

**Natural resources:** types, uses and abuses.

A **resource** is a source or supply from which a benefit is produced and that has some utility.

Resources can broadly be classified upon their availability, a natural resource is anything obtained from the environment to satisfy human needs and wants they are classified into renewable and non-renewable resources. They can also be classified as actual and potential on the basis of the level of development and use, on the basis of origin they can be classified as biotic and abiotic, and on the basis of their distribution, as ubiquitous and localized An item becomes a resource with time and developing technology

Natural

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Natural resources are derived from the environment. Many natural resources are essential for human survival, while others are used for satisfying human desire. Conservation is management of natural resources with the goal of sustainability. Natural resources may be further classified in different ways.

Resources can be categorized on the basis of origin:

- Abiotic resources comprise non-living things (e.g., land, water, air and minerals such as gold, iron, copper, silver).
- Biotic resources are obtained from the biosphere. Forests and their products, animals, birds and their products, fish and other marine organisms are important examples. Minerals such as coal and petroleum are sometimes included in this category because they were formed from fossilized organic matter, though over long periods of time.

Natural resources are also categorized based on the stage of development:

- Potential resources are known to exist and may be used in the future. For example, petroleum may exist in many parts of India and Kuwait that have sedimentary rocks, but until the time it is actually drilled out and put into use, it remains a potential resource.
- Actual resources are those that have been surveyed, their quantity and quality determined, and are being used in present times. For example, petroleum and natural gas is actively being obtained from the Mumbai High Fields. The development of an actual resource, such as wood processing depends upon the technology available and the cost involved. That part of the actual resource that can be developed profitably with available technology is known as a reserve resource, while that part that can not be developed profitably because of lack of technology is known as a stock resource.

Natural resources can be categorized on the basis of renewability:

- Non-renewable resources are formed over very long geological periods. Minerals and fossils are included in this category. Since their rate of formation is extremely slow, they cannot be replenished, once they are depleted. Out of these, the metallic minerals can be re-used by recycling them, but coal and petroleum cannot be recycled.
- Renewable resources, such as forests and fisheries, can be replenished or reproduced relatively quickly. The highest rate at which a resource can be used sustainably is the sustainable yield. Some resources, such as sunlight, air, and wind, are called perpetual resources because they are available continuously, though at a limited rate. Their quantity is not affected by human consumption. Many renewable resources can be depleted by human use, but may also be replenished, thus maintaining a flow. Some of these, such as agricultural crops, take a short time for renewal; others, such as water, take a comparatively longer time, while still others, such as forests, take even longer.

Dependent upon the speed and quantity of consumption, overconsumption can lead to depletion or total and everlasting destruction of a resource. Important examples are agricultural areas, fish and other animals, forests, healthy water and soil, cultivated and natural landscapes. Such conditionally renewable resources are sometimes classified as a third kind of resource, or as a subtype of renewable resources. Conditionally renewable resources are presently subject to excess human consumption and the only sustainable long term use of such resources is within the so-called zero ecological footprint, wherein human use less than the Earth's ecological capacity to regenerate.

Natural resources are also categorized based on distribution:

- Ubiquitous resources are found everywhere (for example air, light, and water).
- Localized resources are found only in certain parts of the world (for example metal ores and geothermal power).

Actual vs. potential natural resources are distinguished as follows:

- Actual resources are those resources whose location and quantity are known and we have the technology to exploit and use them.
- Potential resources are the ones of which we have insufficient knowledge or we do not have the technology to exploit them at present.

On the basis of ownership, resources can be classified as individual, community, national, and international.

The **ecological footprint** measures human demand on nature, i.e., the quantity of nature it takes to support people or an economy. The **global hectare** (gha) is a measurement unit for

the ecological footprint of people or activities and the biocapacity of the earth or its regions. One global hectare is the world's annual amount of biological production for human use and human waste assimilation, per hectare of biologically productive land and fisheries. India has 1.16 **(gha/person)**

## Use and sustainable development

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Typically resources cannot be consumed in their original form, but rather through **resource development** they must be processed into more usable commodities and usable things. With the increasing population, the demand for resources is increasing. There are marked differences in resource distribution and associated economic inequality between regions or countries, with developed countries using more natural resources than developing countries. Sustainable development is a pattern of resource use, that aims to meet human needs while preserving the environment.<sup>[1]</sup> Sustainable development means that we should exploit our resources carefully to meet our present requirement without compromising the ability of future generations to meet their own needs. The practice of the three R's – reduce, reuse and recycle must be followed in order to save and extend the availability of resources.

Various problems relate to the usage of resources:

- Environmental degradation
- Over-consumption
- Resource curse
- Resource depletion
- Tragedy of the commons
- Myth of superabundance

Various benefits can result from the wise usage of resources:

- Economic growth
- Ethical consumerism
- Prosperity
- Quality of life
- Sustainability
- Wealth
- Natural resources comprise abiotic resources and biotic resources. Abiotic resources consist of land, water, air, sunlight and minerals. Biotic resources consist of forests with wild plants and animals, human population, coal, oil and natural gas produced million years ago.

## Types of Natural resources

- There are two types of natural resources
  - Renewable natural resources
  - Non-renewable natural resources

## Renewable Natural resources

- They are inexhaustive and can be regenerated within a given span of time. For example, water, air, soil fertility, wild plants and animals, human beings and energy resources like wind energy, tidal energy, hydropower, solar energy and biomass energy.

## Non-Renewable Natural resources

- Non-renewable natural resources are minerals, fossil fuels such as coal, petroleum and some species of plants and animals. Sometimes, renewable resources become non-renewable if we exploit them without any control. Some species, if overexploited, become endangered or even extinct.

## Natural resources

- The following are the natural resources
  - Forest resources
  - Mineral resources
  - Soil resources.
  - Water resources
  - Food resources
  - Energy resources

## FOREST RESOURCES

- Forest are important renewable natural resources. Trees, shrubs and herbs dominate forest ecosystem. 33% of the world's area consists of forest lands. Insects, birds and animals live there. Native forest has naturally growing plants and trees. Man-made forest consists of species of trees, shrubs, etc., grown by man. Boreal coniferous forests are found around the Arctic Sea, 55<sup>0</sup> to 65<sup>0</sup> north latitude. Temperate forests are found on either side of the earth 30<sup>0</sup> to 55<sup>0</sup> latitude north. Tropical rain forests are found between 30<sup>0</sup> north latitude and 30<sup>0</sup> south latitude.

## Uses of forests

- *Productive function:* Forests provide raw materials like pulp for paper industry and ingredients for pharmaceutical industry. They also provide fuel, fruits, nuts, timber, turpentine, gum, paints, herbal oil, honey and alkaloids.

- *Protective function:* Forests provide shelter for insects, birds, animals etc., and aid in their reproduction, provide food and ensure their free movement. They prevent drought soil erosion and loss of water.
- *Regulative function:* Regulation of environmental equilibrium is successfully achieved by forests. For example, regulation of Carbon-di-oxide (CO<sub>2</sub>), Oxygen (O<sub>2</sub>), water (H<sub>2</sub>O) and minerals is very essential for a healthy environment. Solar energy is absorbed, retained and released by forests. During photosynthesis by green plants, starch is formed from carbon dioxide and water in the presence of sunlight and it is stored. In this process, Carbon-di-oxide (CO<sub>2</sub>) is taken in and Oxygen (O<sub>2</sub>) is released to maintain equilibrium in atmosphere and aid in reducing the global temperature. An increase in global temperature poses a threat to human beings throughout the world.
- One acre of forest absorbs 4 tons of Carbon-di-oxide (CO<sub>2</sub>) and releases 8 tons of Oxygen (O<sub>2</sub>), thereby regulating carbon cycle, flood and drought. It is the forest which helps in economic development and maintenance of land value.

### **Abuses of forests**

- In India, in the olden day (Period of Mauriya and Gaudilya), there was more forest cover and less deforestation. During the period of Ashoka, many trees were planted. In the beginning of 20<sup>th</sup> century, there was 30% of forest cover; but by the end of 20<sup>th</sup> century, there was only 19.4% of forests left. This is mainly due to over exploitation of forests for commercial purposes like timber, food, etc.
- According to the National Forest Act recommendations (1988), 33% of total area and 67% of hilly area must be preserved as forest area. We should not destroy forest for our short-term benefits as it would lead to permanent loss of forests in an area forever.
- **DEFORESTATION**
- Deforestation occurs at an alarming rate. In India, we have lost 40 million hectares of forests during the last 100 years. Of the total land area of 329 million hectares, 174 million hectares of forests, agricultural and non-agricultural lands have been degraded. Deforestation in temperate countries is one per cent only. But, it is 40% in tropical countries! Tropical forests are reduced by 10 million hectares per year. This will lead to 90% reduction of forests in the next 60 years.

### **Causes of deforestation**

- The following are the causes of deforestation
  - Overpopulation and shifting cultivation have resulted in a loss of 51 million of hectares forests.
  - The increase in demand for fuel is another reason. The demand was 200 to 500 million tons in 2001, whereas it was only 65 million tons in 1947.
  - Increasing demand for raw materials for industries. About 900 million trees are cut down in a year to supply raw materials needed for American pulpmills and paper.
  - Growing needs of food and development of various projects

- Overgrazing, increase of pests, mining, forest fire and construction of dams.

### **Consequences of deforestation**

- Soil erosion; 6000 million tons of soil get eroded every year in India.
- Frequent floods are a common occurrence.
- Threatening of wild life species and their habitats, loss of biodiversity, erosion of genetic diversity and loss of economy take place.
- The hydrological cycle is affected and rainfall is reduced.
- Global warming, climate and drought occur.
- Landslides in hilly areas and increase in wind speed occur.

### **MINERAL RESOURCES**

- Minerals are non-renewable natural resources. They occur naturally as inorganic, crystalline solids with physical properties. There are thousands of minerals in the world.
- A nation's economy depends mainly on minerals which are used by man everyday for various activities. On the basis of usage of minerals, there are two types of Human civilization namely Bronze Age and Iron Age. We extract about 74m.metric tons of iron and steel per year.
- Minerals are mainly of inorganic origin but minerals like coal, petroleum and amber are of organic origin. Industrialisation and overpopulation lead to exploitation of minerals. Environmental problems arise when mineral exploitation is pursued unscientifically by man.

### **Uses**

- Development of Industrial plants and machinery.
- Generation of energy using coal, lignite and uranium.
- Construction, settlements and housing.
- Weapons and ornaments/ Transportation.
- Communication-Telephone wires, cables and electronic devices.
- Medical system-Ayurvedic system.
- Alloys, Jewellery (Gold, Platinum, Silver and Diamond)
- Agriculture-Fertilizers, seed dressing and fungicides

### **Abuses**

- Minerals have been exploited by way of open cast mining (stripped of unwanted materials lying above the mineral-bearing strata cast extraction of minerals), underground mining (coal seams) and placer mining (surface mining from stream bar or beach deposits).
- U.S.A exploit huge amounts of minerals and energy resources and has become the richest nation. Japan has the most efficient technologies with respect to coal and oil.

- In India, energy-generating minerals such as coal and lignite are found in West Bengal, Maharashtra, M.P., A.P., and Orissa. The important ore, uranium taken from uranite ore and pitchblende are found in Jharkhand, A.P. (Nellore), Meghalaya and Rajasthan.
- Commercially used minerals are aluminium (bauxite ore) and iron ore (Haemetite and Magnetite), found in Jharkhand, West Bengal, Maharashtra, M.P, and Tamil Nadu. The copper pyrites (Copper ore) are found in Rajasthan, Bihar, A,P, M,P., Karnataka and West Bengal.

### **Environmental Impact**

- Mining is a dirty industry creating largest environmental disaster zones in the world. Each step in the mining produces a lot of waste minerals which cause pollution.
- Environmental damage occurs due to the careless exploitation of minerals.
- They are as follows:
  - Water pollution takes place due to washing loose materials from waste dumps near adjacent water sources. Mine drainage and coal washing operations also cause water pollution. Surface water is contaminated by acid mine.
  - Air pollution is caused by release of noxious gases such as Sulphur di-oxide (SO<sub>2</sub>), Nitrogen di-oxide (NO<sub>2</sub>) and carbon monoxide (CO) into the atmosphere. Hydrocarbons, suspended particulate matter, Silicon (Si), Fluoride (FL), asbestos and metallic dust are released into the atmosphere affecting the vegetation and causing health hazards.
  - Noise pollution takes place due to blasting and operating of heavy machinery.
  - Soil erosion and felling of trees take place. Minerals cause diseases like silicosis, fluosis and asbestosis. The economic devaluation of the land is an important impact.

### **Remedial Measures**

- We must follow ecofriendly mining technology. Microbes must be used in leaching technique to utilise low grade ores. Bacteria and Thiobacillus, ferruxidans are used to extract gold embedded in Iron sulphide ore. Moreover, some strains of bacteria remove impurities of ore. Growing vegetation in mined area helps to prevent the discharge of toxic drainage to minimize environmental impact.

## **SOIL RESOURCES**

- Soil is the most finite and valuable resource upon which we depend for our basic amenities of life. So, we should preserve soil by all means. The total area of India is 328.73 mha. of which the potential area is 264.5 mha. About 187.8 m ha of land have been degraded due to water shortage, wind erosion, salinity, alkalinity and water-logging. Soil is thin covering over land containing organic materials, living organisms, air and water.

- Soil is a renewable source. But it is regenerated at a very slow rate i.e., 2.5 cm soil for 200-1000 years. Soil becomes non-renewable resource when the rate of erosion is faster than the rate of renewal. A cross section of soil horizon is called soil profile.

### **Abuses**

- The rapid increase of population results in demand for limited land resources which are subject to degradation. Land degradation takes place due to natural and man-induced or anthropogenic activities. Natural causes are soil erosion, land slide, volcanoes, earthquakes, floods, droughts and desertification.
- Man induced causes are deforestation, mining, over-irrigation, dam construction and use of more fertilizers. The flood havoc witnessed in Mumbai and Tamilnadu (Nov.2005) was perhaps due to increase in global temperature and green house gases. The average annual erosion rate of land is 20-100 times more than renewal rate.

### **Man-induced landslides**

- Overirrigation of slopes for farming
- Diversion of surface water onto sensitive slopes
- Cutting of trees and forest fires along the slopes
- Construction work along the slopes
- Hydroelectric projects, large dams, reservoirs, construction of roads and railway lines and mining.
- Mining combines with natural factors for landslides Example: Land slides between Rishikesh and Byasi on Badrinath Highway due to construction of roads and mining.

### **Soil erosion**

- Top soil moves from one place to another resulting in loss of fertility of soil. One third of world's croplands is getting eroded. Two thirds of degraded lands lie in Asia and Africa. Soil erosion takes place due to normal erosion by natural process and accelerated erosion by overgrazing, deforestation and mining.
- Two types of agents cause soil erosion. The first one is climatic agent (water and wind) and the other is biotic agent (overgrazing by 35% damage to soil, mining and deforestation by 30% and unscientific modern farming practices by 28%)

### **Desertification**

- The croplands are converted into desert like land. The desertification may be moderate (10-25% drop in productivity), sever (215-50% drop) and very severe (more than 50% drop).
- The causes for desertification are overgrazing, disforestation, surface mining, quarrying , unscientific farming, overcultivation, low rainfall, more drought and global warming.

### • WATER RESOURCES

- Water is an elixir of life. It is a renewable and indispensable natural resource. The volume of water on the earth is 1.4 billion cu km of which 93% is sea water, 4.1% is fresh water on land, 0.2% is glaciers and 0.0001% is humidity of air. The amount of underground water is 8 million cu.km.
- Totally 97% of earth's surface is filled with water. If earth is flat, it will be two feet under water. About 1% of water is needed by man. About 60-65% of water is present in the body of animals and plants. Of the total rainfall, 77% of rain falls on the sea and 23% on land. About 84% of water vapour rise from sea surface whereas 16% from land.

### Uses

- Water is used by man for almost all developmental activities such as drinking, irrigation, washing, transportation, waste disposal in the industries and coolant for the thermal power plants.
- It is the water which shapes the earth's surface and regulates the climate. 70% of water is used for agriculture in the whole world (93% in India and 4% in Kuwait) and 25% of water for industries (70% in Europe and 5% in less developed countries). The per capita use of water in a family of 4 members in the USA is 1000 m<sup>3</sup> per year, many time more than in the developing countries.

### Abuses

- Man overexploits surface water due to overpopulation. Hence, drought condition prevails. 41% (2.4 billion) of people in the world live under drought condition with very less amount of water. It will increase to 48% (3.5 billion) in 2025 and 9 billion in 2050.
- The withdrawal of ground water is more than its recharge level. So, the sediments in aquifer get compacted and sinking of overlying land surface leads to damage in buildings, fracture in pipes, reversing the flow of sewer canals and tidal flowing takes place. The lowering of water table and intrusion of sea water take place due to mining of ground water.
- If irrigation is done with brackish water, it raises the water table in the ground leading to water-logging and salinity problems. So, agricultural operations will suffer. The surface water is largely used for irrigation (93% in India) , industrial use, public water supply, navigation, hydroelectric generation and thermal power generation.
- The ground water resources in India is estimated at 395.6 billion cubic meters. But we use only 10% of this water. The total requirement of water in India in 2050 would be 1,422 billion cubic meters.