UNIT 1: ENVIRONMENT AND ECOLOGY

UNIT STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Environment: Meaning, Definition and Types
1.4 Eco-System
1.5 Ecology
1.6 Let Us Sum Up
1.7 Further Reading
1.8 Answers to Check Your Progress
1.9 Model Questions

1.1 LEARNING OBJECTIVES

After going through this unit you will be able to-

- understand the concept of environment
- explain what an eco-system is
- discuss about ecology and its scope
- distinguish between cultural ecology and political ecology
- analyse the importance of the study of ecology in society.

1.2 INTRODUCTION

Our species have prospered with rapid advancement of adaptation with our environment. The history remains our witness to see the changes (sometimes disturbing and sometimes developmental) that always talk about the interplay between the natural environment and society. Like demography, ecology is another cousin of sociology; it is the study of the interaction of living organisms and the natural environment. Again, ecosystem is a system composed of the interaction of all living organisms and their natural environment. In this unit, we shall discuss in details the concepts of Environment, Eco-system and Ecology. \

1.3 ENVIRONMENT: MEANING, DEFINITION AND TYPES

The term 'environment' is derived from the French word 'environner' which means 'to encircle' or 'to surround'. Thus, environment is a complex of so many things (light, soil, water, etc.) which surround an organism. We can trace some dictionary meanings for the word 'environment'. The dictionary meaning of the word 'environment' is two-fold a) external conditions or surroundings especially those in which people live and work; b) in ecological sense it means the external surroundings in which a plant or animal lives which tend to influence its development and behavior.

The word 'environment' in its etymological sense gives the meaning "surroundings, especially the material and spiritual influences which affect the growth, development and existence of a living being. It means 'the circumstances or conditions that surround an organism or group of organisms', or 'the complex of social or cultural conditions that affect an individual or community."

In the context of human beings, environment is the sum of all social, economical, biological, physical or chemical factors which constitutes the surroundings of man, who is both creator and moulder of his own environment."

- **Definitions of Environment :**

According to Simon Ball and Stuart Bell, "Environment is a difficult word to define. Its normal meaning relates to 'surroundings', but obviously that is a concept that is relative to whatever object it is which is surrounded. Used in that sense environment could include virtually anything, indeed, as Einstein once remarked, "The environment is everything that isn't me." However, 'environment ' has now taken on a rather more specific meaning, though still a very vague and general one, and may be treated as covering the physical surroundings that are common to all of us, including air, space, waters, land, plants and wildlife."

Goudie states,"Environment is the representative of physical components of the earth, wherein man is the important factor influencing his environment."

- **Different types of Environment:**

  Environment can be divided into two categories:

- **Natural environment:** The environment that comes into existence without the interference of man is called natural environment.
- **Man-made environment:**When human beings modify their environment according to their own needs, then it is called man-made environment.

Two other classifications of environment:

- **Physical environment:**It consists of forces of nature like wind, temperature and light, time, non-living materials like soil and water.
- **Biological environment:**It includes the plants, animals and other organisms (biotic).

1.4 ECO-SYSTEM

The term 'eco-system' has been used widely. Eco-system is the basic functional unit in ecology. British ecologist Sir Arthur G. Tansely (1935) introduced the term 'ecosystem' for the first time.An 'ecosystem' is a region with a specific and recognizable landscape form, such as a forest, grassland, desert, wetland or coastal area. The nature of the ecosystem depends on its geographical features such as hills, mountains, plains, rivers, lakes, coastal areas or islands and is also controlled by climatic conditions- the amount of sunlight, temperature and rainfall in the region. 'Eco' from the word 'ecosystem' refers to 'environment' and 'system' to its various components.An 'ecosystem' is a single whole made up of many sub-systems i.e. populations, communities and environment. It is a basicfunctional unit of variable size consistingofboth biotic and abiotic components interacting with each other to sustain the life upon earth. The components that make an ecosystem are of two types-

- **Non- living or abiotic components:**

The geographical, climatic and soil characteristics form the non-living or abiotic components of an ecosystem. It includes ---

- The amount of inorganic substances involved in material cycles. The amount of the inorganic substances, present at any given time in an ecosystem, is designated as the standing state or standing quality
- Amount and distribution of inorganic chemicals, such as chlorophylls etc., and of organic materials, as proteins, carbohydrates, lipids etc., present either in the biomass or in the environment.
- The climate of the given region.

- **Living or biotic components**

The living part of an ecosystem is referred to as the biotic component.

- **Definitions of Ecosystem:**

According to Odum (1971), "Ecosystem is a unit that includes all of the organisms in a given area interacting with the physical environment, so that a flow of energy leads to clearly defined trophic structure, biotic diversity and material cycles within the system".

Michael Allaby (1983) says, "A community of interdependent organisms together with the environment is known as ecosystem".

ErachBharucha(2005):- "The living community of plants and animals in any area together with the non-living components of the environment, such as soil, air and water- constitute the ecosystem."

- **Basic principles or characteristics of an ecosystem:**

The basic characteristics of an ecosystem are given below-

- All ecosystems have two major components: biotic and abiotic.
- The non-living environment supplies the nutrients and energy in the form of sunlight. It also controls the smooth functioning of ecosystem and also the inter-relationships among the members of its biotic community. Therefore, non-living environment is a very essential part of any ecosystem.

- Plants and animals have interdependence between them. An exchange of materials takes place between the biological community and non-living environment.
- An ecosystem acts as a stabilizer of the changes and fluctuations that occasionally occur in the environment. An ecosystem has self-regulating mechanism of checks and balances that helps to achieve this stability.
- Ecosystem is a major structural and functional unit of ecology. The structure of an ecosystem is dependent on its species diversity. The simple ecosystems have less species and the more complex ecosystems have high species diversity.

1.5 ECOLOGY

The word 'ecology' comes from two Greek words, namely 'Oikos' (meaning 'household', 'place to live' or 'habitation') and 'Logos' (meaning 'study or 'discourse') to denote and deal with the organism and its place of living i.e. 'at home'. Ecology denotes such relationships between the organisms and their environment.

Ecology as a subject in India is known since long. The Vedas, Epics and Puranic writings have dealt with ecological thoughts; for instance, Charaka, an ancient physician described the importance of Vayu (air), Jala (water), Vruksha(tree), Desha (topography)and Kala (time)in the regulating process of life.

Greek Philosophers Hipocrates, Aristotle, Theophrastus, Reaumur etc. have mentioned about the concept of ecology in their writings, basically when these philosophers have written the natural history and the habits of animals and plants growing in different environment or areas. Theophrastus has been entitled as the 'First ecologist' who first explained the inter-relations between organisms and their environment.

There are some controversies about the person who coined the term 'ecology' and used it in literature.

According to Kormondy, Henry david Thoreau, the American Naturalist and philosopher, has used the term 'Ecology' for the first time in

the year 1857 but he did not provide a proper definition for it. We can have some other evidences in literature that says, H. Reiter, The German biologist, has used the term "ecology' for the first time in 1868 (see Reiter, 1885; Macmillam, 1897).

The French Zoologist, Isodore Geoffroy St. Hilarie (1859) had proposed the term 'ethology'for "the study of the relations of the organisms within the family and society in the aggregate and in the community."

In 1866, the German Zoologist Ernst Haeckel has used the term 'oekologie' to refer to the inter-relationship between the living organisms and their environment. He defined the ecology of an organism as "…..the knowledge of the sum of the relations of organisms to the surrounding outer world, to organic and inorganic conditions of existence….." .That is how the word 'ecology' has appeared to refer to the study of the mutual relationship between living organisms (biotics) and non-living environment (abiotics).

- **Scope of Ecology:**

Although ecology is a multidisciplinary science, it is usually considered as branch of Biology, since the various forms of living organisms are the taxonomic divisions of biology which deal with the morphology, physiology, ecology etc. of specific kinds of organisms.

Ecology basically is a science that deals with the relationship of all the organisms to their environment. Ecology as a subject matter not only includes the life sciences but also physics, chemistry, geography, geology, meteorology, climatology, hydrology, archaeology, anthropology and sociology. Therefore, the scope of ecology is too vast. It deals with biotic components, animals and plants, natural history etc.

In ecology, organism is the self-regulating or self-perpetuating mechanism which is always in a process to maintain equilibrium with its environmentand living organisms have the ability to respond to the environmental stimuli. Therefore, they are called 'physico-chemical' mechanisms.

Historically, the urge for studying about plants and animals initiated the development of ecology. In that way, ecology can be divided into plant

ecology and animal ecology. Plant ecology deals with the relationship among the plants and relationship between plants and environment. Basically plant ecology describes about the vegetational and floristic composition of a particular area. Animal ecology, on the other, describes the relation between animals and their environment and also the animal behavior, population dynamics, population distribution etc. Since, animals are bound to depend upon plants for survival (both for food and shelter), therefore, animal ecology and plant ecology are interlinked.

- **Ecological Perspectives:**

The ecological perspective views all living organisms within their social and physical environments and examines the factors and matters that people exchange with their environments (Gitterman, 2009). Applying ecology to human beings in social settings involves holding a perspective to observe how humans interact with their physical, social, and cultural environments. Physical environments include the natural world as well as the built world, which entails buildings and structures designed and made by human beings. Social environments include the interactions with friends and family, social and community networks, such as colleagues or through membership or involvement with organizations or the community, and the societal structures that shape the way in whichthe environment operates and orders itself, such as through political, legal, and economicstructures. The cultural aspect of the environment involves those values, norms, beliefs, and language that shape the individual's views, perspectives, and expectations. On the other hand, most importantly, the political aspect of the environment deals with the resource allocation structure, pattern and also the power holding to manipulate the nature.

An ecological perspective can considerably enlarge the horizon of sociology and social anthropology.Here, in this chapter, we will discuss about two ecological perspectives- i) Cultural perspective and ii) political perspective.

- **Cultural Perspectives of Ecology:**

Cultural ecology is based on the interaction of culture, man and environment. it talks about human adaptation to social and physical

environment. Here, human adaptation basically means both biological and cultural processes that enable human beings to survive in a particular environment. It also talks about how human beings cope up with their changing environment.Ecology is a science that deals with the study of the living-organisms and their physical milieus. To be simplified ecology is the study of structure and dynamics of nature, mankind being the part of nature (Olum, 1975:1).

The dualism that separates the study of 'natural environment' from 'human environment' had fruitfully worked to isolate natural science from social science. Cultural observation of ecology is a holistic approach that is capable of including human activitiesand this is the reason why it has gained wide acceptance.

Anthropologist Julian Stewardcoined the term 'envisioning cultural ecology' for the first time. He initiated this term as a methodology to understand the typical human nature that allows human beings to adapt to any variety of environment. The central argument for the cultural perspective of ecology is that it represents the ways in which cultural change is induced by continuous adaptation to its environment. Historically, cultural change in its part embraces technological changes, changes in practices, changes in knowledge which allow people to adjust with any changing or given environment. Hence, we can come to a conclusive notion that environment can influence human nature to a greater range but it cannot determine human nature all alone.

Regarding cultural perspective, we see 'environment' in some sociological theories too. Marx, Durkheim and Goldblatt observed the relationship between natural world and human societies as a central cause for any historical change. He did not emphasize on economic and demographic impact on ecology. In fact classical sociological theories often emphasized on how pre-modern societies had been hindered by their natural environment. They did not pay attention to how increasing industries in modern societies led to environmental degradation.

David Pepper's view is that Man-Nature dialectic is central to Marxist notion(Chaudhury 2014: 74). Man often transforms nature by means of labor. The process of transformation or the process of changing is a social process. Human beings shape their own society and also their social relationship with other members of the society by shaping their own nature. In order to change the nature, they first try to know the nature. In this process of knowing the nature, they transform themselves to a higher intellectual order (Pepper 1986).

Giddens observed that no one among Durkheim, Marx and Weber has seen degrading consequences of industrial work upon human beings. He said that no one could foresee that 'forces of production' would lead to large-scale destructive effect in natural as well as material environment. He concludes to say that, 'Ecological concerns do not brook large in the traditions of thought incorporated into sociology, and it is not surprising that sociologists today find it hard to develop a systematic appraisal of them' (Giddens 1990:8).

Steward's concept of cultural ecology got widely accepted among archaeologists and anthropologists in the mid-20th century. His main focus was on the interrelation between culture and environment. Steward's objectives for initiating this method of understanding human adaptation were-

- To have a proper documentation of tools and technologies used to exploit the environment in order to get a life out of it.
- To observe the pattern of human behavior or pattern of cultural change within its concerned environment.
- To assess the influence of behavior pattern of human being on other cultural aspect (for instance, in drought-prone areas the prime concern is the concern for rainfall which in turn becomes a practice of religious belief system where water and rainfall become strong figures for that particular belief; but this sort of religious belief may not appear in those areas where availability of water is taken for granted or where the practice of irrigation is prevalent. Steward recognized that the principle difficulty in usingthe cultural factor in ecological studies was the lack of clear objectivesfound in the

biological use of ecology. Steward proposed the use of an explanatoryor causal method with cultural ecology and an operational toolrather than as an end in itself.

- **Political Perspective of Ecology**

The roots of political ecology in ecological and social science are described by Paulson. The ground from which political ecology first emerged in the 1970s (the first use of the term is often traced to Wolf, 1972) was defined by the confluence of cultural ecology (formulated by Steward) which linked human strategies of ecological success to cultural adaptation, with community ecology, cybernetics and systems theory (Odum, 1970; Bateson, 1972). Despite important differences, these areas of study shared a focus on flows of matter, energy, technology and information within integrated humanenvironmental systems. Political ecology was also influenced by the hazards school with its focus on perception, adjustment and management of environmental hazards. Political ecology focuses on how human beings relate to the biophysical world. Political ecologists have investigated the many environmental challenges that vulnerable communities across the world must face. These include the unequal impacts of global warming on different societies, the health effects of environmental toxics in food, air and water, the environmental crimes of corporations and syndicates, tropical deforestation, wars based on control over natural resources, land grabbing, acquisition of land and urban environmental injustice etc. Political ecology has been important in explaining such phenomenon, and particularly the social and political inequities both causing them and mediating their impacts (Bryant, 2015).

Political ecology emphasizes environmental problems and human vulnerabilities to see inequalities in power. Political ecologists observethe human struggle for resource allocation and healthy environment. They also see how this struggleis strongly influenced by the power a society or individuals hold and how they use it.

Inequalities in 'access to natural resources' is a central theme of political ecology. While it is a matter of power structure and ideology of

power to hold or possess resources, it always focuses on weak and sometimes corrupt governance, outdated and undemocratic land tenure rules, as well as divided communities who are poor and vulnerable to demands for land. It also talks about the effect on rural women, who lack a political mandate to speak out collectively.

Methodologically, political ecologists use a wide range of approaches, to illustrate exactly how political and economic activities influence the fate of ecosystems and local cultures, and how institutional arrangements and organizations are (or have been) responsible for these outcomes. Geographer Piers Blaikie and colleagues were the originators of a distinctive 'regional PE' approach which analyses processes that operate at different scales, but are interlinked. Blaikie identified a "chain of explanation" linking soil erosion to changes in land use practices, caused not by poor local land management but by poverty and denial of access, even arguing that "soil erosion in lesser developed countries will not be substantially reduced unless it seriously threatens the accumulation possibilities of the dominant classes" (Blaikie, 1985: 147).

Theorists including Karl Marx and Michel Foucault, show how inequalities are embedded in capitalism, and in the subjugation and control of entire populations through monitoring and categorizing. There are rational underpinnings to environmental struggles that create winners andlosers. Feminist political ecology sees power as gendered, focusing on the marginalization of women but also their vital role in maintaining livelihoods and in struggling for access to resources.

- **Importance of the Study of Ecology and Society**

The study of ecology is essential for human beings to manage the things in life for better living. Human beings know they are inevitably linked to their environment. The air they breathe, the water they drink, the food they consume and the products they use bind them to their environment to the local and global ecosystems. Ecology helps people to deal with changing nature of environment and its challenges.

- In order to achieve maximum food production, man has eliminated stable and complex ecosystems and replaced them with fragile and simplified single-species ecosystems in which the energy flow is directed to crops(Myneni, 2008).
- Man has shortened food chains by selecting and breeding domestic livestock that produces milk, meat or wool by converting grasses directly into products useful to man (Myneni, 2008).
- Ecology helps a person to understand that successful agriculture requires ecological adaptation of crop plants and domestic animals to environmental condition. It also requires genetic capability of plants to respond to agricultural practices like fertilization.
- Through life experience people become concerned about how overgrazing of grasslands and mismanagement of crop fields may lead to soil erosion.
- Different approaches of ecology help us to realize he power over natural resources in order to get development and it can directly highlight the necessity of the species which are economically desirable in the environment.
- Regarding Fish-biology, the management and exploitation of the fish population needs a thorough knowledge about the essential bio-physical aspects of the environment.

Ecology reveals that environmental pollution represents a short-circuiting of the biosphere cycles in nature. The chemical fertilizers and pesticides threaten the survival of organisms like birds. Too much sulphur dioxide in the atmosphere can kill and injure plants and animals. Atmospheric pollutants on the other hand, are responsible for a distinct rise in cases of chronic bronchitis, nasal and eye irritations and lung cancer (Myneni, 2008).



CHECK YOUR PROGRESS

Q1: How does an eco-system act like stabilizer in environment?

Q2: Why organisms in ecology are called to be 'physico-chemical' mechanism?

Q3: Name two theorists who focused on inequalities embedded in capitalism regarding political ecology.

Q4: What is political ecology's subject matter?

Q5: What does feminist ecology focus on?



1.6 LET US SUM UP

- Ecology is the study of the interaction of living organisms and the natural environment.
- The word 'environment' refers to the surroundings, especially the material and spiritual influences which affect the growth, development and existence of a living being.
- Environment is of two types: Man-made and Natural or Physical and Biological.
- Steward's main focus regarding cultural perspective was on the interrelation between culture and environment.
- An ecosystem is a basic functional unit of variable size consisting of both biotic and abiotic components interacting with each other to sustain the life upon earth.
- Political ecology emphasizes environmental problems and human vulnerabilities to see inequalities in power. Political ecologists observe the human struggle for resource allocation and healthy environment.
- Feminist political ecology sees power as gendered, focusing on the marginalization of women but also their vital role in maintaining livelihoods and in struggling for access to resources.



1.7FURTHER READING

1) Bharucha, E. (2005). Textbook of Environmental Studies for Undergraduate Courses. Hyderabad: Universities Press.

2) Chaudhury, S. K. Sociology of environment (Vol. 7). (I. Modi, Ed.) SAGE.

3) Guha, R. (1994). Social Ecology. (T. Madan, Ed.) New Delhi: Oxford University Presss.

4) Myneni, D. S. (2008). Environmental Studies. Hyderabad: Asia Law House.

5) Plummer, J. m. (2014). Sociology: A global introduction (5th ed.). New delhi: PEARSON.

6) Sharma, P. (1975). Ecology and Environment. Meerut-New Delhi: Rastogi Publications.

7) walker, P. A. (2005). Political ecology: where is the ecology. Progress in Human geography, 29, 73-82.



1.8 ANSWERS TO CHECK YOUR PROGRESS

Ans to Q No 1: An ecosystem acts as a stabilizer of the changes and fluctuations that occasionally occur in the environment. An ecosystem has self-regulating mechanism of checks and balances that helps to achieve this stability.

Ans to Q No 2: In ecology, organism is the self-regulating or self-perpetuating mechanism which is always in a process to maintain equilibrium with its environment and living organisms have the ability to respond to the environmental stimuli. Therefore, they are called 'physico-chemical' mechanisms.

Ans to Q No 3: Karl Marx and Michel Foucault