of water can be controlled and soil erosion can be checked.
  - *Construction of Check Dams:* Constructing check dams on streams can reduce the speed of water and stop soil erosion.
  - *Crop Rotation:* Together with other crops, if pulses are cultivated in rotation, soil erosion can be reduced to a large extent.
  - *Controlling Streams:* When water flows down the mountain slopes at a great speed, it creates deep channels and aggravates soil erosion. This can be checked by constructing dams. Grass, bushes and hedges can stop the land from cracking up and getting eroded.

- **Prevention of Damages Caused by Wind:** Erosion caused by wind can be stopped by different methods. Planting green grass, keeping the ground uneven, crop rotation etc. are some of the ways through which erosion by wind can be stopped. The forests created by excessive planting is called Shelter Belt. Trees reduce the speed of winds, and protect the soil particles carried by the wind.

  Rajasthan in India suffers most from wind erosion. The Central Arid Research Institute in Jabbalpur is involved in carrying out research on how to reduce and control erosion by wind.

- **Landslides:** Constructing dams for hydro-electronic projects, constructing roads and highways, digging reservoirs, laying rail lines, etc. involve cutting the earth and, as a result, landslides frequently occur on hillsides. Heavy rainfall washes away the top layer of the soil and the rocks move down due to gravity causing huge landslides. Landslides in the North-eastern region cause death to a large number of people annually.

- **Desertification:** Destruction of forests has led some regions to desertification. This results in soil infertility, reduction of ground water, salinity in the soil, and increase in soil erosion. Misuse of land results in desertification. Its ill effects lead to – (i) Weakening of the food chain and (ii) Appearance of exotic plants.

  Desertification take place because of the following factors –

  - *Deforestation and Excessive Animal Grazing:* Destruction of forests, and excessive animal grazing lead to erosion of soil. Animal grazing is becoming a threat to grassland forests and mountain regions. The wind erosion caused by deforestation, when not checked, leads to reduction in the amount of rainfall. In order to prevent excessive animal grazing, goats and sheep should be kept in enclosures, and fed only on cut grass.
  - *Mining and Quarry Extraction:* Desertification also happens when mining is done to extract mineral salts and other minerals. Mining results in the extinction of many plants. In order to prevent desertification, environment friendly mining methods should be used.



**CHECK YOUR PROGRESS**

**Q 11.** Mention the elements of soil in percentage.

.....

.....

**Q 12.** What are the effects of desertification?

.....

.....

## 2.11 CONSERVATION OF NATURAL RESOURCES

In order to sustain the growing population, natural resources are being used recklessly, which in turn, has reduced their quantity. Nature takes a lot of time to remedy the wrongs done by man. Afforestation after deforestation requires both time and energy. After plantation nature requires time to nurture the saplings and bring them up.

- **Conservation Practices:**
  - Keep a balance between resources and man's needs
  - Proper planning for proper use of resources.
  - Environmental knowledge and awareness.
- **Objectives of Conservation of Natural Resources:** Natural resources need to be conserved both for our own good and the good of our future generations. Its objectives are –
  - The conservation of the natural resourese is essential for controlling the environmental system. This means the controlling of various environmental system such as food-chain, renewal of mineral resourses, maintainance of the supporting condition like soil, wind, water, animals.
  - It makes the resources available and their existence pereanial so that all living beings can lead an undistrubed life.
  - To keep conservation at a specific level in order to maintain the biodiversity for ensuring safe evalution of life.

- **Some methods for conservation of natural resources:**
  - *For Conserving Water:*
    - We should not keep the water taps open unnecessarily. When not in use, the taps should be tightly closed.
    - Use of water for domestic purposes should be properly regulated.
    - We should water the plants only in the evening.
    - Store rain water for later use.
    - Controlled use of water for irrigation and sprinkling of water on the green.
    - Clean water should be used in irrigation.
    - We should be careful and thrifty while using water both at home and in industries.
  - *For Conserving Energy:*
    - We should develop alternative sources of energy like solar energy, nuclear energy for everyday use.
    - We should be careful while using fuel for extracting energy so that the fuel is not wasted. Only when there is no alternative fossil fuels should be used. In this way, fossil fuels can be preserved.
    - Misuse of energy can be stopped by the following ways –
      (a) As far as possible we are to use the most efficient fuels .
      (b) For burning fuels, efficient cooking implements like stoves and chulhas should be used.

Excessive use of coal, crude oil and natural gas has led to a depletion of these resources. It is necessary to find renewable sources of energy as an alternative, and to stop the misuse of these types of fuels. In the today's context, it is necessary to modify the models of houses, industries, business, hospitals, schools, colleges, factories etc. Change in life style will encourage energy conservation, as saving energy will create energy.

- *For Conserving Soil:*
  - It is necessary to preserve soil fertility to grow more food grains for the increasing population. Soil fertility can be increased in

the following ways – Supplying fertilizers; using green fertilizers, stabilizing organic nitrogen. The decomposition of fallen leaves, dead animals etc. can provide mineral fertilizers.

- Soil Erosion Can be Stopped in the Following Ways –
  - i) Crop rotation methods
  - ii) Planting grass, pulses, groundnuts etc.
  - iii) Drains or canals should be dug to drain out floodwaters
  - iv) Afforestation
  - v) Controlled animal grazing
  - vi) Cutting steps on slopes in order to stem the flow of water.

- **Equitable Distribution of Fuel:** America, Canada, Japan, Australia and other developed countries constitute only 22% of the world's total population. But this population utilises 88% of the total resources. They cntrol 73% of the power and 85% of this their earnings. It is seen that there is a vast difference between developing and developed countries in fuel use. Because of this imbalance, the rich countries are becoming richer.

  For this reason, it is necessary to share the natural resources equitably between the rich and the poor. Equitable distribution is required especially for the basic necessities– water, food and fuel. It will be difficult, rather impossible to control pollution, unhygienic conditions etc. in the developing countries without the intervention of the developed countries.

  Developed countries should therefore intevence in favour of shifting resources to the poor countries. This will lead to equitable sharing of developmental works, bridging the gap between the rich and the poor and establishing balanced, equal development everywhere.

## 2.12 SUSTAINABLE DEVELOPMENT

All the essential requirements of man such as air, water, food, shelter etc. can be acquired from the environment. The economic development of man has adversely affected the resources given by nature such as minerals,

plants and animal kingdom, which in consequence has led to a depletion of these resources. Population explosion is also a contributing factor towards environmental imbalance.

Environment cannot be separated from economic development. Different developmental works contribute to the destruction of natural resources. The degradation of natural resources has a harmful effect on the economic development. There is an intimate relation between environmental imbalance, disaster and scarcity of fuel etc. Such imbalances creat problem and cause disasters. The accelerated rates of development have broyght immense pressure on the use of raw materials from forests and other land areas.

If this development process continues, then it will be most difficult to maintain an environmental balance in the world. Therefore, in recent times a new concept has emerged worldwide, which is called sustainable development. Sustainable development means the capacity to cater to the present needs of the people of a certain geographical region without affecting the interests of the future generations. The sustenance capacity depends upon land area, its productivity and the proportion to the essential requisites of man.

Therefore, when a country or a region marches towards economic progress or development through the proper use of its resources and by maintaining the environmental balance sustainable development occurs and it meets the essential requirments of men and ensures their availability in the future without destroying the environmental resources.

According to the world organization of environment and development, the following areas need to be considered for sustainable development in the local, regional and national levels.

- **Political System:** Citizens should take decisions through active participation.
- **Economic System:** Increase in production through the use of technology.
- **Social System:** Removal of the anxiety and concern which stem from unequal development.

- **Productive System:** Preserving the ecosystem for progress, and to recognize our responsibility towards it.
- **Technical System:** Find solutions through research
- **Government System:** To have the capacity for self correction, and to become humble.
- **National Foreign Policy:** To sustain business and economy through international agreements.

It is feared that unsustainable economic development will destroy the environment as it causes great strain on the resources. Therefore, the policy makers of the country need to be motivated by the thoughts of sustainable development. This will enable the growing economy to have a firm grip on the roots of the ecosystem. This system needs to be protected and cared for, in order to continue it till posterity.



**CHECK YOUR PROGRESS**

**Q 13.** What are the objectives of the conservation of natural resources?

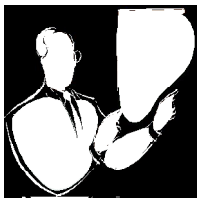
.....

.....

**Q 14.** What do you mean by sustainable development?

.....

.....



**LET US KNOW**

Resources : Storehouse of necessary materials.

Atmosphere : The layer of transparent gases covering the earth.

Living Energy : Energy extracted from living beings.

Living Community : Organic elements from living beings.

Bio-gas : Gas produced from the decomposition of microbes in garbage.

Inexhaustible Resources : Those resources which cannot be exhausted with continuous use.

| | | |
|---|---|---|
| LPG | : | Liquefied Petroleum gas |
| O.T.E. | : | Ocean Thermal energy |
| Non-renewable Eesources | : | Resources which cannot be renewed. |
| Renewable Resources | : | Resources which are produced spontaneously by nature. |
| Soil Erosion | : | The transference of the upper layer of the land surface from one place to another. |



## 2.13 LET US SUM UP

- After going through this unit, we have acquired a holistic idea of natural resources. We have come to know about the types of natural resources and where these resources are to be found and in what state.
- Beside knowing about renewable and non-renewable resources, we have also understood how to use them in a proper manner.
- We have learnt about environmental imbalance as created by deforestation.
- Natural gases and the reserves of petroleum and petroleum products will become extinct one day. So, we have been acquainted with the means to use the resources in a proper way in order to maintain the natural balance. Finally, we also got some idea about sustainable development which is closely related to the above mentioned issues.



## 2.14 FURTHER READING

1) Asthana, D. K. & Meera A. (2012). *A Textbook of Environmental Studies*. New Delhi: S. Chand and Company Ltd.

2) Bharucha, E. (2004). *A Textbook of Environmental Studies.* New Delhi: UGC.

3) Kaushik, A. & Kaushik, C. P.(2006). *Perspectives in Environmental Studies.* India: New Age Publications (Academic).



## 2.15 ANSWERS TO CHECK YOUR PROGRESS

**Ans to Q No 1:** Air, sand, solar radiation, etc are examples of inexhaustible resources. Water, wood, natural grasslands, soil and biotic matter, forests, wild animals, fossil fuels (coal, petrol), minerals like copper,iron etc are exhaustible resources.

**Ans to Q No 2:** Deforestation results in soil erosion, increase in floods and drought, reduction in the profits derived from flora and fauna, scarcity in wood and energy resources etc.

**Ans to Q No 3:** If rainfall occurs 75 % less than the usual amount, then drought situation occurs.

**Ans to Q No 4:**
- Destruction of forests, plants and animals along with it.
- Displacement of tribal people.
- Fundamental changes in the climate.
- Occurrence of diseases like malaria etc.

**Ans to Q No 5:** Mineral resources are of two types-

(i) Non metallic e.g. Diamonds, Graphite, Quartz.

(ii) Metallic, e.g. Bauxite, laterite etc.

**Ans to Q No 6:**
- Destruction of plants
- Geographical changes
- Depression of the earth surface
- Poisoning of ground water
- Air pollution.

**Ans to Q No 7:** Food products include carbohydrates, proteins, fats, bio-acids, vitamins, mineral salts etc.

**Ans to Q No 8:** (i) Use of better quality water

(ii) Spreading the inland network through open canals.

**Ans to Q No 9:** ● Solar energy

- Hydro power
- Nuclear energy
- Wind energy
- Bio mass energy

**Ans to Q No 10:** Coal is of 3 types – (i) Anthracite (Hard coal), (ii) Bituminous (Soft coal) (iii) Lignite.

**Ans to Q No 11:** Mineral elements – 50-60%

Biotic elements – 10%

Water – 25 – 35%

Air - 15-25%

**Ans to Q No 12:** (i) Weakening of the food chain

(ii) Appearance of exotic plants.

**Ans to Q No 13:** Following are the objective of the conservation of natural resources:

- The conservation of the natural resourese is essential for controlling the environmental system. By this is meant the controlling of various environmental system such as food-chain, renewal of mineral resourses, maintainenca of the supporting condition like soil, wind, water, animals.
- It makes the resources available and their existance perennial so that all living beings can lead an undistrubed life.
- To keep conservation at a specific level in order to maintain the biodiversity for ensuring safe evalution of life.

**Ans to Q No 14:** Sustainable development means the capacity to cater to the present needs of the people of a certain geographical region without hampering the interests of future generation.

The sustenance capacity depends upon land area, its productivity and the amount of everything that is required for man.



## 2.16 POSSIBLE QUESTIONS

### VERY SHORT ANSWER QUESTIONS

**Q 1.** What are resources?

**Q 2.** What are the natural resources?

**Q 3.** What is pesticide?

**Q 4.** Give the full form of DDT.

**Q 5.** Write the names of some inexhaustible natural resources.

**Q 6.** What is energy? Why is it necessary?

**Q 7.** What is deforestation?

**Q 8.** What is a drought situation?

**Q 9.** Write the names of some alternative sources of energy.

### SHORT ANSWER QUESTIONS

**Q 1.** What are the uses of forest resources?

**Q 2.** Describe the reasons for deforestation.

**Q 3.** Discuss the impacts of the constraction of dams forests and man.

**Q 4.** What are the different types of water? Describe its importance.

**Q 5.** What are the problems of modern methods of agriculture?

**Q 6.** What are the environmental effects of mineral extraction?

**Q 7.** Write short notes on :

(a) Floods, (b) Drought, (c) Marine resources (d) Solar Energy (e) Geo thermal energy (f) Bio-gas (g) Bio-fuel.

### LONG ANSWER QUESTIONS

**Q 1.** Account for the importance of forest resources.

**Q 2.** Write an essay on water resources.

**Q 3.** Describe the mineral resources in terms of their types, use and the environmental impact of thir extraction.

**Q 4.** Discuss the renewable and non-renewable sources of energy.

**Q 5.** Elaborate on the land resources.

**Q 6.** Discuss the different types of energy.

**Q 7.** Write short notes on:

(a) Soil erosion, (b) Soil conservation,

(c) Responsibility of man towards conservation of natural resources,

(d) Sustainable development.

*** **** ***