

Quadrant I– Notes

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Unit: Natural resources

Module Name: Introduction-Resource cycle

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RESOURCE:

A resource is a means for satisfying human and social requirement in a given space and time. Materials from the Earth that humans use and that are used to support life and meet people's needs.

Natural resource:

Nature is the regular source of variety of substances required to meet our basic needs of everyday life. Any material which can be transformed in a way that it become more valuable and useful is termed natural resource. Thus it is possible to obtain a valuable item from a particular resource provided that appropriate technology is available. Thus air, water, soil (land), plants, animals (wildlife) and microorganisms ie. Biodiversity are the natural resources. Soil is the source of all minerals. Plants including forests and animals (wildlife) provide us directly or indirectly practically everything what we need for daily use. The energy sources-coal and petroleum are also of biological origin. These become deposited in earth's crust. Based on their utility, natural resource can be classified as source of food, raw materials, energy etc. Based on their origin, they are classified as biotic (organic) or abiotic (inorganic) resources. Biotic resources obtained from any component of biodiversity include forest and forest products, crops, birds, animals, fish and other marine life forms. Abiotic resources include air, land, water and minerals etc. Based on their quantity in nature and extent of continuous availability, natural resources are classified into two categories: inexhaustible and exhaustible resources. Inexhaustible resources occur in abundance and are not likely to be exhausted soon by human use and thus would last for fairly a longer period. These include air (wind), water (precipitation or rainfall), sun (radiant energy). Exhaustible resources occur in limited amount in nature and therefore, likely to become

exhausted one day due to continuous use. These include minerals, fossil fuels, forests and wildlife, water (ground water).

These exhaustible resources are of following two types: renewable and non-renewable resources.

Renewable resources: Although exhaustible, these can be renewed (regenerated) simultaneously along with their exploitation, and hence always available for use for longer periods. They can also maintain themselves by natural recycling or reproduction or can be replenished if managed wisely. They include forests, crop, domestic animals, wildlife, groundwater etc.

Non-renewable resources: These cannot be recycled or replenished and hence , they get exhausted due to unlimited continuous use. They include metallic mineral ores, coal, petroleum etc. Once they are used in unlimited way they cannot be replaced easily.

Increasing pressure on natural resources

With expanding human population and technological development, man started utilizing natural resources at a much larger scale. Increase in demand for resources has created a situation where the non-renewable resource may come to an end after sometime.

Considering this concern, there must be some sort of balance between the population growth and utilization of natural resources. The non-availability of resources has adversely affected the world economy. Overutilization of resources had led to draught like conditions, while in other areas there are problems of waterlogging. The rate of population growth in India has been highest in the last decade. The overexpanding population has caused depletion of all natural resources-soil, water, forests, wildlife and energy. Natural resource cycles explain a constant interaction between the biotic and abiotic components of the biosphere. Natural resource cycles are a dynamic phenomenon that helps to maintain the stability in the ecosystem.

The significant natural cycles are –

Carbon Cycle, Nitrogen Cycle, Water Cycle, Phosphorus Cycle, Sulphur Cycle

Carbon cycle

Plants absorb the carbon dioxide from the atmosphere and transform it into sugars in a process called the photosynthesis. These are later eaten by animals or insects that use it for their own needs. Those animals reinject carbon dioxide into the atmosphere by breathing or when they die it is being returned to the soil by the decomposition process.

Nitrogen cycle

One of the most important cycles, as it represents the majority of elements in the atmosphere. Nitrogen is used by living organisms to produce organic molecules like amino acids, proteins or nucleic acids. Plants receive nitrogen from soil as an inorganic nitrate. Animals receive the required amount of nitrogen they need for metabolism, growth and reproduction consuming living or dead organisms containing the composed nitrogen

molecules. Nitrogen is being then implemented into soil from where it is being carried out by different bacteria and other organisms and reintroduced into the atmosphere.

Water cycle/ Hydrologic cycle:

The water cycle shows the continuous movement of water within the Earth and atmosphere. It is a complex system that includes many different processes. Liquid water evaporates into water vapor, condenses to form clouds, and precipitates back to earth in the form of rain and snow. Water in different phases moves through the atmosphere (transportation). Liquid water flows across land (runoff), into the ground (infiltration and percolation), and through the ground (groundwater). Groundwater moves into plants (plant uptake) and evaporates from plants into the atmosphere (transpiration). Solid ice and snow can turn directly into gas (sublimation). The opposite can also take place when water vapor becomes solid (deposition).

Phosphorus cycle:

The phosphorus cycle is the biogeochemical cycle that describes the movement of phosphorus through the lithosphere, hydrosphere, and biosphere. Initially, phosphate weathers from rocks. The small losses caused by leaching through the action of rain are balanced in the gains from weathering rocks. In soil, phosphate is absorbed on clay surfaces and organic matter particles and becomes incorporated (immobilized). Plants dissolve ionized forms of phosphate. Herbivores obtain phosphorus by eating plants, and carnivores by eating herbivores. Herbivores and carnivores excrete phosphorus as a waste product in urine and feces. Phosphorus is released back to the soil when plants or animal matter decomposes and the cycle repeats.

Sulphur cycle:

When sulphur is released from the rock and comes in contact with air, it is converted into sulfate (SO_4), which is taken up by plants and microorganisms and converted into organic forms. Animals acquire these organic forms of sulfur from their foods. When organisms die and decompose, some of the sulfur enters the tissues of microorganisms and some is released again as sulfate. Additional sulphur enters the ocean through fallout from the atmosphere. Once in the ocean, some of the sulphur cycles through marine communities as it moves through food chains, some re enters the atmosphere, and some is lost to the ocean depths as it combines with iron to form ferrous sulfide (FeS). Sulphur re enters the atmosphere naturally in three major ways: Sea spray (aerosol particles) releases large amounts of the element from the ocean into the atmosphere.

Anaerobic respiration by sulfate-reducing bacteria causes the release of hydrogen sulfide (H_2S) gas especially from marshes, tidal flats, and similar environments in which anaerobic microorganisms thrive. Volcanic activity releases additional but much smaller amounts of sulfur gas into the atmosphere