

## Environmental Resource Management

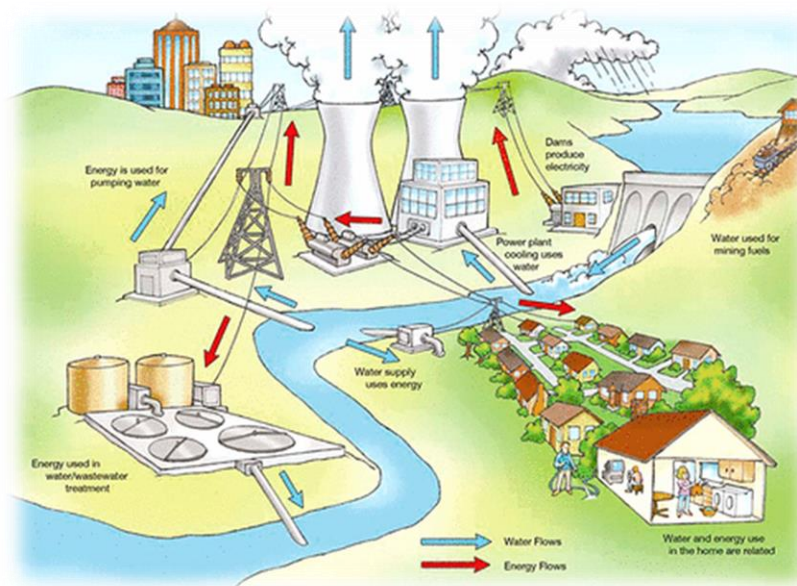
### Earth's Hydrospheric Natural Resources

Hydrosphere is the sphere of water. It encompasses the global water resources and its distribution over the land, atmosphere, and oceans. The water resources of the globe include, the major oceans and seas, glaciers and ice on mountains and polar regions,. Rivers and streams with their running water Lakes, ponds and reservoirs Groundwater and soil moisture and the water vapour.

The major part of the global water is saline and is present in the oceans. Fresh water is very limited and is found in rivers and in lakes. The surface water resources are mainly used for-

- Drinking and sanitation
- Agriculture and irrigation
- domestic consumption
- industrial processes
- power generation
- water transport.

Groundwater resources are mainly used for drinking, domestic consumption and industrial applications when the surface water is limited.



Water plays many complex roles in human activities and natural systems. Freshwater is one of the most essential of the elements that support human life and economic growth and development. It is irreplaceable for the purposes of drinking, hygiene, food

production, fisheries, industry, hydropower generation, navigation, recreation and many other activities. Water is equally critical for the healthy functioning of nature, upon which human society is built. The reality is that 97.5 per cent of all water on Earth is salt water, leaving only 2.5 per cent as freshwater. Nearly 70 per cent of that freshwater is frozen in the ice caps of Antarctica and Greenland, and most of the remainder is present as soil moisture, or lies in deep underground aquifers as groundwater not accessible to human use. Much of the approximately 110,000 cubic kilometres of precipitation that fall on the continents each year evaporates back into the atmosphere, or is absorbed by plants. About 42,700 cubic kilometres of the water that falls on Earth flows through the world's rivers. Freshwater resources are very unevenly distributed: at one extreme are the deserts, where almost no rain falls, and at the other are the most humid regions, which can receive several metres of rainfall a year.

The oceans and seas are the storehouses of many naturally depositing substances and marine life. The ocean is the earth's water reservoir. Oceans are the heat regulators, absorbing more heat from the atmosphere than land. Oceans play an important role in determining the climate of an area. The ocean provide many things to human population and other life. It is far more than a place for swimming, sailing and other recreation. The ocean serves as a source of food, energy, and minerals. Ships use the ocean to carry cargo between continents. Above all, the global climate is regulated by the oceans. If there were no oceans, life could not have been in existence on the planet earth. Every natural element can be found in the waters of the ocean. But the ocean is especially known for its salts. Sea water contains about 35000 mg/L of salts. Six elements account for 99 per cent of the ocean's salinity (saltiness). They are, in order of amount, chlorine, sodium, sulphur (as sulphate), magnesium, calcium, and potassium. Most of the salty material in the sea consists of the compound sodium chloride, or ordinary table salt.

Oceans have enormous amounts of other resources. They include:

- (1) food,
- (2) energy,
- (3) minerals, and
- (4) medicines.

A good amount of life thrives in the oceans. An incredible variety of living things reside within the ocean. Marine life ranges in size from microscopic one-celled organisms to the blue whale, which may measure up to 30 metres long. Ocean plants and fishes and other sea animals are the major resources. Oceans contains many natural mineral substances like manganese nodules, oolites and oozes. Under the freshwater resources, rivers, reservoirs and lakes are of primary importance.

The presence of large lakes in a region greatly influences the lives of the people living nearby. Lakes affect weather conditions over a large area. In summer, a lake never gets as warm as the land that surrounds it. As a result, breezes blowing over the water are cooled. In winter, a lake does not cool off as fast as the surrounding land, and may cause the climate to be warmer. These water bodies are good ecosystems and habitat for many life. Irrigation, water supply and recreation are the major applications of these natural resources. Rivers have been important to transportation and trade for many centuries. They also serve as an important energy source. Today, hydroelectricity meets about a quarter of the world's electric power needs. Groundwater is another natural resource mainly derived from the rainfall that percolates into the subsoil. It forms the largest source of freshwater available over the globe. Groundwater is not uniformly distributed throughout the earth's outer layer. Ground water is the source of water for wells and many springs. Bore wells are drilled down to aquifers to draw ground water to the surface. The unique features of groundwater is that it is available everywhere. Though it is less than 1% over globe, it caters to the catering to the needs of 60 % of world's population. Hydrosphere is the major sphere supporting life through its natural resources.

### Earth's Biospheric Natural resources

The biosphere is made up of all that is living on earth, from the smallest bacterium to the largest whale. It includes between 3 and 30 million species of plants, animals, and fungi, bacteria, and protozoans. The biosphere extends over the Earth's surface in a thin layer from a few kilometers into the atmosphere, in very cold environments, to the deep-sea vents of the ocean depths, in very hot environments.

The biosphere is a life-supporting global ecosystem, where each living being depends on each other and the environment. The ecosystem includes all living organisms and the abiotic or nonliving environment on which they depend for their energy and the nutrients they need to live.

The natural resources of the biosphere includes

- The Forests
- The Animal wealth and
- The human resources.

In addition to these, the raw materials and produces from the activities like agriculture, mariculture, silviculture and aquaculture generate a huge amount of food and other resources which govern the life and economy of a country. Forests and forest products are plenty of natural resources for our use. Forest are the gift of nature for human and

animal life. They are the native homes and parks for wildlife and sanctuaries for birds. The primary and secondary resources of forests have helped the population to sustain for several centuries. Forests have a variety of uses to humans, including wood from trees, nutrition from animals, for grazing, recreation, medicinal and so on.



Timber and non-timber forest products are essential materials for human use. Forests are air purifiers. The complex ecological relationships involving forests could allow humans to benefit from them in a variety of ways. Biomass, productivity of forests and the biodiversity are the ultimate strengths of the biosphere. Herbal medicines, animal extracts and food items are the benefits of these resources. All population thrives on the biospheric reserves and resources. Farmers, Foresters and fishermen are the major stakeholders of many biospheric reserves. Earth is the living planet containing a lot of terrestrial, freshwater and marine species. Energy and biomass are the major factors in the biosphere. The natural resources of the biosphere includes all species and populations of the plant and animal kingdom. 7 Biogenic chemicals, plant and animal extracts, herbs, fruits, nuts and roots of plants are used in varieties of ways for human needs. Though their availability is very limited, but their usage is very essential. Seeds and husks, ivory from elephants, feathers of birds are valuable resources for human use.

The natural resources of the Earth are not uniformly distributed. The availability and purpose of usage are also varied. Some are essential, strategic and critical substances. Some are rare items and precious commodities. Many of these may be renewable and non-renewable resources. The non-renewable resources are to be properly conserved by the human beings. Conservation and management of natural resources in the environment needs adequate planning and analysis.

## The Concept of Carrying Capacity

The population size of most organisms is usually controlled by the availability of a few key resources that limit its ability to survive and reproduce. When resources are abundant, the population of the species grow without damage. When population grows, the demand supersedes the supply. If the resources are over-consumed, the population of the species will experience a decline census and resource crunch. The scarcity of resources leads to starvation and death. The population size of most species reaches a steady state equilibrium that is defined by the availability of the limiting resources in its habitat. This equilibrium is also called the carrying capacity. Human populations are also influenced by a habitat's carrying capacity. Earth's natural resources are of several kinds like land resources, soil resources, water resources, forest resources, marine resources, mineral resources, animals and human resources. These are in addition to the Solar radiation and atmospheric wind.



The carrying capacity of an environment is the maximum population size of a biological species that can be sustained by that specific environment, given the food, habitat, water, and other resources available. The carrying capacity is defined as the environment's maximal load, which in population ecology corresponds to the population equilibrium, when the number of deaths in a population equals the number of births (as well as immigration and emigration). The effect of carrying capacity on population dynamics is modelled with a logistic function. Carrying capacity is applied to the maximum population an environment can support in ecology, agriculture and fisheries. The term carrying capacity has been applied to a few different processes in the past before finally

being applied to population limits in the 1950s. The notion of carrying capacity for humans is covered by the notion of sustainable population.

At the global scale, scientific data indicates that humans are living beyond the carrying capacity of planet Earth and that this cannot continue indefinitely. This scientific evidence comes from many sources. It was presented in detail in the Millennium Ecosystem Assessment of 2005, a collaborative effort involving more than 1,360 experts worldwide. More recent, detailed accounts are provided by ecological footprint accounting, and interdisciplinary research on planetary boundaries to safe human use of the biosphere. The Sixth Assessment Report on Climate Change from the IPCC and the First Assessment Report on Biodiversity and Ecosystem Services by the IPBES, large international summaries of the state of scientific knowledge regarding climate disruption and biodiversity loss, also support this view.

An early detailed examination of global limits was published in the 1972 book *Limits to Growth*, which has prompted follow-up commentary and analysis. A 2012 review in *Nature* by 22 international researchers expressed concerns that the Earth may be "approaching a state shift" in which the biosphere may become less hospitable to human life and in which human carrying capacity may diminish.[8] This concern that humanity may be passing beyond "tipping points" for safe use of the biosphere has increased in subsequent years. Recent estimates of Earth's carrying capacity run between two billion and four billion people, depending on how optimistic researchers are about international cooperation to solve collective action problems. These estimates affirm that the more people we seek to sustain, the more modest their average standard of living needs to be.