

Credit III

Geography as the Study of Environment

Study of the environment occupies a very important place in the subject of geography. The concept of geography as the study of man and environment relationship is quite old. The Greek, Roman, Indian, Chinese and Arab geographers attempted to establish a relationship between man and natural environment. Kant, in the concluding part of the 18th century, advocated the impact of environment on the lifestyle and physical constitution and lifestyle of the equatorial, hot deserts, Mediterranean, coastal and mountainous regions.

Humboldt asserted that the mode of life of the inhabitants of the mountainous countries of the Andes mountains differ from that of the people of Amazon basin, coastal plains and islands like Cuba and West Indies. Ritter attempted to establish the cause variations in the physical constitution of body, physique and health of people living in the different physical environmental conditions. The idea of defining geography in terms of man and environment relationship developed on scientific lines in the later part of the 19th century after the publication of Origin of Species (1859) by Charles Darwin.

The main theme of geographical study one way or the other is environmental study. No other discipline can boast of a richer heritage of the study of environment than geography. The close association of environment with geography since the hay-day of determinism, geographers were always concerned with environment and it remained a basic element in most of the approaches. Geography as the study of environment may be defined as inter-relationship between living organisms and natural environment in general and between technologically advanced man and his natural environment, which is operated in temporal and spatial framework. So environmental geography studies the characteristics, composition and functions of different components of natural environmental systems and mutual dependence including man and other biological organisms.

Geography studies the spatial attributes of all the phenomena including man in a given space and highlights complex man-environment relationships at different stages and phases in a time-space continuum while other sciences study individual phenomenon and do not bother for spatial organization. Being an integrating science geography synthesizes all the

elements and components of planet earth into one body and links the social sciences with the natural sciences. Geographers besides identifying complex relationships between man and physical environment have the capability of locating the distribution of such relationships in space, mapping them and exploring the causes of variations in distribution. They recognize and identify the environmental regions, locate them in space and present them on maps.

Questions:

1. Explain geography as the study of environment.
2. Discuss the association of environment with geography.

Ecology- Scope and Significance

Ecology is the study of the relationships among organisms and with their surroundings. These surroundings are called the environment of the organism.

The term ecology was first coined and used by German biologist Earnest Heckel in 1869. The term oekologie has been derived from two Greek words oikos meaning house/dwelling or habitat and logos meaning study of. Thus according to Heckel ecology means the science of laws and rules of the management of the organic world.

Heckel also defined the subject of ecology as the science which studies relationships of organisms with their exterior world.

E.P Odum pleaded that biotic and abiotic components of environment are not only related in a reciprocal manner but also function in an orderly manner as a definite system. Therefore he defined ecology as a study of structure and functions of ecosystem or the study of the functions of nature.

In a simple term ecology may be defined as that science which studies, interrelationships between abiotic and biotic components of the biosphere ecosystem on one hand, and among biotic components on the other hand. Generally ecology is divided into autecology and synecology wherein autecology is concerned with the study of ecological relations of

individual species in a given ecosystem whereas synecology is the study of plant communities in relation to their habitats of the given ecosystem.

Scope of Ecology:-

Earlier ecology was considered to be a branch of biology that deals with the relation of organisms or group of organisms to their environment. Later on, it was realised that ecology is not only concerned with the organisms, plants and animals but also with the energy flows and material cycles on the lands, in the oceans, in the air and in fresh waters. So keeping with modern emphasis, ecology is defined as the study of structural unite and function of nature.

The study of ecology starts with the understanding of the interaction of various biological units with their environment for the production of a series of living systems, i.e. Ecosystems. Ecosystems are classified on the basis of type and level of gross energy flow. Now comes the understanding of the flows of energy and exchange of materials between ecosystems. Then movement of materials back and forth between organisms and environment is taken up. This movement of materials is known as Bio-geochemical cycles.

The population ecology studies the interaction of organisms with organisms in the maintenance of community structure and function. Here focus is on the role of great physical and chemical forces in the nature.

The most important object of ecology is the study and maintainence of ecological balance and role of man in the degradation of th environment and to suggest remedies for minimising the effects of population explosion, killing of animals and many other problems.

Significance:-

The study of ecology is of paramount importance because:

Environmental Conservation: By studying ecology, emphasis is put on how each species needs the other for peaceful coexistence. Lack of understanding ecology has led to degradation of land and environment which is home to other species thus leading to because extinction and endangerment of species of lack of knowledge e.g. dinosaurs, mammoth, white shark, black rhinos, sperm whales etc.

Resource Allocation: All the plants and animals need to share limited natural resources such as air, minerals, space and environment. Lack of ecological know-how has led to deprivation and looting of these natural resources leading to scarcity as well as exploitation and competition.

Energy Conservation: All species require energy whether light, radiation, nutrition etc. Poor understanding of ecology is seeing the destruction of the energy resources e.g. non-renewable sources like oil, coal, natural gas and also pollution and destruction of the ozone layer.

Eco Friendliness: Ecology helps to appreciate harmonious living among the species; this will ensure natural order of things is followed.

Questions:

1. Discuss Ecology in detail.
2. In the present day scenario discuss the significance and scope of ecology.

Concept and Broad Types of Ecosystem

Ecosystem is a structural and functional unit of biosphere consisting of community of living beings and the physical environment, both interacting and exchanging materials between them. The term 'ecosystem' was introduced by Tansley in 1935. An ecosystem can be temporary or permanent, natural or man-made, small or large. Ecosystems are so varied in form and stature that whatever has a distinct community of its own, would be an ecosystem, e.g. pond, lake, river, village garden, park, a forest, a grassland, etc.

The two major components of ecosystem are:-

- The biotic components comprising all living organisms, and
- The abiotic components including the physical (non-living) environment.

Broad types of ecosystem

The biosphere is the biggest ecosystem which combines all the ecosystems of the world. But with the difference in physiography, climate, natural vegetation, soil and water bodies, separate ecosystems have been developed. There are essentially two kinds of ecosystems; Aquatic and Terrestrial. Any other sub-ecosystem falls under one of these two headings.

Terrestrial Ecosystems

Terrestrial ecosystems can be found anywhere apart from heavily saturated places. They are broadly classed into:

The Forest Ecosystems

They are the ecosystems in which an abundance of flora, or plants, is seen so they have a big number of organisms which live in relatively small space. Therefore, in forest ecosystems the density of living organisms is quite high. A small change in this ecosystem could affect the whole balance, effectively bringing down the whole ecosystem. A fantastic diversity is found in the fauna of this ecosystem. About 30 percent of the land area of the earth is under forest cover, but due to man's intervention this area is gradually becoming smaller. They are further divided into; Tropical evergreen forest, Tropical deciduous forest, Temperate evergreen forest, Temperate deciduous forest and Taiga.

The Desert Ecosystem

Desert ecosystems are located in regions that receive an annual rainfall less than 25. They occupy about 17 percent of all the land on our planet. Due to the extremely high temperature, low water availability and intense sunlight, fauna and flora are scarce and poorly developed. The vegetation is mainly shrubs, bushes, few grasses and rare trees. The stems and leaves of the plants are modified in order to conserve water as much as possible. The best known desert ones are the succulents such as the spiny leaved cacti. The animal organisms include insects, birds, camels, reptiles all of which are adapted to the desert conditions.

The Grassland Ecosystem

Grasslands occupy about 19 percent of the earth's area. Grasslands are located in both the tropical and temperate regions of the world though the ecosystems vary slightly. The area mainly comprises grasses with a little number of trees and shrubs. The main vegetation

includes grasses, plants and legumes that belong to the composite family. A lot of grazing animals, insectivores and herbivores inhabit the grasslands.

The Mountain Ecosystem

Mountain land provides a scattered and diverse array of habitats where a large number of animals and plants can be found. At the higher altitudes, the harsh environmental conditions normally prevail and only the treeless alpine vegetation can survive. The animals that live there have thick fur coats for prevention from cold and hibernation in the winter months. Lower slopes are commonly covered with coniferous forests.

Aquatic Ecosystems

The aquatic ecosystem is the ecosystem found in a body of water. It encompasses aquatic flora, fauna and water properties as well. There are two main types of aquatic ecosystem - Marine and Freshwater.

The Marine Ecosystem

Marine ecosystems are the biggest ecosystems, which cover around 71 percent of earth's surface and contain 97 percent of our planet's water. Water in marine ecosystems features in high amounts minerals and salts dissolved in them. In a marine ecosystem, the ecology of shallow and deep waters as well as estuarine part are different from each other. Each ocean also represents a very large and stable ecosystem.

The Freshwater Ecosystem

Contrary to the Marine ecosystems, the freshwater ecosystem covers only 0.8 percent of earth's surface and contains 0.009 percent of the total water. Although freshwater habitats occupy a small portion of the earth's surface, they are of great importance to man because they provide drinking water as well as water for domestic and industrial needs. The ecosystems are habitats to reptiles, amphibians and around 41 percent of the world's fish species.

Questions:

1. Define ecosystem and its broad types.
2. What is an ecosystem, name its broad types and define any one.

Biodiversity

Biodiversity or biological diversity is a term that describes the variety of living beings on earth. In short it is described as degree of variation of life. Biological diversity encompasses microorganism, plants, animals and ecosystems such as coral reefs, forests, rainforests, deserts etc.

Biodiversity also refers to the number or abundance of different species living within a particular region. It represents the wealth of biological resources available to us. It's all about the sustaining the natural area made up of community of plants, animals and other living things that is being reduced at a steady rate as we plan human activities that is being reduced by habitat destruction.

There are at present 1.8 million species known and documented by scientists in the world. However scientists have estimated that the number of species of plants and animals on earth could vary from 1.5 to 20 billion. This means that the majority of species are yet to be discovered. Most of the world's bio rich nations are in South; in other words they are the developing nations. In contrast, the majority of the countries capable of exploiting biodiversity are northern nations, in the economically developed world. These nations however have lower levels of biodiversity of global plant life, probably occur in only 18 hotspots in the world. Countries which have a relatively large proportion of these biodiversity hotspots are referred to as 'mega-diversity nations'.

Some of the countries with higher biodiversities are India, South America, such as Brazil and South-east Asian countries, such as Malaysia and Indonesia. India's globally accepted national hotspots are in the forests of the North-east and the Western Ghats, which are included in the world's most bio-rich areas. The Andaman and Nicobar islands are extremely rich in species and many subspecies of different animals and birds have evolved. Among the endemic species, i.e., those species found only in India, a large proportion are concentrated in these three areas.

Importance:

Biodiversity has a number of functions on the earth. These are as follows:

- Maintaining balance of the ecosystem: Recycling and storage of nutrients, combating pollution and stabilizing climate, protecting water resources, forming and protecting soil and maintaining eco balance.
- Provision of biological resources: Provision of medicines and pharmaceuticals, food for the human population and animals, ornamental plants, wood products, breeding stock and diversity of species, ecosystems and genes.
- Social benefits: Recreation and tourism, cultural value and education and research.

Conservation:

Biological diversity needs to be preserved; it is vital for the survival of human beings. Loss of biodiversity poses a great threat to the food security of human civilisation. Many wild varieties of plants constitute important supplies of valuable nutrients to humans. These plants are also a rich source of genetic material which can be used for the further development of domestic crops. According to the renowned tropical ecologist Norman Meyers, about 80,000 wild plant species could be useful to humans. Unfortunately, factors like overgrazing, forest clearing, conversion of natural lands to agricultural fields and expansion of human settlement in forest areas are gradually destroying our potential food resources.

In biodiversity conservation we study how human activities effected diversity of plants and animals and develop ways of protecting that diversity. Conservation ranges from protecting the population of specific species to preserving the entire ecosystem.

There are two main types of conservation:

1. **In situ or on sight conservation:** In this type of conservation we try to protect species in their natural habitat. It requires identification and protection of natural areas having high biodiversity. This includes the establishment of national parks, natural reserves, sanctuaries etc.

2. **Ex-situ conservation:** In this approach we conserve biodiversity in an artificial setting. This includes storage of seeds in banks, breeding of captive animal species in zoos and setting up of biological gardens, aquariums and research institutes. We also try to reduce the biotic stress and lastly rehabilitation of endangered species.

Questions:

1. Define Biodiversity and give its importance.
2. Why is conservation of biodiversity important.

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ECOLOGICAL IMBALANCES – Causes and Consequences

Introduction

Ecological Imbalance is the natural or human-caused disruption in the natural balance of an ecosystem. *Ecosystem* is the environment where biotic (living) things interact with abiotic (non-living) factors such as forest, grassland, coral reef, etc. The term ‘ecosystem’ was coined by a British ecologist, Sir Arthur George Tansley. He depicted natural system in “constant interchange” among their biotic and abiotic parts.

Important causes and consequences of ecological imbalance

In general, there are two factors which contribute to ecological imbalance:

- The Physical or Natural Factor
- The Human Factor

The important causes and effects of ecological imbalance are discussed below:

Soil Erosion

Soil erosion exposes bare rock surfaces to various physical and chemical weathering and biological processes which lead to physical and chemical disruption. The disintegrated soil is the basic material which in interplay with endogenic and exogenic forces cause soil erosion.

The direct consequences of different types of soil erosion are many. These are:

- I. Formation of gullies and ravines which form an undulating topography rendering the affected area unsuitable for habitation.
- II. Deforestation caused by uprooting of plants due to soil cutting.
- III. Washout of upper layer of the soil and loss of soil fertility.
- IV. Loss of pastures and desertification
- V. Increase in frequency of droughts and floods.
- VI. Landslides

Deforestation

Deforestation is a havoc wreaked by thoughtless destructive activities of development. Forest clearings have been made not only for village settlements but for cultivation, especially shifting cultivation and jhumming, and pastures as well. With increase in human population more forests get cleared. Commercial exploitation of forests is the main cause of deforestation. The total forest cover

has shrunk to 16% only compared to a time when it was 70% of the land area.

The adverse effects of Tropical Deforestation (Brazil, Indonesia, India, and Thailand) are not restricted to the region itself but it has global adverse effects.

Consequences:

- a. Micro-climatic change, increase in temperature and decrease in humidity/ rainfall.
- b. Soil erosion, loss of soil fertility, increase in sediment load of rivers and siltation of their beds.
- c. Increase in frequency of floods and landslides, loss of habitat to wild species, extinction of different species of plants and animals.
- d. Change in bio-oxygen demand (BOD) values and increase in Carbon dioxide levels on earth and its atmosphere and the resultant greenhouse effect.
- e. Ground water depletion.
- f. Recurring droughts

Volcanoes and Earthquakes

In a volcanic explosion an average 150 cubic km are ejected out of the earth's interior. This material is of three types – solid material, liquid material (*magma*) which comes out of a volcano, known as *lava* and gaseous material. Earthquakes are tremors caused by the passage of seismic / vibratory waves through the rocks.

Both volcanoes and earthquakes cause ecological imbalances due to sudden changes in the environment. During a volcanic eruption gases like chlorine, fluorine, etc are added in the surrounding environment.

Addition of volcanic steam, carbon dioxide, vapour sulphur and poisonous gases takes a heavy toll of life forms. The devastation caused by earthquakes to life and property and to the ecosystem is very high.

Consequences of volcanic eruptions

- I. Threat to animal and plant life. For example, the sweeping clouds of incandescent gases and suspended matter left only 2 people alive out of a population of 30,000 in St Pierre city (West Indies) when Mount Pele burst in 1902.
- II. Destruction of cities and built-ups, e.g., volcanic explosions of Etna & Vesuvius in Italy.
- III. Environment degradation, e.g., volcanic activity in the Andaman & Nicobar Islands.

Earthquakes:

- I. Loss of life and property
- II. Change in river course
- III. Loss of vegetation and animal life
- IV. Development of faults and fractures in earth's surface
- V. Destruction of dams
- VI. Biodiversity losses and environmental degradation

Mining

In mining operations, drilling and deep digging for extraction of minerals causes serious threats to the ecology and environment.

With growing knowledge of mineral resources, due to technological and scientific developments and the economic value of minerals, mining is carried out on large scale. This causes depletion of mineral resources. Mineral resources are the product of geological structure and their replenishment takes thousands of years.

Consequences

- I. Loss of original relief and *increase of wasteland area*. e.g, in U.S.A about 150,000 acres of land has changed into **wasteland**. In mining areas of Bihar, Orissa, Madhya Pradesh, Rajasthan there is **total destruction of land**.
- II. *More mining waste heaps* that cause ecological imbalances.
- III. Pollution due to *dust spreading and spread of diseases* among workers as well as locals.
- IV. Large scale destruction of natural vegetation and wildlife and the resultant ecological challenges.
- V. Creation of '*Ghost towns*'.

There are many more causes and consequences of ecological imbalance like Pollution, over-population, increasing industrialization, unjust utilization of natural resources, etc. A discussion of these needs a detailed explanation of the problem.

Question Bank

Long Answer Questions

Q1 Discuss the important causes that result in Ecological Imbalances. What are the consequences of such imbalances?

Q2 Explain the factors that induce ecological imbalances in the environment.

Short Answer Questions

Q1 Explain the terms –

a) Ecological imbalance

b) Ecosystem

Q.2 What are the causes of ecological imbalances. Discuss any three of them.

Q3 Discuss any three consequences of ecological imbalance in the environment.