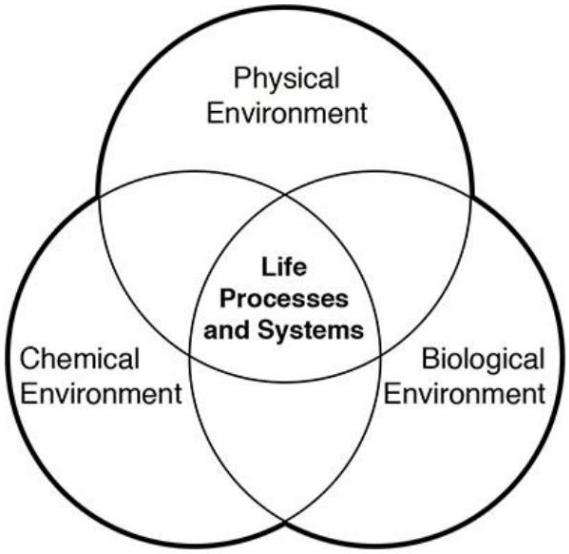
INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES

Environment

The complex of physical, chemical, and biotic factors (as climate, soil, and living things) that act upon an organism or an ecological community and ultimately determine its form and survival. The aggregate of social and cultural conditions that influence the life of an individual or community.



Biotic and Abiotic Components of Environment

Natural environment includes all the living and non-living components occurring naturally on Earth. The biological components of the ecosystem that is the biotic components interact with the physical entities (abiotic components). The scientific study of the interaction of biotic community with each other and with abiotic components is known as Ecology.

Abiotic Components

The abiotic components are also known as the abiotic factors. The abiotic factors in ecology consist of the non-living and physical factors of the environment. Non-living components like pH value, solids, water, intensity of light as energy source, temperature of the atmosphere, humidity, physical factors of land like altitude, gradient and region and microclimate. The abiotic components have a strong influence on the distribution, behavior, relationship and structure of the living organisms.

Biotic Components

Biotic components are the living factors of the ecosystem. A biotic factor is any living component that includes a number of interrelated populations of different species in a common environment. A biotic factor can be any organism that affects any other organism including animals that consume other organism and food the organism consumes. Biotic factors in an environment require food and energy to survive. Based on the role of the biotic components in the ecosystem they are categorized into three main categories.

Producers - These are organisms that synthesize organic substances. Example: Plants.

Consumers - These are organisms that feed on other organisms. Consumers are of three trophic levels depending on the level and category of their food; they are primary consumer, secondary and tertiary consumers.

Decomposers - These are saprophytes - microorganisms that feed on dead and decayed waste matter. Example: Bacteria and fungi.

Forest Resources.

The word ‘forest’ is derived from the Latin word ‘foris’ means ‘outside’ (may be the reference was to a village boundary or fence separating the village and the forest land).

A forest is a natural, self-sustaining community characterized by vertical structure created by presence of trees. Trees are large, generally single-stemmed, woody plants. Forest can exist in many different regions under a wide range of conditions, but all true forests share these physical characteristics. Because a forest is a natural community, no forest is static in time. That is, because forest communities respond to outside influences, most forests are in a state of constant flux. Depending upon the systems within which forest communities exist, such factors might include rainfall, fire, wind, glaciations, seismic activity, flooding, animal activity, insulation, and so on.

At any time, a forest is a collection of past responses to outside influences and internal competitive interactions. Therefore, the present status of any forest, indeed of any natural community, reflects what has gone on before. Forests are of great significance both ecologically and economically. Forests provide a suitable habitat for animals and birds, protect soil from erosion and also provide a number of major and minor products which serve many purposes e.g., timber and firewood etc

Kinds of Forests:

Kenyan forests are biologically rich and harbour high concentrations of endemic species. Forests contain lowland rainforest in western Kenya, and montane forest in the central and western highlands and on higher hills and mountains. Forest classification done by describing dominant species and environmental features of different forest types summarises these forests in six main blocks: the volcanic mountains, the western plateau, the northern mountains, the coastal forests, the southern hills and the riverine forests. Since Kenyan forests are influenced by the farming and herding practices of the local inhabitants, many Kenyan forests are cultural rather than natural entities. However, they still support a forest cover of solely or mainly indigenous species. This is also why most forests are highly fragmented and under pressure - lowland forests are the first forests to be cleared for agriculture and present population pressure is making the forests more and more fragmented and degraded. As a result of wide variety of soil, climatic conditions and relief, various kinds of forests are found in Kenya.

Tropical Evergreen or Rain Forests:

These forests usually occur in areas where both temperature and rainfall is quite high. The high rainfall enables growth of trees throughout the year. Trees grow to a height of 60 meters. Usually there is dense tree growth with large number of species of hardwood forests.

Tropical Deciduous Forests:

These are known as monsoon forests because they form a natural cover in most parts of the country, particularly between the regions of 200 and 75 centimetres of rainfall. These forests are called deciduous because they shed leaves for about six to eight weeks in summer. These forests need a lot of care as they are less resistant to fire.

The Thorn and Scrub Forests:

These forests occur in areas which have less than 75 cm rainfall annually. They are found scattered in the dry areas like Turkana, Naivasha and Kitui towns in Kenya.

Tidal Forests:

These types of forests are common in areas along the coasts and rivers which are affected by tides. They can survive both in fresh and salt water. The best examples of such forests are found in Mombasa and Kisumu towns where Mangroves and pine trees thrive.

Economic Value:

Forests are a source of great wealth. Out of total forest cover, 70% is of economic importance. The total income from forestry is estimated at 1.5% of national income. Scientific management of forests, controlled felling of trees and replanting of cleared areas will increase forest yield, provide limber, bamboo and other products which we need. Forest based industries such as paper and synthetic fibers would be able to get adequate raw materials.

Use and Over Exploitation: A forest is a biotic community predominantly of trees, shrubs and other woody vegetation, usually with a closed canopy. This invaluable renewable natural resource is beneficial to man in many ways.

The direct benefits from forests are:

(a) Fuel Wood:

Wood is used as a source of energy for cooking purpose and for keeping warm.

(b) Timber:

Wood is used for making furniture, tool-handles, railway sleepers, matches, ploughs, bridges, boats etc.

(c) Bamboos:

These are used for matting, flooring, baskets, ropes, rafts, cots etc.

(d) Food:

Fruits, leaves, roots and tubers of plants and meat of forest animals form the food of forest tribes.

(e) Shelter:

Mosses, ferns, insects, birds, reptiles, mammals and micro-organisms are provided shelter by forests.

(f) Paper:

Wood and Bamboo pulp are used for manufacturing paper (Newsprint, stationery, packing paper, sanitary paper)

(g) Rayon:

Bamboo and wood are used in the manufacture of rayon (yarns, artificial silk-fibers)

(h) Forest Products:

Tannins, gums, drugs, spices, insecticides, waxes, honey, horns, musk, ivory, hides etc. are all provided by the flora and fauna of forests.

The indirect benefits from forests are:

(a) Conservation of Soil:

Forests prevent soil erosion by binding the soil with the network of roots of the different plants and reduce the velocity of wind and rain — which are the chief agents causing erosion.

(b) Soil-improvement:

The fertility of the soil increases due to the humus which is formed by the decay of forest litter.

(c) Reduction of Atmospheric Pollution:

By using up carbon dioxide and giving off oxygen during the process of photosynthesis, forests reduce pollution and purify the environment.

(d) Control of Climate:

Transpiration of plants increases the atmospheric humidity which affects rainfall and cools the atmosphere.

(e) Control of Water flow:

In the forests, the thick layer of humus acts like a big sponge and soaks rain water preventing run-off, thereby preventing flash-floods. Humus prevents quick evaporation of water, thereby ensuring a perennial supply of water to streams, springs and wells.

Human Interactions with Forests:

Human are indisputably a part of most forests. With the exception of extremely inaccessible forestlands, all forests present on Earth today have been influenced by human being for tens of thousands of years. In many cases, forest communities have never been without the influence of human activities.

Because of the widespread nature of human, activity in forests, it is tempting to think of human endeavour as one more outside factor influencing forest development. This approach is misleading, however, since it denies the role of self- awareness in human activity. Because human beings can understand cause and effect, and because we have amassed an increasingly deep body of knowledge about forest processes over the past ten millennia, human influences simply cannot be likened to the blind forces of nature. Since pre-history, human beings have realized benefits from forested lands in the form of spiritual values, medicines, shelter, food, materials, fuel and more. Often, humans have sought to manipulate natural processes so as to compel forest systems to produce more of the goods and services desired by people. At times, human management has become as intensive as to become the primary set of factors under which the forest system operates.

Such systems move towards the near total human control found in agricultural systems and cannot be thought of as forests in any natural sense, although they may continue to resemble forests superficially.

Deforestation:

Deforestation is the permanent destruction of indigenous forests and woodlands. The term does not include the removal of industrial forests such as plantations of gums or pines. Deforestation has resulted in the reduction of indigenous forests to four-fifths of their pre-agricultural area. Indigenous forests now cover 21% of the earth's land surface. The World Resources Institute regards deforestation as one of the world's most pressing land-use problems. The difference between forests and woodlands is that whereas in a forest the crowns of individual trees touch to form a single canopy, in woodland, trees STOW far apart, so that the canopy is open. Of great concern is the rate at which deforestation is occurring. Almost all of this deforestation occurs in the moist forests and open woodlands of the tropics. At this rate all moist tropical forest could be lost by the year 2050, except for isolated areas in -Amazonia, the Zaire basin, as well as a few protected areas within reserves and parks. Some countries such as Ivory Coast, Nigeria, Costa Rica, and Sri Lanka are likely to lose all their tropical forests by the year 2030 if no conservation steps are taken. The destruction of forests due to unscrupulous and indiscriminate felling of trees has lead to an overall deterioration of our environment and is posing a serious threat to the quality of "life in future.

Causes of Deforestation:

Population Explosion:

Population explosion poses a grave threat to the environment. Vast areas of forest land are cleared of trees to reclaim land for human settlements (factories, agriculture, housing, roads, railway tracks etc.) growth of population increases the demand for forest products like timber, firewood, paper and other valuable products of industrial importance, all necessitating felling of trees.

Forest Fires:

Fires in the forests may be due to natural calamities or human activities:

(a) Smouldering of the humus and organic matter forming a thick cover over the forest floor (i.e. ground fires).

(b) Dried twigs and leaves may catch fire (i.e. surface fires).

(c) In densely populated forests, tree tops may catch fire by heat produced by constant rubbing against each other (i.e. crown fires).
(d) Human activities like clearing forest for habitation, agriculture, firewood, making charcoal, construction
of roads, railway tracks and carelessness (throwing burning cigarette stubbs on dried foliage).
Fire destroys fully grown trees, results in killing and scorching of the seeds, humus, ground flora and animal life.

(3) Grazing Animals:

Trampling of the forest soil in the course of overgrazing by livestock has four reaching effects such as loss of porosity of soil, soil erosion and desertification of the previously fertile forest area.

(4) Pest Attack:

Forest pests like insects etc. destroy trees by eating up the leaves, boring into shoots and by spreading diseases.

(5) Natural Forces:

Floods, storms, snow, lightening etc. are the natural forces which damage forests.

Effects of Deforestation:

Forests are closely related with climatic change, biological diversity, wild animals, crops, medicinal plants etc.

Large scale deforestation has many far-reaching consequences:

(a) Habitat destruction of wild animals (tree-using animals are deprived of food and shelter.)
(b) Increased soil erosion due to reduction of vegetation cover.
(c) Reduction in the oxygen liberated by plants through photosynthesis.
(d) Increase in pollution due to burning of wood and due to reduction in Carbon-dioxide fixation by plants.
(e) Decrease in availability of forest products.
(f) Loss of cultural diversity
(g) Loss of Biodiversity
(h) Scarcity of fuel wood and deterioration in economy and quality of life of people residing near forests.
(i) Lowering of the water table due to more run-off and thereby increased use of the underground water increases the frequency of droughts.

(j) Rise in Carbon dioxide level has resulted in increased thermal level of earth which in turn results in melting of ice caps and glaciers and consequent flooding of coastal areas.

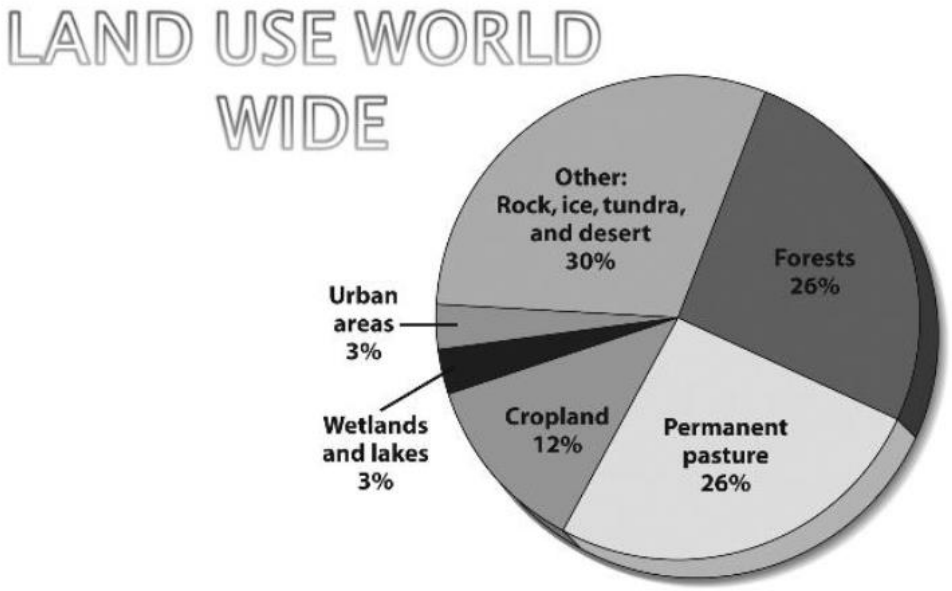
LAND RESOURCES

Land ecosystems cover nearly 30% of the Earth's surface. The land surface changes over days, seasons, decades, and longer. Vegetation boundaries shift, cities grow, rain forests and farm lands shrink, amounts of trace chemicals in the air increase and decrease, rivers flood, forests burn, and volcanoes erupt. Activities of the growing human population cause or influence many of these changes.

Resources that are obtained from the land are called land resources. Almost every man-made product is composed of products of land resources. Land is the most important resource existing. It is the major source of important energy resources like fossil fuels. Agriculture is not possible without land resources. Land also harbours all crucial minerals.

LAND USE WORLD WIDE

The use of land worldwide can be represented as;



Use of land resources

FOREST:

Role in Hydrologic Cycle

Food source

Commercial use

Soil conservation

Pollution moderator

Wildlife habitat

O 2 producer

CO 2 sink

References:

1. Whittaker, R.H., and E. Likens. 1975. The Biosphere and Man. In Primary Productivity of the Biosphere, Ecological Studies No. 14, ed. H. Lieth and R. H. Whittaker, 306, Table 15-1. Berlin: Springer-Verlag.

2. Atjay, G.L., P. Ketner, and P. Duvigneaud. 1979. Terrestrial primary production and phytomass. In The Global Carbon Cycle, ed. B. Bolin et al.129–181. Chichester: John Wiley & Sons.

3. Olson, J.S., J.A. Watts, and L. J. Allison. 1983. Carbon in Live Vegetation of Major World Ecosystems. Report ORNL-5862. Tennessee: Oak Ridge National Laboratory

4. Ohnaka, M. (2013). The Physics of Rock Failure and Earthquakes. Cambridge University Press. p. 148. ISBN 978-1-107-35533-0.

5. Vassiliou, Marius; Kanamori, Hiroo (1982). "The Energy Release in Earthquakes". Bull. Seismol. Soc. Am. 72: 371–387.

6. "What are Aftershocks, Foreshocks, and Earthquake Clusters?". Archived from the original on 2009-05-11.