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ENVIRONMENTAL EDUCATION



Contents:

- Block- I : Concept of Environment**
- Block- II : Environmental Awareness through Education**
- Block- III : Environmental Stressors and Conservation of Environment**
- Block- IV : Population and Quality of Life**
- Block- V : Environmental Ethics and Sustainable Development**

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BLOCK- I

UNIT- 1 ENVIRONMENT

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UNIT- 1

ENVIRONMENT

Unit Structure

- 1.1 Introduction
- 1.2 Objectives
- 1.3 Meaning of Environment
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1.1 Introduction

Dear learners, this is our first block where you will understand the concept and meaning of environment. Environment is the surrounding or conditions in which we the human beings, all other living animals and plants live. Without Nature and natural resources man never can think about the existence of life. Again without life environment has little meaning. Thus for the continuation of existence of life every living organism depends on the environment. Among all the living organisms of the planet man has been trying to uplift life and attain high standards through technological advancement. This has resulted in widespread pollution of the environment all over the world.

However, there has been a constant debate on heredity and environment as regards influence of these factors in the development of personality of an individual. Behaviorists are of this

view that environment is all in all in the development of personality and heredity is nothing to do in it. Others say that heredity has an important role in the personality development.

The main focus of educational process is to develop the child personality, therefore main job of education is to create conducive environment for the child in educational institutions. The development of any type- physical, social, economic, cultural, etc. require an appropriate or desirable environment.

1.2 Objectives

After going through this unit, you will be able to –

- *understand* the meaning of environment;
- *analyse* various definitions of Environment;
- *explain* the concept of Environment;
- *identify* various characteristics of Environment;
- *understand* the structure of environment;
- *describe* various components of environment.

1.3 Meaning of Environment

The dictionary meaning of the word 'environment' is a surrounding; external conditions influencing development or growth of people, animals or plants; living or working conditions etc. This involves three questions what is surrounded? By what is surrounded? and where is surrounded? Decidedly the answer to the first question is living object in general and man in particular. If man is taken to be surrounded, physical attributes become the answer to the second question which become environment and where is surrounded in the space or habitat. 'Primarily, the concern of all educationists with the *environmentis* man. But man cannot exist or be understood in isolation from the other forms of life and from plant life' and so environment of all biological population should be the concern of

teachers. Environment of all biological population should be the concern of teachers. 'Environment refers to the sum total of conditions which surround man at a given point in space and time. In the beginning the environment of early man consisted of only physical aspects of the planet earth (land, air and water) and biological communities but with the march of time and advancement of society man extended his environment through his social economic and political functions.

Generally speaking the environment is equated with nature wherein physical components of the planet earth, viz. land, air, water etc., support and affect life in the biosphere. A. Goudie (1984) in his book 'The Nature of the Environment' has, in fact, taken environment as the representative of physical components of the earth wherein man is an important factor affecting the environment. Environment is defined more comprehensively by others as holistic view of the world as it functions at any point of time, with a multitude of spatial elements and socio-economic system distinguished by quality and attributes of space and mode of behaviour of physical and biological forms. He further remarks, 'the definition, and in turn the scope, could be governed by our concern and priorities. Our turn the scope could be governed by our concern and priorities. Our immediate concern is the quality of space we live in, the air we breathe, the food we eat, the water we drink and the resources we draw from the environment to support our economy'. He has also pleaded for the inculcation of only 'air-land- water-plant' in the concept of environment, thus excluding man and human society from the ambit of environment.

1.4 Definition of Environment

Environment consists of the sum total of the stimulation that the individual receives from conception until death. It covers all those

circumstances which assert their influence on the individual since conception to death. Whatever found around the individual may be covered by the term environment. It has been defined by various psychologists as follows-

"A person's environment consists of the sum total of the stimulation which he receives from his conception until his death."***Boring***

"The environment is everything that affects the individual except his genes."***Anastasi***

"The term environment is used to describe, in the aggregate, all the external forces, influences and conditions, which affect the life, nature, behaviour and the growth, development and maturity of living organisms."***Douglass and Holland***

Check Your Progress

Q. What is the Dictionary meaning of environment?

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.....
.....

Q. Write a definition of environment.

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.....

1.5 Concept of Environment

Environment consists of various types of forces like, physical, intellectual, social, moral, economic, political, cultural and emotional forces. 'Environment is the aggregate of all the external forces, influences and conditions, which affect the life, nature, behaviour and the growth, development and maturation of living organisms. A

favourable environment caters to the development of native abilities of child.'

The term mental environment means the atmosphere necessary for the mental development of person. All the things helpful in the mental development of a child constitute his mental environment. Thus, for a child in school, the mental development consists of the libraries, laboratories, recreational, co-curricular as well as curricular activities. If these are properly organized, they would achieve the desired intellectual development. Therefore, teachers should try their best to provide the best mental environment in the schools. Workshops, museums, dramatic and recreational clubs, associations, debates, symposiums, etc., should also be encouraged.

Environment is viewed in different ways with different angles by different groups of people but it may be safely argued that 'environment is an inseparable whole and is constituted by the interacting system of physical, biological and cultural elements which are inter-related individually as well as collectively in myriad ways. Physical elements (space, landforms, water bodies, climate soils, rocks and minerals) determine the variable character of the human habitat, its opportunities as well as limitations. Biological elements (plants, animals, micro-organisms and man) constitute the biosphere. Cultural elements (economic, social and political) are essentially man-made features which go into the making of cultural milieu.

The term '*Environment*' refers the surrounding of an organism which includes both living and non-living components. The word meaning of environment is to

surround and to develop. The words 'surround' and 'develop' raise two basic questions-

- What is surrounded and developed? The answer is that man and other organism.
- Man and other living organisms are surrounded by what? The simple answer is that all non-living components-land, water, air, atmospheric pressure, etc., and living components-plants, social, cultural and economic surroundings.

Thus environment includes all the external conditions and influences affecting life and development of an organism.

Man's environment consists of natural as well as socio-cultural environment. Man has to improve the quality of his environment, because there is environmental pollution or crisis. It is due to over consumption of natural resources, over population, urbanization industrialization and unscientific attitude of human beings.

Natural resources have been utilized to meet the demand of better living to such an extent that has caused serious ecological and environmental imbalances. Man's participation is the only way to improve environment protection. The best insurance for the environment is a commitment to prevent the deterioration of land, water and air. It requires an introduction of environmental education.

Stop to Consider

Different people defined the term 'Environment' in different ways. It is therefore a difficult task to give a general definition of the word 'environment' However, generally the

term 'environment' means surroundings. This includes all the situations under which an organism survives.

The word 'Environment' is derived from the French *Environner* which means to encircle or surround. Environment can be defined as the situation or setting that surround an organism or group of organisms or the complex of social and cultural conditions that affect an individual or community. The United Nations Environment Programme (UNEP) has defined environment as the outer bio-physical system in which people and organism exist. Hence, the environment really represents the interconnections, the dynamic relationships between organisms and their physical and biological surroundings.

Thus we can say that the environment has to be regarded as a sphere of personal experience, a subject of inter-disciplinary learning and research, a sphere of socially important act and a challenge to initiation and responsible action.

1.6 Characteristics of Environment

In the above definitions the following characteristics have been emphasized of an environment.

1. The sum total of the stimulation forms his birth until his death.
2. It is everything which affects the individual excluding genes.
3. All the external forces which affect the growth, development of living organisms.
4. It consists of physical, intellectual, social, moral, cultural, emotional, economic and political forces which affect the life and nature of behaviour.
5. It refers to sum total of conditions which surround man all given point in space and time.

6. It includes physical (land, air and water) and biological S (plants, animals including man and his several functions organizations and institutions) components.
7. In involves, physical chemical, biological, social, economic political and cultural processes.

Kurt Lewin includes biological components under the physical environment. Every person tries to adjust in physical, social and psychological environments.

1. Physical Environment- It refers to geographical climate and weather or physical conditions in which an individual lives. The human races are greatly influenced by the climate. The white, black and yellow races are due to the climatic conditions. In the cold counties, the people are of white colour and in hot countries people are of black colour. The human working efficiency depends on the climatic conditions. The physique of an individual depends on climatic conditions. The individual tries to adjust in his physical environment. Even heredity is also influenced by the physical environment.

2. Social Environment- It refers to the social cultural, economic and political conditions of an individual in which he lives. The moral, cultural and emotional forces affect the life and nature of individual behaviour. It may be of two types-closed and open society. The open society is very conducive for the individual development, where as closed society is not very conducive for the development. Even the classroom climate should be more open which contribute for the development of individual potentialities. Every individual tries to adjust in his social environment.

3. Psychological Environment-

Kurt Lewin has given main emphasis to the psychological environment of individual. The physical and social environment are

common to the individual in a specific situation while every individual has own environment, in which he lives. He has used 'life space', topology for explaining psychological environment. It refers to the definition of personality. The man within man is the personality. Psychological environment is very important to understand the personality of an individual. The person and his goal form the psychological environment. If a person can not achieve his goal, unable to overcome the barriers it may cause to frustration or he has to change his goal for a new psychological environment. This mechanism will help the individual for an adjustment.

Check Your Progress

Q. Define the concept of environment?

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.....

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Q. Write any two characteristics of environment.

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.....

1.7 Structure of Environment

So far as you have understood the meaning of environment and its various characteristics, now let us understand the structure and components of environments. The environment is both physical and biological concept. It includes both living and non-living components. Thus, on the basis of basic structure the environment may be divided into two basic types. These are –

1. Physical or abiotic environment and
2. Biological or biotic environment.

So, on the basis of physical characteristics and state, the physical environment is subdivided into three broad categories viz., (i) solid (ii) liquid and (iii) gas which represent the lithosphere (solid earth), the hydrosphere (water component) and the atmosphere respectively. Thus the three basic division of physical environment may be termed as (i) lithospheric environment, (ii) atmospheric environment and (iii) hydrospheric environment. These may be further broken into smaller units based on different spatial scales, e.g. mountain environment, plateau environment, plan environment, Lake Environment, river environment, maritime environment, glacier environment, desert environment, coastal environment, etc.

The biological component of the environment consists of plants (flora) and animals (fauna) including man as an important factor. Thus the biotic environment may be divided into *floral environment* and *faunal environment*. All the organisms work to form their social group and organisations at several levels and thus is formed social environment where in the organisms work to derive matter from the physical environment for their substance and development. This process generates economic environment. It may be pointed out that of all the organisms man is the most skilled and civilized and hence his social organization is most systematic. It is significant to note that three aspects of man, e.g., physical, social and economic, have different characteristics and functions in the biotic environment as 'physical man' is one of the organism populations or biological community and thus requires basic elements of the physical environment, viz., habitat (space), air, water and food like other biological populations and releases wastes into the ecosystem; 'social man' establishes social institutions, forms social organisations, formulates laws, principles and politicize to safeguard his existence, interest and social welfare and 'economic man' derives and utilises resources from the physical and biotic environments

with his skills and technologies. These may be termed as physical, social and economic functions of man. It is the third function (economic) which makes the man and environmental geomorphic process as well because he transports matter and energy from one component of the ecosystem to the other. This aspect/function does not necessarily involve change in the working of the ecosystem so long as the exploitative functions are in harmony with the natural environment but when these exceed the critical limit, the equilibrium of the environment/ecosystem is disturbed and several environmental and ecological problems crop up which become detrimental not only to man himself but to whole population (of species), in a given ecosystem.

The physical environment may also be viewed in terms of climatic conditions providing certain suites of habitat for the biological communities, viz., tropical environment, temperate environment, polar environment, etc., which may be further subdivided into smaller but specific divisions. Physical/abiotic and biotic environments fused together form 'biome environment' like tundra biome, temperate biome and tropical biome which are further subdivided into second and third order biomes. In environmental geography the physical environment is the most outstanding feature and thus should be given more significance than the social or cultural environment. The economic function of man becomes more significant than his other functions as it is more concerned with the functioning of ecosystem. Thus, the interaction of man through his economic function and hence as an environmental process, with nature. Environment and resultant human response to the environment is the fundamental concern of environmental education.

1.8 Components of Environment

As per the meaning and definition of environment is concerned, the concept of environment is a broad concept which includes all external conditions influencing growth and development of child, animals, plants and working conditions, etc. The environment has been broadly classified into two components. They are-

1. Physical components.
2. Biological components.

The physical components include land, air and water where as biological components are plants, animals including man, his functions organisations and institutions. However, the environmental components can also be classified in the following categories-

1. Physical components are land, air and water.
2. Biological components are plants and animals.
3. Social components are population, social system, social change and social relations, urbanization, etc.
4. Cultural components are political, economic, moral and values of life religion, industries, etc.
5. Psychological components are facts, self concepts, level of aspiration, life space, topology, goals of life.

No doubt, environmental components can be classified in various categories. But Social components are equally important. It is important to determine the role of educational institutions. Environment and society are also closely related and they are interdependent. Different social groups and social structures like industrial, agricultural, political, cultural, religious, aesthetic, etc., have evolved and developed during various stages of development of human civilization and there social structure represents man's accumulated cultural experiences and resources primarily based on natural environment. The educational process helped in the

development of different structures of society on one hand, the quality of environment on the other hand.

“Education is the creature and creator of society.” The structure of the society is evolved by the process of education. The educational process utilizes the natural environment and its resources. Different social structures depend on the natural resources and environment. Education is a powerful instrument for social change and social control. The social changes are essential to utilize the natural resources of the environment.

1.9 Summing Up

Environment is the surrounding or conditions in which we the human beings, all other living animals and plants live. Without Nature and natural resources man never can think about the existence of life. Environment is equated with nature wherein physical components of the planet earth, viz. land, air, water etc., support and affect life in the biosphere. Environment consists of the sum total of the stimulation that the individual receives from conception until death. It covers all those circumstances which assert their influence on the individual since conception to death. Whatever found around the individual may be covered by the term environment.

However the following are some of the characteristics of environment.

1. The sum total of the stimulation forms his birth until his death.
2. It is everything which affects the individual excluding genes.
3. All the external forces which affect the growth, development of living organisms.

4. It consists of physical, intellectual, social, moral, cultural, emotional, economic and political forces which affect the life and nature of behaviour.
5. It refers to sum total of conditions which surround man at given point in space and time.
6. It includes physical (land, air and water) and biological S (plants, animals including man and his several functions organizations and institutions) components.
7. It involves, physical chemical, biological, social, economic political and cultural processes.

Moreover, Kurt Lewin has classified environment into three categories. They are

1. Physical Environment
2. Social Environment and
3. Psychological Environment.

On the basis of basic structure the environment may be classified into two basic types. They are-

1. Physical or abiotic environment and
2. Biological or biotic environment.

1.10 Questions and Exercises

1. Define the term environment.
2. Enumerate the characteristics of environment.
3. Discuss different types of environment.
4. "The environment is everything that affects the individual except his genes." Explain.
5. Describe the structure and components of environment

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UNIT- 2

ECOLOGY AND ECOSYSTEM

Unit Structure:

- 2.1 Introduction
- 2.2 Objectives
- 2.3 Ecology
 - 2.3.1 Concept of Ecology
 - 2.3.2 Meaning and Definition of Ecology
 - 2.3.3 Characteristics of Ecology
 - 2.3.4 Objectives of Ecology
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- 2.4 Ecosystem
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- 2.5 Ecology and Education
- 2.6 Ecosystem and Education
- 2.7 Difference between Ecology and Ecosystem
- 2.8 Summing Up
- 2.9 Questions and Exercises
- 2.10 References and Suggested Readings

2.1 Introduction

The environmental study becomes so important that it is included in physical sciences, bio-sciences and behavioural sciences. It is

mostly interdisciplinary in nature. The areas of study related to environment and other disciplines which are environmental chemistry, environmental geography, environmental botany, environmental zoology etc. Similarly environmental education is the new area of study under the discipline education.

Each discipline and field of study has its own words and terms to communicate the awareness and understanding of the concepts involved in it. The same words and terms are used in different disciplines but these have different meanings in different disciplines. The words and terms have no meaning without the reference of the study area, these may have only the dictionary meaning. There are certain words and terms which are commonly used in the study of environment, almost in all the related disciplines or environmental studies. Therefore it is very essential for the awareness, understanding and developing the areas of 'environmental education' to know the meanings of related terms and concepts used in it.

2.2 Objectives

After going through this unit you will be able to-

- *understand* the concept of ecology and ecosystem;
- *know* the ecological principles;
- *describe* various functions of ecosystem;
- *establish* relationship between ecology and education;
- *establish* relationship between ecosystem and education;
- *differentiate* ecology and ecosystem.

2.3 Ecology

Ecology or Environmental Biology is the branch of science concerned with plant and animal relationship and their interaction

with the environment. Ecology is a multidisciplinary science which includes not only the life science, but also Chemistry, Physics, Geology, Geography, Meteorology, Climatology, Hydrology, Anthropology, Archeology, Sociology and even Mathematics and Statistics as well. Ecology is the systematic study of the associations between organisms and their environment. It was a German Biologist Hanns Reiter, Who in 1865 coined the original Greek term Oekologie (later on anglicized to Ecology) by combining two Greek words oikos (= house) and logos (= study of). Ecology can be termed as the systematic study of the relations of the organisms with each other and with their physical environment.

2.3.1 Concept of Ecology

There are several words and terms which are used in the environmental studies. The two terms 'Ecology' and 'Ecosystem' are most important and basic for the understanding of environment. Sometimes these terms are used interchangeably or for the same meaning but these have different meanings. Ecosystem is considered a unit of Ecology. The word meaning- 'Eco' means environment, 'logy' means science and 'system' refers to interaction and interdependence of organisms and environment. 'Ecology' means the science of environment whereas Ecosystem means environmental system of particular place and in a unit time.

2.3.2 Meaning and Definition of Ecology

Ecology is a new science which deals with the various principles which govern the relationship and interdependence between organisms and their environment. The term ecology was coined by combining two Greek words, oikos (meaning house) and logos (meaning the study of) to denote such relationships and interdependence between the organisms and environment. The term

ecology has been defined in various ways by definition have been given in the following ways. The ecology has been defined as the study of structure and function of ecosystem. It may be stated in simple terms "It is the study of structure and functions of nature." However, various environmental scientists have given various definitions on this. Let us go through the definitions.

Definitions of Ecology:

C.J. Dreb (1985) defined ecology in simple and in comprehensive way as "Ecology is the scientific study of the interaction between organisms and nature that determine the range/distribution and abundance of organisms."

L.R. Taylor (1967) has defined ecology as "the study of the way in which individual organism, populations of some species and communities respond to those changes."

Macfadyen (1957) defined ecology as, "a science which concerns itself with the inter-relationship of living organisms, plants, animals and their environment.

Woodbury (1954) defined ecology as the science which investigates organisms in relation to their environment and a philosophy in which the world of life is interpreted in terms of natural processes.

G.L. Clarke (1954) defines ecology as "the study of inter- relations of plants and animals with their environment which includes the influences of other plants and animals as well as those of the physical features."

Alles et al. (1949) considered ecology as, "the science of inter-relation between living organisms and their environment, including

both the physical and biological environments and emphasizing inter- species as well as intra-species relations."

The modern ecologists have given somewhat more comprehensive and broder definitions of ecology as follow:

P. Clark (1999) defined ecology as a combination of biotic and abiotic environment. The plants, animals and man depend on each other.

Sodonis (1995) defined, ecology as 'a science of inter relations of living components with their non-living components'.

Southwide (1976) defined ecology as, "the scientific study of the relationship of living organisms with each other and with their environments." He further explained his definition of ecology by stating that, it is the science of biological interactions among individuals, populations and communities, and it is also the science of ecosystem - The inter-relations of biotic communities with their non-living environments."

Pinalea (1973) defined ecology as, "the study of relations between organisms and the totality of the biological and physical factors affecting then or influenced by them."

M.E. Clark (1937) considers ecology as, "a study of ecosystems or the totality of the reciprocal interactions of all organisms to all their environments, it is a scientific approach to study of environmental interactions which control the welfare of living things: regulating their range, distributions, abundance, reproduction and evolution."

2.3.3 Characteristics of Ecology

On the basis of analysis of the above definitions, reveal the following characteristics of ecology

1. It is the scientific study for analyzing the relations between organisms and environment.
2. It includes the structure and function together for full understanding of this vast nature.
3. It is the study of interrelationships and interdependence between organisms and environment.
4. It is the scientific approach for controlling and regulating the welfare of living organisms.
5. It is also a philosophy in which the world of life is interpreted in terms of natural processes.
6. It is the study of organisms in relation to their environment.
7. It is the science of all the relations of all organisms to all their environments.
8. It is the science of ecosystem. The ecosystem is an important ecological unit.
9. It is the science of interrelation between organisms and their environments and also emphasizes inter-organisms as well as intra-organisms (within) relations.

STOP TO CONSIDER

The two terms 'Ecology' and 'Ecosystem' are most important and basic for the understanding of environment. Sometimes these terms are used interchangeably or for the same meaning but these have different meanings. Ecosystem is considered a unit of Ecology. The word meaning- 'Eco' means environment, 'logy' means science and 'system' refers to interaction and interdependence of organisms and environment. 'Ecology' means the science of environment whereas Ecosystem means environmental system of particular place and in a unit time.

2.3.4 Objectives of Ecology

Ecology is an independent field of study as it has a body of knowledge not similarly organised in any other science subject. Ecology has a special set of methods, techniques and procedure. Theme of ecology has its own. The following are the main objectives of ecological studies:

1. To study the relationships between living organism and environment.
2. To provide the true understanding of the structure and functions of the vast nature.
3. To analyze the interdependence between organisms and environmental components.
4. To evolve scientific approaches for controlling and regulating the welfare of living organisms.
5. To interpret the world life in terms of natural processes.
6. To provide the comprehensive awareness of all relations between all the living organisms and their all environments.
7. To evolve mathematical models to relate interaction of environmental components and predict their effects by employing system analysis approach.
8. To explore the evolutionary development of the inter-relations between living organisms and environment.
9. To study the conservation and management of natural resources and environment pollution. It is the main focus of applied ecology.
10. To observe the biological productivity of physical environment or nature and how the products may best serve the mankind or to improve the quality of man. It is the main aim of ecology.

The objectives are related to different areas of ecology and the other disciplines-population ecology, geography, physiology,

evolutionary, ethology, ecosystem, system analysis and applied ecology. There is not one ecology but several ecology to understand the relationships.

Check Your Progress

1. Define the term ecology.
2. Write any two characteristics of ecology.
3. Write any two objectives of ecology.

2.3.5 Scope of Ecology

The scope of ecology is very vast. It does not confine to biological sciences form where it has evolved but it has reached the social sciences and also upto behavioural sciences of edifice of knowledge. Ecology has been viewed as 'a state of the mind on the basis of its holistic nature, as a unifying social movement. It accelerates the rate of economic development to meet out the demands of ever-increasing human population at global and regional levels.

Ecology is the science that requires minimum time and labour for its introduction of a layman. Present day problems of varied nature in human life are directly and indirectly very much related to the field of ecology, as their solution needs an ecological knowledge. The ecology has been contributing these days very much to socio-economic, industrial, technological, political and other policies and plans of the worlds. There is interdependence not only between ecology and other areas of plant sciences, but also between ecology and physical as well as social sciences. Ecology indeed plays an important role in human welfare. The field of study of modern ecology is concerned with the functional interdependence between organisms and their environment.

Ecology is an interdisciplinary discipline and it includes not only the life science but also chemistry, physics, geography, geology, meteorology, mathematics, statistics, sociology, climatology, anthropology, hydrology etc. An ecologist has to collect the data for interpreting the behaviour of an organism in given environment which are obtained from many sources: morphology, geology, taxonomy, genetics, physiology, soil science, climatology, physics and chemistry. Many practical applications of this area are found in agriculture, horticulture, forestry, limnology, fishery, biology survey, oceanography, public health, mental health and hygiene. Ecology helps in discovering new sources of food, source of energy (solar energy) and new method of pest control such as biological control which cause no environmental pollution. The major themes and area of ecological study at ecosystem level and ecosystem is a fundamental ecological unit.

2.3.6 Types of Ecology

The scope of ecology is very vast. Early scientists have classified ecology into two major types- animal ecology and (ii) plant ecology. When equal emphasis is given to animals and plants, it is termed bio-ecology.

Ecology is broadly divided into two types.

1. Autecology and 2. Synecology.

1. Autecology deals with the relationship of one species organism. An autecologist studies of one population, dynamics, behaviour studies the life of a species e.g. bull frog of India.
2. Synecology deals with the ecological studies communities or entire ecosystem. A synecologist studies deserts, caves or tropical forests. This describes the overall energy and materials flow through the system.

2.3.7 Ecological Principles

There are basic fundamental principles which govern the various aspects organisms and components of environment. The following are the fundamental principles of ecology:

- All living organisms and physical environment are mutually reactive. The organisms interact among themselves and affect each other and physical environment.
- The physical and biological processes follow the principles of uniformitarianism which states the same physical and biological processes, as the environment is influenced by human activities.
- Natural hazards affect adversely the biological communities in general and in particular. When biological processes are associated with physical events, yet server hazards are created.
- Sustained life on earth is a characteristic of ecosystem, not of individual organisms or population.
- Environmental principles of holistic nature of natural environment which largely affect the biological communities in a biospheric ecosystem.
- Ecosystem is a fundamental unit of ecological study because it comprises both biotic and abiotic components.
- Ecosystem functions through the input of energy mainly solar radiation which is trapped by green plants and is used to prepare food through the process photosynthesis. The solar radiation is the main driving force of the ecosystem. In any system of constant mass, energy is neither created nor destroyed but it can be transformed from one type to another type.

- The ecosystem productivity depends on two factors:
 - (a) The availability of the amount of solar radiation to the primary producers.
 - (b) The efficiency of plants to convert solar energy into chemical energy.
- Ecosystem instability result when an ecosystem becomes unable to adjust with environmental change.
- Man being an active agent or environmental change, modifies the ecosystem through the exploitation of natural resources.

STOP TO CONSIDER

The scope of ecology is very vast. Early scientists have classified ecology into two major types- animal ecology and (ii) plant ecology. When equal emphasis is give to animals and plants, it is termed bio-ecology. Ecology is broadly divided into two types. 1. Autecology and 2. Synecology.

2.4 Ecosystem

The ecosystem is one of the fundamentally efficient units in ecology. It comprises the entire living organisms that act together with the physical environment in an area. Hence, an ecosystem includes populations, communities, habitats, and environments, and it particularly refers to the dynamic interactions among every mechanism of the environment, focusing specifically on the substitution of resources between the living and non-living mechanisms.

2.4.1 Concept of Ecosystem

The term ecosystem was coined in 1935 by a Britisher - A.G. Tansely. Ecosystem can be defined as a dynamic system which

includes both organism (biotic-component) and abiotic component influencing the properties of each other and both necessary for the maintaining of life.

The ecosystem can be defined as ecological system which is the sum of living organisms, the environment and the processes of interaction between and within all parts of the system. The system which results from the assimilation of all living and non-living factors of the environment is defined as ecosystem. The living beings of society that interact with the physical environment with the purpose of flow of power lead to clearly defined trophic organization, biotic variation and material cycle within the system (i.e., exchange of resources between living and non-living things). It constitutes an ecological system or ecosystem.

2.4.2 Meaning and Definition of Ecology

The term ecosystem is most preferred in recent development in ecology, where even implies the environment and system implies interacting, inter-dependent complex.

Any unit that includes the entire organism in a given area, interact with physical environment so that flow of energy lead clearly define trophic structure, biotic diversity and material cycle within the system is known as an ecological system or ecosystem.

The recent development in ecological, studies has been undertake besides structure, the similarities and difference in food and energy relationship among living components of ecosystem that generally referred to a the bioenergetic approach in modern ecology. Modern ecology is broadly defined as the study of ecosystems.

According to *Evans (1956)*, "the ecosystem involves the circulation, transformation and accumulation of energy and matter through the medium of living organisms and their activities. The dynamic

abiotic components of environment and the assemblage of plants and animals there, as result of interactions between themselves keep modifying and the changing each other and this leads to the development of ecosystem."

Human ecology or applied ecology is the use of ecological concepts to describe human activities and determination of ways which people can best obtain their needs from ecosystem. Ecosystem which are substantially altered by human activities are called managed where as those free from such disturbances are referred to as natural.

According to *Tansley* the ecosystem is comprised to two major parts-

- (i) The first part is biome which includes the whole complex of plants and animals or particular spatial unit.
- (ii) The second part is habitat which involves the physical environment of the particular spatial unit.

All parts of an ecosystem - organic and inorganic, biome and habitat may be regarded as interacting factors which, in a mature ecosystem, are in approximate equilibrium, it is through the interactions that the whole system is maintained.

"The ecosystem as functioning, interacting system composed of one or more living organisms and their effective environment, both physical and biological."

-A.G. Tansley & F.R. Fosberg (196)

Ecosystems have inputs of matter and energy, used to build biological structure, to produce and to maintain necessary internal energy levels. Matter and energy are also exported from an

ecosystem. An ecosystem tends to achieve a balance of the various processes and activities within it.

An ecosystem may be defined as a fundamental functional unit occupying spatial dimension of 'earth space ship' characterized by total assemblage of biotic community and abiotic components and their mutual interactions within a given time unit.

The ecosystems are units of organisms connected to one another and to their environment. The ecosystem is the sum total of all natural organisms and substance within an area and it can be viewed as a basic example of an open system in physical geography.

"The term ecosystem applies to, 'any system composed of physical, chemical and biological processes within a space-time unit of any magnitude.'" -**A. L. Linderman (1942)**

"The total assemblage of components interacting with a group of organisms is known as ecological system or more simply an ecosystem." -**A.N. Strahler (1976)**

Living organisms can use energy in several forms, but all forms can be grouped into two categories - radiant and fixed.

(i) Radiant energy is in the form of electromagnetic waves such as light.

(ii) Fixed energy is chemical energy in various organic substances which can be broken down to release energy.

2.4.3 Characteristics of Ecosystem

The above definitions of ecosystem have enumerated the following basic characteristics of ecosystem -

1. The ecosystem is a unit of organisms connected to one another and to their environment within given space and time unit.

2. Any system composed of physical, chemical and biological processes within a space-time unit of any magnitude.
3. It is composed of three basic components- biotic (biome), abiotic (habitat) and energy components.
4. It occupies certain well defined area on the earth-space, and time unit.
5. Ecosystem of any given space-time-unit represents the sum of all living.
6. It is an open system which is characterized by continuous input and output of matter and energy.
7. There are complex sets of interactions between biotic and abiotic components including energy component on the one hand and among the organism on the other hand.
8. Ecosystem has its own productivity which is the process of building organic matter based on the availability and amount of energy passing through ecosystem. The productivity refers to the rate of growth of organic matter in a space unit per time unit.
9. It is powered by energy of various sorts but the solar energy is the most significant (radiation) and tends to be relatively stable equilibrium. It has the natural resources system.
10. It is well organized and structured system. The study of ecosystem development is helpful in the environmental planning from ecological point of view.

STOP TO CONSIDER

The term ecosystem was coined in 1935 by a Britisher - A.G. Tansely. Ecosystem can be defined as a dynamic system which includes both organism (biotic-component) and abiotic component influencing the properties of each other and both necessary for the maintaining of life.

2.4.4 Types of Ecosystem

There are different types of ecosystem of nature. These may be classified broadly into three broad categories -

1. Permanent and Natural ecosystem:

These ecosystems operate under natural conditions without the interference of human beings. These are of two types-

- (i) **Terrestrial ecosystem** operates on land e.g. Grassland ecosystems, Desert ecosystem, forest ecosystem etc.
- (ii) **Aquatic ecosystem** operates in water and are again of two types -
 - a. **Fresh-water ecosystem** operates in ponds, streams and lakes.
 - b. **Marine ecosystem** operates in oceans, estuaries etc.

2. Temporary and Natural ecosystem:

These ecosystems also operate under natural conditions but are short lived e.g. rain fed small sized pond.

3. Artificial or Anthropogenic ecosystem:

These ecosystems are man-made e.g. croplands, space ecosystems, large dams, fishery-tanks etc. A balanced aquarium is also artificial ecosystem.

2.4.5 Functions of Ecosystem

The main functions of ecosystems are the following:

• Transformation of solar Energy into food Energy

The radiation of solar or sun is the basic input of energy entering the ecosystem. The radiant solar energy is received by the green part of the plants. Most of the received solar energy is converted into heat energy and is lost from the ecosystem to the atmosphere through

plant communities. Only a small proportion of radiant solar energy is used by plants to make food through the process photosynthesis. Thus the green plants used a part solar energy into food energy.

- **Circulation of Elements through Energy flow**

Energy flow is the main driving force of nutrient circulation in the various biotic components of the ecosystem. The organic and inorganic substances are moved reversibly in the biosphere, atmosphere, hydrosphere and lithosphere through various closed system of cycles in such a way that total mass of these substance remain almost the same and are always available to biotic communities.

- **The conversion of elements into Inorganic flow**

The organic elements of plants and animals are released in a variety of ways-

- (i) decomposition of leaf falls from the plants, dead plants and animals by decomposers and their conversion into soluble inorganic form
- (ii) burning or vegetation by lighting, accidental forest fire or deliberate action of man
- (iii) The waste materials released by animals are decomposed by bacteria and find their way in soluble inorganic form to soil storage.

- **Growth and Development of plants**

The composition of leaves, plants and animals and their conversion into soluble inorganic form are stored into soil which helps in the growth and development of plants; the decompositions are converted into such elements which are easily used in development of plant tissues and plant growth by bio-chemical process, mainly photosynthesis.

- **Ecosystem productivity**

Productivity of ecosystem represents rate of growth of energy or organic matter per unit time by autotrophs at trophic level. One through the process of photosynthesis with the help of solar energy. The ecosystem productivity depends on two factors- the availability of the amount of solar radiation to the primary producers at trophic level one and another efficiency of the plants to convert solar energy into chemical energy which is used by the green plants to build up their tissues.

- **Stability of Ecosystem**

There are two models of the nature of ecosystem stability or equilibrium - i) equilibrium models and (ii) Non-equilibrium model. The equilibrium model states that an ecosystem always tends towards stability. Whenever the community of an ecosystem is disturbed due to external environmental change, it quickly returns to original state whereas the non-equilibrium models states that ecosystem stability is rarely attained because disturbances caused.

Check Your Progress 1. Define the term ecosystem. 2. Write any two characteristics of ecosystem. 3. Write any two objectives of ecosystem.
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2.5 Ecology and Education

The concept of 'ecology' has been widely used in physical and biosciences. But it has very broad areas of its application of social sciences as well as behavioural sciences. It is considered both art and science. Education is the process of development or all round development, Behaviour psychologists has claimed that environment is all in all in the development of a child and heredity

has nothing to do in the process of development. Behaviourists have given much more importance to environment. This school of psychology is also termed as Environmental Psychology.

The ecology indicates the structure and function together for with understanding of an environment. Similar education also designed the structure for the functions of students which helps in their development. Education is a scientific approach for controlling and regulating the behaviour for the desirable change among the students.

The education is an independent field of study as it has been discussed in the earlier unit. It is science as well as art. The teaching is an art and learning is the science. The teaching is the doing or action part whereas learning is the understanding aspects in the educational process. Ecology has also both doing and understanding aspects.

Education is also philosophy which helps in formulating aims and objectives for the human welfare whereas ecology interprets world of life in terms of natural processes.

Education includes several systems. A school is a unit of the system which has its own organizational climate which is same as ecosystem of ecology. Every institution has its own input and output or productivity, it functions like ecosystem. Education and Ecology have their broad areas of doing and understanding.

2.6 Ecosystem and Education

The ecosystem is used mostly in ecology. The ecosystem is the study of any unit of ecology within given space and time unit. It is a functional aspect of ecology which includes interacting system composed of living organisms and their effects on one another. Ecology is defined as the study of ecosystem. Ecosystem includes

biotic, abiotic and energy components and has its own productivity. The productivity refers to the rate of growth of organic matter within given space and time unit.

The ecology and ecosystem are the new areas of study which are broadly concerned with interaction and interdependence of organisms and environment. The theme and concepts which have been interpreted according to their own but theme and concepts are applicable also to interpret educational concepts. Education is also an applied aspect of ecosystem.

Recently in the discipline of education, new concepts of organizational climate and organizational health of educational institutions have evolved. A school is the functional unit of education process which has its own input as the man power of teachers and output in terms of students' results and performance in co-curricular activities. It is also called as the productivity of the school. The organizational climate of school or college includes physical, social and cultural environments which are mainly created by the psychology of the head of institution. The teachers and head of institution are the energy or power components. If head of institution is changed the whole organizational climate is changed. Similarly in the classroom, the teacher generates social and emotional climate by performing certain activities in which students gain new experiences which result in desirable behavioural changes. The school has its own ecosystem which is governed by the principal and classroom unit has its own ecosystem which is regulated by the teacher.

The term 'feedback' has been widely used in teaching and instruction. It is a device for providing energy in the instruction and teaching system for realizing the objectives of education.

2.7 Difference between Ecology and Ecosystem

Ecology	Ecosystem
1. It is a science of environment. 2. It is the study of population and communities as whole. 3. It has two components- organisms and environment. 4. It includes structure and functions of environment. 5. It is composed of biotic and abiotic components. It includes biological and physical components. 6. It is the science of ecosystems. 7. The analysis of relationship between organisms and environment is done in ecology 8. The ecology is science and art. It is also considerable philosophy 'world of life' 9. It is a science of all relations of all organisms to all their environment. 10. Ecology concerns with welfare of organisms and man-kind but not energy. 11. It is the study of change and development of vast nature. 12. It usually refers to organism and environment.	1. It deals with a system of a environment. 2. It is the study of an organism with reference specific time and space unit. 3. It has three components: organism, environment and energy. 4. It concerns with a functional unit within a given time unit. 5. A system is composed of physical, chemical and biological process (material and energy) with in a space time unit. 6. It is an important ecological unit. 7. It attempts to analyze the relationship and interdependence of any system within space and time unit. 8. Ecosystem is purely science which helps in controlling and regulating the system. 9. It is applied science of organisms to his environment within space time unit. 10. It is open system of input and output of matter and energy 11. It has its own productivity ie, role of growth of organism matter in space-time per unit 12. It generally refers to a organisms its environment and energy.

2.8 Summing Up

- The two terms 'Ecology' and 'Ecosystem' are most important and basic for the understanding of environment. Sometimes these terms are used interchangeably or for the same meaning but these have different meanings. Ecosystem is considered a unit of Ecology. The word meaning- 'Eco' means environment, 'logy' means science and 'system' refers to interaction and interdependence of organisms and environment. 'Ecology' means the science of environment

whereas Ecosystem means environmental system of particular place and in a unit time.

- The scope of ecology is very vast. Early scientists have classified ecology into two major types- animal ecology and (ii) plant ecology. When equal emphasis is give to animals and plants, it is termed bio- ecology. Ecology is broadly divided into two types. 1. Auteecology and 2. Synecology.
- There are different types of ecosystem of nature. They are :1. Permanent and Natural ecosystem, 2. Temporary and Natural ecosystem and 3. Artificial or Anthropogenic ecosystem.
- Education is an independent field of study. It is science as well as art. The teaching is an art and learning is the science. The teaching is the doing or action part whereas learning is the understanding aspects in the educational process. Ecology has also both doing and understanding aspects. Education is also philosophy which helps in formulating aims and objectives for the human welfare whereas ecology interpret world of life in terms of natural processes.
- The ecology and ecosystem are the new areas of study which are broadly concerned with interaction and interdependence of organisms and environment. The theme and concepts which have been interpreted according to their own but theme and concepts are applicable also to interpret educational concepts. Education is also an applied aspect of ecosystem.

2.9 Questions and Exercises

A. Long Questions

1. Define the term 'Ecology' and enumerate its characteristics. Justify that it is science as well as art.

2. Indicate the main objectives of ecology. Describe the areas of study of Ecology Enumerate the branches of ecology and their areas of study.
3. Enumerate the principles of ecology which govern the various aspects of environment and organism.
4. Describe various methods qualitative and quantitative, which are employed in ecological studies.
5. Define and illustrate the term 'Ecosystem'. Enumerate the characteristics of ecosystem. Describe the relationship between ecology and ecosystem.
6. Enumerate the types of ecosystem and indicate the basis of classification of ecosystem. Mention the components of ecosystem and their types.

B. Short Questions

1. Enumerate the characteristics of Ecology.
2. Indicate the main principles of Ecology.
3. Differential between ecology and eco-system
4. Enumerate the methods of ecology.
5. Indicate the features of ecosystem.

2.10 References and Suggested Readings

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UNIT- 3

MAN AND ENVIRONMENT

Unit Structure:

- 3.1 Introduction
- 3.2 Objectives
- 3.3 Relationship between Man and Environment
- 3.4 Approaches of studying Man and Environment
- 3.5 Influence of Man on Environment
- 3.6 Psychological or Behavioural Environment
- 3.7 The Propositions for the Interaction between Man and Environment
- 3.8 Summing Up
- 3.9 Questions and Exercises
- 3.10 References and Suggested Readings

3.1 Introduction

As you know that since the dawn of civilization there has been interference of man with nature. The prehistoric man, being persistent forager and inexorable hunter, exploited the resources of nature. He moved from place to place after depleting resources and accumulating waste. However, the earth's environment was not significantly altered because the technology of early man was limited and his population was very small. Whatever damage was afflicted to the environment, nature was able to repair it. As the population grew, modern industries came up along with agriculture and man started influencing the environment with an awesome control to transform the future of the earth. To provide food to the growing population man has taken advantage and maximally utilized all accessible resources with no consideration towards nature. Man's interest for development lead to cutting of forests,

lakes became toxic with hazardous chemicals and harmful gases polluted the air. Pollution has made the air, water and food unfit for human consumption, and global warming has put the survival of man in danger.

The development has made man to turn towards resources, for example, wood, coal, minerals and fossil fuels. He became the boss of energy and substance eventually becoming exploiter of the environment by holding a control to alter the fate of the planet earth. The transformation from huntsman economy to that of agriculture and industry noticeably affected the natural environment. Changes in the roles of man in the environment have laid grave demands on air, water and natural resources. Man's control over the environment, in fact weakened the connection between him and environment, and he started to disconnect himself and began to consider himself separate and superior to nature. It is in this context that we must understand the basic principles of ecology and environment so that we may find sustainable solutions to the problems faced by the modern man.

The welfare and respect of natural ecosystems and the biophysical environment are vital to the health and well being of human population. The inference for individual is not limited to corporal health and happiness, accessible to pure air and water, food, but comprises emotional need and promotes considerations involving a range of progress, promoting capability and care-giving practices in natural environments, such as creating individuality, re-establishment, leisure, association, and motivation. Similarly, awareness on environmental degradation and loss can show the way to distress, nervousness, blame, annoyance, vulnerability, fear and negativity. Environmental problems are, ultimately, problems of human behaviour. Specific attention will be given to the difference between individual and collective interests (social dilemmas), which

play a role in a series of environmental matters, choices from the number of parking places in a neighborhood to the greenhouse effect. Individual behaviour with environmental consequences should be analysed from a social-psychological perspective.

3.2 Objectives

After going through this unit you will be able to-

- *know* the relationship between man and environment;
- *describe* various approaches of studying man and environment;
- *understand* what is Psychological or Behavioural Environment;
- *identify* different propositions for the interaction between man and environment.

3.3 Relationship between Man and Environment

Man ever since he appeared on earth, became a part of his environment so we can say that interaction between man and the environment has existed since human beings first appeared on earth. Man is an important part of the biotic component of the environment and simultaneously he is also an important factor of the environment. Thus man plays important roles in the natural environmental system in different capacities such as 'biological or physical man', 'social man', 'economic man' and 'technological man'. All the natural functions of human beings such as birth, growth, death, health, are affected and determined by the natural environment in the same manner as in the case of other organisms but man being most developed and advanced animal, both physically and mentally and hence technologically, is capable of making substantial changes in natural environment so as to make it suitable for his own living. The role of most primitive biological or

physical man in the function of natural environmental system was fundamentally that of user of environmental resources and thus he played the role of a factor of the environment but as the skill and technology of man developed his roles towards natural environment also changed progressively such as from user through modifier and changer to destroyer of the environment.

Man's capacity to adjust his relationship with the natural and man-made (i.e, social and cultural) environment, and to transform the environment itself has passed through various phases. The present period of human history is characterized by the rapid development of those productive forces through which the scientific and technological revolution, promoting socio-economic progress in every possible way, provides powerful means of affecting the environment. With the help of science and technology, man overcame the natural barriers and established his supremacy over nature. He can travel from one part of the world to the other part, in a matter of a few hours, undertake journey to outer space and planets, dive down to the bottom of seas and explore the wonders there and so on. But at the same time, the environment became more and more degraded and polluted. As a result of man-made activities like deforestation, industrialization, urbanization etc, the quality of the environment suffered which has threatened the survival of man himself on earth.

The progress of science and technology has supported the creation of industrialized society which in turn has fostered the mass production of material goods and also spurred mass urbanization. Among many factors these two are also largely responsible for unprecedented amount of human waste and pollution which have contributed significantly to the degradation of the environment. Infact, the whole ecological system is in danger of being disturbed in our mindless exploitation of natural resources which many bring

miseries to our younger generation in the not too distant future. We have to realize that the universe is a vast inter-locking system comprising all humanity in its natural environment.

So, it is the technology of man which has drastically changed the man-environment relationship from prehistoric period to the present most advanced industrial period. Infact, the industrial and scientific revolution have lead to rapid changes in our environment but all technology, from the most primitive to the most advanced, causes some changes in the environment. It may also be stressed that religious ideas and materialistic outlook of man have also played significant roles in changing man-environment relationship on larger scale. Modern technological man, intoxicated by highly advanced technology and materialistic view points, has changed and is changing the environment for his vested interests to such an extent that even the very existence of human beings is threatened.

Thus if you look at historical progression of man-environment relationship it becomes clear that purely natural relationship between 'physical primitive man' and natural environment during prehistoric period has changed to hostile relationship between 'technological man' and the environment at present. This substantial change and shift in the nature and magnitude of man's interactions with the natural environment posed problems of serious consequences because the changes affected by man in the environment have become unadjustable by the inbuilt self-regulatory mechanism of the natural environmental system/ecosystem. The study of changing relationship between man and environment in historical perspective may help in demonstrating the increasing adverse impact of human activities on the environment.

STOP TO CONSIDER

Man plays important role in the natural environmental system in different capacities such as 'biological or physical man', 'social man,' 'economic man' and 'technological man'. All the natural functions of human beings such as birth, growth, death, health, are affected and determined by the natural environment in the same manner as in the case of other organisms but man being most developed and advanced animal, both physically and mentally and hence technologically, is capable of making substantial changes in natural environment so as to make it suitable for his own living.

3.4 Approaches of studying Man and Environment

The concept of environmental science and relationship between man and environment has been changing through time with the development of human society and components of environment. Some of the important approaches to study the relationship between man and environment from the ecological and psychological perspectives are as follows:

1. Environmentalistic or Deterministic Approach:

The main proposition of this approach is that physical environment has complete control on man and his activities. According to this approach, man is subordinate to natural environment in all aspects of human life-physical health, body formation, social, economic, political, cultural, ethical and aesthetic, etc.

2. Possibilistic Approach:

The main proposition of this approach is that man has the capacity and potentialities to mould and modify the natural environment in his own ways. Human ecology pleads for the study of mutual interaction between man and environment or man's cooperation with nature.

3. Economic Deterministic Approach:

This approach is based on the proposition of man's mastery over environment and continued economic and industrial development by employing modern technologies. This quality of environment is placed at lower priority in planning economic and industrial projects. The approach has accelerated the exploitation of natural resources which has created most of the ecological problems of global dimension.

4. Religious or Teleological Approach: The main proposition of this approach is that man is superior to all creatures and everything is created for his use and recreation or enjoyment. This ideology of man towards the environment fostered the man to exploit natural resources rapidly without considering the after effects of reckless and uncontrolled plundering of natural resources.

5. Ecological Approach: Man is an integral part of his environment or nature. The relationship of man with environment should be symbiotic and not suppressive and exploitative. Ecological approach to the study of man-environment relationships is based on the principle of ecology which is the study of mutual interactions between man and physical environment in a given ecosystem. This approach recognises that man is most skilled as well as intelligent among all creatures of earth. It lays stress on restrained use of natural resources with appropriate environmental management programmes, policies and strategies so that quality of the environment can be maintained. The basic principle of this approach is that there should be harmony and coordination between man and nature or environment. The mutual interactions and

relationship between man and environment is symbiotic in character.

Check Your Progress

Q. What type of relationship have you perceived in ancient times?

Q. Write any two approaches of studying man and environment.

- **An Appraisal of Environment**

The proposition of existentialism is that "environment taken itself is a meaningless phrase; without an environment does not exist. The man recognizes the existence of environment or nature. The emphasis was shifted from natural environment to social, cultural and dynamic forces or technological development.

The physical factors include the food habits and the consequent effects on the rate or birth rate in the different regions. The fertility depends on the proteins quantity in food stuff.

Environment determinism is being criticized on the basis that man makes his own history, culture, language literature and civilization under definite conditions and his environment. Determinism's major draw-back is that it ignores cultural factors that affect human behaviour and activities. In the similar climate and landforms man has different culture and dissimilar similar societies.

Environment influences man and man in turn changes his environment and the interaction is so complex that it is difficult to know when one influences ceases and other begins.

Man's relations to his environment are numerous, infinite and complex than those of the most highly organized plants and animals. The relations are so complex and varied in nature that they require

necessary objects of special study. Man claims that he conquered nature but nature is silent in persistent influences over man. Works of man reveal many facts for which environment forces alone cannot give satisfactory explanation. Man is the product of his environment but the creation of his social rules and traditions.

The essence of man's relation with environment can be summarized as follows:

"Nature does not drive man along a particular road but it offers a number of opportunities from among which man is free to select."

The most important fact is that 'the freedom of man to choose. Man himself brings his influence to bear on that environment and change it. Nature is never more than an adviser. Man follows nature only if he is wise enough.

- **Social or Cultural Determinism**

The modification of an environment mainly depends on our ideas, values, perceptions and decision making processes. "Our thoughts determine our acts and our acts determine the previous nature of the world." There is great variation in human interest, desires, prejudices and values among people of the world. This proposition advocates, "Significance of man of the physical and biological features of his habitat is a function of the attitudes, objectives and technical skill of man himself."

Social determinism does not adequately assess the environmental factors, i.e., the influence of natural environment upon cultural differences. It is also rigid and therefore it can not be accepted in its crude form.

- **Humanistic Philosophy**

It is another philosophical approach to state the relationship. It gives central role to human awareness or experience, consciousness and creativity. According to this approach man has a central position. It is more close to existentialism. The human experiences, experiences provide the awareness about environment on earth. This philosophical approach gives much more weightage to man rather than nature. The existence of nature is due to human experiences and expression. Man finds values and goals in his experiences and expression. Man finds values and goals in his experiences which is the advancement of human knowledge. If man finds values and goals in his environmental awareness, is known as environmental education.

3.5 Influence of Man on Environment

Human ecology provides the understanding of the reciprocal interaction of man and environment. The history of India classics- philosophers and thinkers had the knowledge of human ecology. They have revealed in their writings in the *vedas*, *upanishads*; *puranas* and epic literature. Our two great epics- *Ramayana* and *Mahabharata* have shown their ecological awareness at several occasions. *Kalidas* has also shown his ecological understanding in his writings such as '*Meghdoot*' '*Ritusamhar*' and *Abigyanshakuntalam* and Kautilya's *Arthashastra*. Charak considered the important factors of *Vayu* (air and gases) *Jala* (water) *Desha* (topography) and *kala* (time) in regulating the life of plants.

Determinism and possibilism are the two extreme approaches dealing the concept of 'Man and Environment. The eclectic approach appears to be tangible to deal this concept, ie., mutual interaction between man and environmental. Nature influences both man and environment. Man cannot prevent himself from these

events. He can forecast for the precautionary measures and can prepare himself for the relief measures. Man has in environmental problems. Man induced impact on environment can be prelude by employing various types of measures, legal and administrative steps. The influence of man on environment has the following propositions.

- **Human Activities**

The earth history, the forces of environment change have been the natural agents like earthquakes, volcanoes, floods, fire, storms. They produce dynamic ecosystem to maintain balance. Human agencies of environmental change have only become significant in the last ten thousand years or so, but as technological advances have made their impact tremendously increased. Most of the environmental change has taken place as man has started to exploit the natural resources. Thus one of the major reasons of man-induced change is to manipulate energy transfer and expansion of human population. In the following paragraphs, the human factors and activities have been enumerate and discussed which have induced or are responsible for the environmental change.

Man made sources or human activities are such as urbanization, industries, factories, aircraft, automobiles, nuclear experimentation, agriculture, power plants, tourism, means of recreation and social functions. These human activities influence the environmental components, air, water, soil, noise, radio-active and solid waste. Human activities degrade the quality of the environment.

3.6 Psychological or Behavioural Environment:

The influence of environment on man can be assessed in terms of psychology or behaviour of the man. Human perception is condition for the active process of decision making. The environmental

perception is both factual experiences and a directive for human activities. It depends on the organization or cognitive maps of a person. It is also termed as a field or life space of a person.

The concept of psychological environment was developed by Kurt Lewin, the Gestalt psychologist. It holds the view that a person lives simultaneously in different environments- physical, social and psychological environment. We perceive the same phenomenon but have different meaning because every person has his own psycho-physical field or environment. It is the environment in which rational behaviour begins and decisions are taken, which may or may not be translated into overt action or behaviour in the phenomenal environment. The behavioural environment is the product of the interaction of reality and cultural values. Human actions are guided by psychology field not by physical environment. Two factors are taken into account by Gestalt psychology. These are-(a) Experience or content and (b) Situation or environment or context. Experience or content has its meaning only in the context or relevant environment.

But Behaviourists take into account only situation or environment and do not consider the experience or the perception which is more meaningful for human activity. Every person reacts according to his own perception and experience gained through the situation. Watson's strongest claim for environment is that he could guarantee, if given free hand in controlling the environment, to take any normal child and train him or make him whatever type of specialists we want. Gestalts has attempted to establish relationship between man and his environment. Behaviourists do not help in this context. Thus, behaviourists take into account situation or environment rather than experience while Gestalts take into account both experience and situation.

STOP TO CONSIDER

Human ecology provides the understanding of the reciprocal interaction of man and environment. The history of India classics-philosophers and thinkers had the knowledge of human ecology. They have revealed in their writings in the *vedas*, *upanishads*; *puranas* and epic literature. Our two great epics- *Ramayana* and *Mahabharata* have shown their ecological awareness at several occasions. Kalidas has also shown his ecological understanding in his writings such as '*Meghdoot*' '*Ritusamhar*' and *Abigyanshakuntalam* and Kautilya's *Arthasastra*. Charak considered the important factors of *Vayu* (air and gases) *Jala* (water) *Desha* (topography) and *kala* (time) in regulating the life of plants.

CHECK YOUR PROGRESS

- Q. What is the essence of man's relation with environment?
- Q. How ecological awareness to place in *Ramayana* and *Mahabharata*?

3.7 The Propositions for the Interaction between Man and Environment:

The concept of "Man on Environment" is based on the following propositions:

1. Man is no longer the product of his environment. He is also its creator and transformer. Man dominates the ecology since his origin on earth.
2. Environmental change is a continuous process which is operating since the origin of man on earth. The change is occurring due to natural forces and man's activities.

3. Human beings must always have been concerned with their environment since it has been their immediate surroundings that provide the resources essential for their survival.
4. The factors and forces of environmental change are several and the processes involved in this change are very complex.
5. The climate and humans are two major forces for the environmental change which directly influence the process operative in environmental systems.
6. The changes are gradual and imperceptible or intrinsic. All natural systems are in a state of dynamic equilibrium. These systems have both resistance and resilience to change.
7. Man becomes a powerful force or agent to change in the global environment. The degree and extent of man's impact on environment may be appreciable due to certain significant contributions or positive feedback. Man is the most powerful present creator of environmental change.

3.8 Summing Up

The historical progression of man-environment relationship it becomes clear that purely natural relationship between 'physical primitive man' and natural environment during prehistoric period has changed to hostile relationship between 'technological man' and the environment at present. This substantial change and shift in the nature and magnitude of man's interactions with the natural environment posed problems of serious consequences because the changes affected by man in the environment have become unadjustable by the inbuilt self-regulatory mechanism of the natural environmental system/ecosystem. The study of changing relationship between man and environment in historical perspective

is helpful in demonstrating the increasing adverse impact of human activities on the environment.

The concept of environmental science and relationship between man and environment has been changing through time with the development of human society and components of environment. Some of the important approaches to study the relationship between man and environment from the ecological and psychological perspectives are as follows: Environmentalistic or Deterministic Approach, Possibilistic Approach, Economic Deterministic Approach, Ecological Approach and Religious or Teleological Approach.

Man made sources or human activities are such as urbanization, industries, factories, aircraft, automobiles, nuclear experimentation, agriculture, power plants, tourism, means of recreation and social functions. These human activities influence the environmental components, air, water, soil, noise, radio-active and solid waste. Human activities degrade the quality of the environment.

3.9 Questions and Exercises

A. Short Answer Questions:

1. Explain the concept of Man and Environment.
2. Enumerate the approaches of studying man and environment.
3. Indicate human activities which influence the environment.
4. Enumerate the proposition for interaction between man and environment.
5. Indicate the impact of man on his environment.

B. Long Answer Questions:

1. Define the term 'Humane Ecology'. Explain the concept of 'Man and Environment'. Describe the approaches of studying Man and Environment.
2. Indicate the influence of man and environment. Enumerate the human activities which influence the environment.
3. Describe the assessment impact of man and environment, Suggest some measures for assessing this type of impact.
4. Enumerate the approaches of studying Man and Environment. Describe the main features Ecological approach.
5. Explain the term psychological environment. Indicate the propositions for the interaction between Man and his Environment.

3.10 References and Suggested Readings

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UNIT- 4

INTERDEPENDENCY IN ENVIRONMENT

Unit Structure:

- 4.1 Introduction
- 4.2 Objectives
- 4.3 Functional Aspects of Environment
- 4.4 Ecological Production and Productivity
- 4.5 The Food Chains and Food Webs
- 4.6 Factors Affecting Food Chains and Food Webs
- 4.7 Role of Education
- 4.8 Summing Up
- 4.9 Questions and Exercises
- 4.10 References and Suggested Readings

4.1 Introduction:

Ecology is a vast and encyclopedic biological subject. It is the study of ecosystems of the interaction between living organisms and their environment. The Environment include all the surrounding physical and biological factors. The factor is any external force, substance of conditions that affects organisms in any way. These physical and biological factors are interacting and maintain ecological biological, factors are interacting and maintain ecological balance.

The ecosystem is any organizational unit which includes living organisms and non-living substances interacting to produce an exchange of materials, the living and non-living parts. The ecosystem has two aspects-structural and functional aspects. The interdependence in environment deals the functional aspect of ecosystem. An ecosystem contains various population of different types of plants, animals and microbes, all are interacting with one

another as community and with the physical environment as well. The different species living in different habitats, eat different foods and live with different styles. Thus each organism in a community has unique ecological niche. It includes not only the physical space occupied by an organism but also its functional role in its trophic position and its position in environmental factors-temperature, moisture, soil and other conditions of existence. This interdependency in environment reveals the life-forms of the plants which influence the nature and life cycle of animals.

An ecosystem includes abiotic and biotic factors. The main abiotic factors are climate factors as light, fire, pressure, geomagnetism; chemical factors as acidity, salinity and inorganic nutrients required by plants. The biotic factors of ecosystem are all living organisms as plants, animals bacteria and viruses.

4.2 Objectives

After going through this unit you will be able to-

- *understand* various functional aspects of environment;
- *know* the ecological production and productivity;
- *analyse* the concept of Food Chains and Food Webs;
- *discuss* the factors that Affect Food Chains and Food Webs;
- *describe* the role of education in Food Chains and Food Webs.

4.3 Functional Aspects of Environment

The interdependency of abiotic and biotic factors provides the functional awareness of an environment. The ecosystem is divided into three types of organisms from the energy point of view-producers, consumers, and reducers. Photosynthetic algae (plants

leaves), plants and bacteria are the producers of the ecosystem. These producers provide the food to all the organisms directly or indirectly. Consumers are herbivorous, carnivorous and omnivorous animals. The consumers eat the organic matter produced by other organisms. Species are related to their feeding behaviour in food chain or food web or food cycle.

1. Food Chain- The process of transfer of energy from producers to consumers and then to decompose is called food chain. In the biosphere the energy flows from producers to primary consumers; from producers to primary; from primary consumers to secondary and from secondary consumer to decomposers, is known as food chain.

The consumer food chain includes the sequence energy flow- plants producers and Animals consumers.

Producers→Herbivore→ Carnivore→ Reducer

(i) Grass →Sheep→ Lion

(ii) Grass→ Deer →Lion

The entire zone of water, air, soil which can sustain life is known as biosphere.

2. Biogeochemical Cycle- Organisms take inorganic nutrients from soil, water and air; they eliminate their wastes and their bodies are rendered into inorganic molecules once again. Thus water and minerals shuttle among air, land, and water with an occasional pause in an organism. Such cycling of nutrients in circular path in between biotic and abiotic components of the ecosystem are called biogeochemical cycles.

3. Biological Clocks- A biological clock is hypothetical internal mechanism by which an organism can keep track of time and

governs its activities. It is predictable for a given area and depends upon rainfall, temperature and soil conditions. It is an ecological succession change of organisms.

Ecology is broadly divided into two aspects-(a) Autecology and (b) Synecology.

a) Autecology- It deals with the ecological study of one species of organisms. Autecology is concerned with the study of the interrelations of individual organisms with the environment. Autecology is experimental and inductive.

b) Synecology- It deals with the ecological studies of communities of entire ecosystems. Synecology is philosophical and deductive. It is concerned with the study of groups of organisms-the community, hence, it is called community ecology.

Autecology is concerned with the relationship of an organism to one or more variable such as light, temperature, moisture and salinity, is easily quantified and subject to experimental design both in the laboratory and in the field. Autecology has borrowed techniques from physical sciences. It has great significance in the following disciplines-economic botany, agriculture, horticulture, forestry, - economic zoology which includes fishery, pearl culture, animal husbandry, agriculture, sericulture. Autecology is also important for soil conservation and wild life conservation. It gives an idea of distribution, adaptation, speciation, etc. of a particular species. There is an intimate interrelationship between the individual organism and its surrounding environment. The life cycle of a plant is highly influenced by a number of environmental factors and conversely, species does modify continuously the environment. Autecology is based on the study of the ecological life history which is concerned with the activities of species throughout its life cycle and in relation to its adjustments to natural conditions.

Ecological Niche-The niche is the property of the community and it presents the place of the species in the formal community structure. The position of functional roles in the community can be considered as niches as the community can be viewed as an aggregation of niches. The term niche is used in the area of ecology for a variety of meanings.

STOP TO CONSIDER

The process of transfer of energy from producers to consumers and then to decompose is called food chain. In the biosphere the energy flows from producers to primary consumers; from producers to primary; from primary consumers to secondary and from secondary consumer to decomposers, is known as food chain.

4.4 Ecological Production and Productivity

The green plants use solar energy to convert carbon dioxide and water into carbohydrates and other biochemical molecules. The process of conversion of light energy into food or chemical energy is known as the photosynthesis. The organisms which produce their own food are known Primary Producer or Autotrophs. They are of two types-phototrophs and chemotrophs. The primary producers include chlorophyll in green plants, green purple bacteria, blue green algae and phytoplanktons. The production of organic matter or energy by autotrophic primary producers is termed Primary Production. The green plants involve the production activity of ecosystem.

The productivity of ecosystem depends on two factors.

- (i) The amount of solar radiation available to the autotrophic primary producers, and
- (ii) The efficiency of the plants to convert solar energy or light energy into food energy or chemical energy which is used by green plants to build up their tissues.

Biomass refers to the quantity or weight of living matter per unit area, per unit time and is represented in terms of dry weight. It includes plants and animals; therefore it is of two types-Plant Biomass and Animal biomass.

The productivity of ecosystem mainly depends on solar radiation and plants efficiency to use energy. There are abiotic factors-temperature, water, climate, chemical factors-nutrient supply.

Plant and grass are primary producers, because they convert solar energy into food.

Animals and insects are primary consumers, because they depend for their food energy on primary producers. The plants depend on solar radiation and physical components of the environment while animals and insects depend on plants and gas. There is interdependency among the environmental factors and also for the survival of the organisms.

Check Your Progress

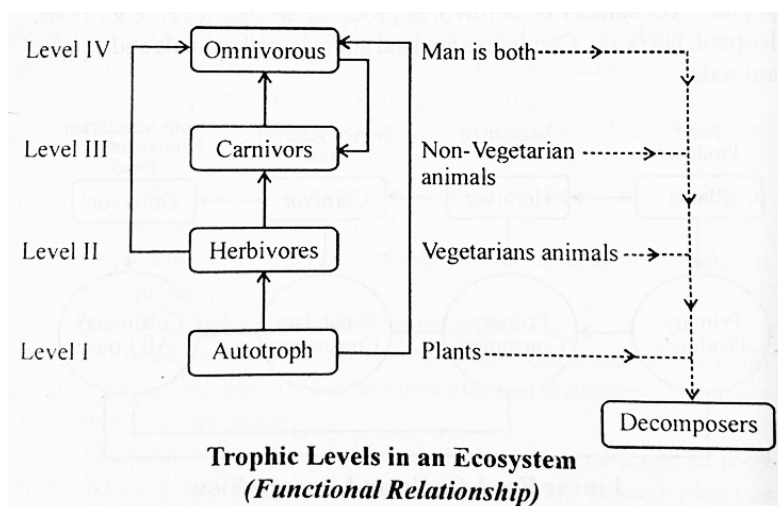
1. Explain the term 'food chain'.
2. What do you mean by biosphere?
3. The productivity of ecosystem depends.

4.5 The Food Chains and Food Webs

The green plants are the primary producers because they prepare their own food which is the main source of food energy for all types of organisms in the biosphere. Carbon dioxide is taken by plants from the atmosphere through their leaves in day time and inorganic matter and water are taken by the roots from the soils. Plants convert water and carbon dioxide into starch and sugar with the help of sun light. The process is known as photosynthesis. Thus the green plants are Primary Producers. Some animals depend on plants for their food is called herbivores. The animals take their food from animals is known as carnivores. Some animals depend on both, plants and animals for their food are termed as omnivores.

In the ecosystem feeding process takes place in hierarchical order. The food energy passes from one group of organism to another group are called *Trophic Level*.

The chain of transformation of food energy in the ecosystem from one group of organisms to the other group through a series of steps or levels is called food chain. The transfer of food energy from one group of organisms to the other group is called Trophic Level or Step. The four trophic levels of a food chain have been identified.



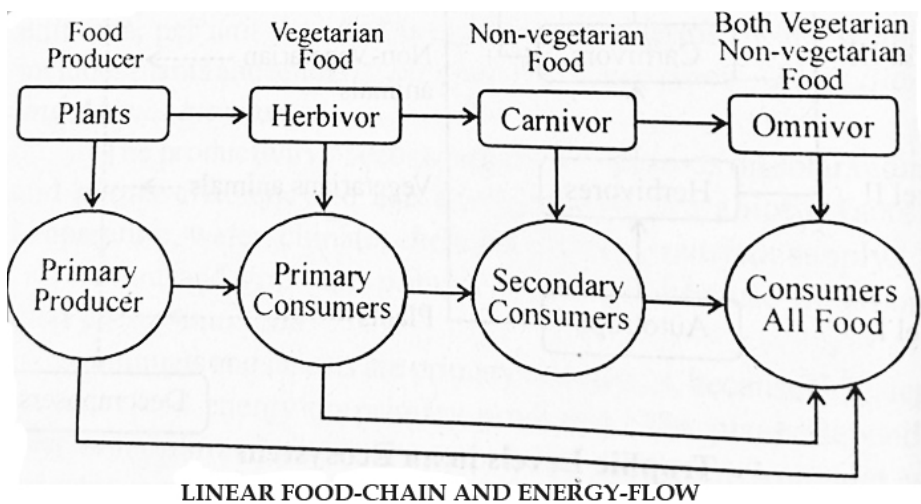
The linear food chain and energy flow have been explained in four trophic levels in the following paragraphs.

First Step of Food Chain-The base of the food chain in the primary producers is known first level of trophic. The green plants produce their food through the process of photosynthesis with help of sunlight, water, carbon dioxide and inorganic salts and consume the produced food energy to form their tissues and grow. This level is the source of food for all other organisms of the food chain.

Second Step of Food Chain-The organism do not produce their food themselves but depends on primary producer of first level for their food is known as second level of trophic or second step of food chain. The organisms or animals are called primary consumers (*Vegetarians*).

They basically depend on plants for their food, e.g., sheep, cow, goats, deers and rabbits. Such animals are known as *Herbivores*. The food energy passed on from primary producers to primary consumers is second level of the food chain. The animals are known as herbivores.

Third Step of Food Chain-The trophic level where energy is transferred from primary consumers to secondary consumers is called third level of food chain. Some animals depend on other animals, are known secondary consumers of carnivores, because they depend on primary consumers or herbivores group of second level, e.g., lions, leopard, bears etc. Carnivores are land animals, soil animals and aquatic animals.



Fourth Steps of Food Chain-The animals which take food either directly or indirectly from primary producers, primary and secondary consumers, are known as omnivores. Man is the most important member of the fourth level, because man takes food and fuel from the green plants, primary and secondary consumers. Decomposers also take their energy from all these levels.

A simple food chain is formed with the help of four steps. It is the sequence of energy transfer from lower levels to higher levels.

This chain may be summarized as follows-

- 1) Primary producers → Primary consumers → Secondary consumers → Higher secondary consumers.
- 2) Plants → Herbivores animals → Carnivores animals → Omnivores animals
- 3) Grass is eaten by sheep, cow, goats (primary- consumers) → Sheep, goats are eaten by → tigers. Lion (secondary consumers)
- 4) Vegetation → Vegetarian food → Non-vegetarian food → all the earlier food.

The food chain does not remain simple and linear in a natural ecosystem, sometime it becomes complicated by several inter-connected overlapping food chains. This happens when greater number of species feed on many kinds of prey. The complicated food chain is known as *Food Web*. The complicated food-web is in a polar or arctic ecosystems where there are several inter-connected food chains.

- i. Man eats caribou which feeds on grass
- ii. Man eats whales which eat crustacean which feeds on diatoms.
- iii. Man eats polar bear which feeds on crustacean which in diatoms
- iv. Man eats wolf and fox which eat hares which feeds on grass
- v. Man eats hares which feed on grasses.

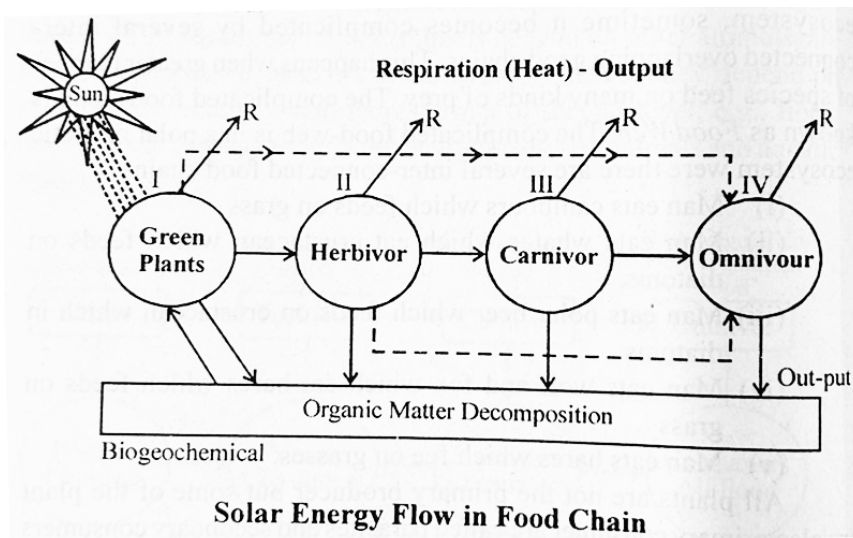
All plants are not the primary producer but some of the plants are also primary consumers are called parasites and secondary consumers are known as hyperparasites.

The solar energy passes through the hierarchy of levels of food chain and food web ultimately becomes output from the ecosystem as energy is lost through respiration from each level.

Thus, food chain and food web require sunlight or solar energy as a basic input which enters into the ecosystem. The plants are the primary producers which require sunlight, water and minerals for preparing their own foods. Thus, the food chain involves solar energy flow and biogeochemical cycle to maintain ecology balance. The brief description of energy flow and biogeochemical cycles have been given in the following paragraphs-

(1) Solar Energy Flow:

The plants prepare their food in sunlight with photo synthesis. It requires one percent solar radiation which is received on earth. This solar energy passes through the hierarchy of levels of a food chain and food web. The solar energy is a basic input and becomes output through respiration from each level of food chain. The process of formation of organic tissue which indicates the transformation of solar energy into food energy is known as biosynthesis. The process of decomposition of organic matter which refers to the release of nutrients and food energy in the form of heat, is called *biodegradation*. The transfer of organic molecules in the ecosystem is unidirectional or non-cycle which cannot be recessed.



The solar energy is received by green plants and its is used in photosynthesis to prepare food at level first. The solar energy is transformed into organic tissues. It is the source of energy directly to the vegetarian animals of second level which are the primary consumers. The plant energy is transferred to plant-eating animals

are known as herbivores. The organic tissues are formed among herbivores by eating plants.

The stored energy in the bodies of herbivores now becomes the source of energy for carnivores animals at the third level of food chain. Some part of chemical energy is lost through respiration from herbivores at second level of food chain. The animals consume energy for their movement for getting food from green plants. The carnivores eat herbivores at third level of food chain, thus some part of potential energy is lost by herbivores. Some part of energy is released by herbivores as wastes and their dead bodies decompose in soil.

The stored energy in the bodies of carnivores now becomes the store house of energy for omnivores which eat both plants and animals, man is most important example of omnivores at the fourth level of food chain. The animals of the fourth level take energy from both primary producers (plants) and herbivores (animals), i.e., first and second levels of food chain. Some part of energy is released by respiration of omnivores, their dead bodies are decomposed in soil by the decomposers. The omnivores take their food directly from plants and herbivores and also from carnivores. Thus there are three ways of flow of energy under food chain and food web in a natural ecosystem- First way is as follows-

First Path-The chemical energy flows in a hierarchical order,

i.e. I level → II level → III level → IV level

Second path-The chemical energy flows in a bypass manner,

i.e. I level → IV level or II level to IV level.

The second way of flow of energy is that animals of all levels release energy by respiration as heat which is lost in the atmosphere as output which cannot be recycled.

The third way of transfer of chemical energy from dead bodies of animals and waste of plants are decomposed in soil by the decomposers at all levels of food chain. The chemical energy which is transferred by decomposers can be recycled by plants. Thus, there is cycle of flow of chemical energy.

(2) Biogeochemical:

Cycles in Food Chains-The biogeochemical cycles include the intake of inorganic elements by plants through their roots in solution form the soils where these inorganic elements are stored. The nutrients are taken up by plants through the process of osmosis and prepare their own food. The chemical energy is transferred to the higher levels along the food chains and food webs through flow of energy. The nutrients are used and assimilated in developing plants tissues and their bodies. When these are transferred and assimilated among different animals of different levels of food chain or food webs are known as organic matter.

There are three cycles through which organic elements flow in a food chain or food web.

- i. The waste materials released by plants and animals such as leaves, dung, etc., are decomposed by bacteria decomposers, are again changed into inorganic elements which is again used by plants through the process of osmosis. It is first cycle of inorganic matter to organic matter and organic matter into inorganic matter in a food chain.
- ii. The dead bodies of animals and plants are decomposed by the bacteria on in to soil as inorganic matter. The organic materials are converted into inorganic materials in soil. It is the second cycle of biogeochemical energy.

- iii. The process of deforestation and burning of vegetation by lightning or accidental forest fire, the organic material are released to the atmosphere and again fall down on the ground surface, it become soluble inorganic form of element to soil which can be re-used by plants.

(3) The Carbon Cycle in Food Chains and Food Webs:

The carbon dioxide of the atmosphere is used in the biological cycles in food chain through the process of photosynthesis of green plants. The carbon, oxygen and hydrogen are combined by green plants with the help of sunlight and thus organic compounds are formed by the processes of osmosis and photosynthesis of green plants.

Thus carbon dioxide assimilated by green plants is stored in the form of body's tissues. The green plants produce the carbohydrates as chemical energy which is consumed by herbivorous animals of the second level of food chain and by omnivorous animals at the fourth level. The animals release carbon dioxide during respiration. The fallen leaf, animals carbon and carbon dioxide are returned to the atmosphere. The decomposers release carbon in gaseous form through respiration and dead organic tissues.

(4) The Oxygen Cycle in Food Chain:

Oxygen is very essential for the living organisms because they cannot survive without oxygen and plays a significant role in the biosphere. It is very active gas because it combines with majority of the elements in the biosphere. It is produced through the process of photosynthesis by the green plants of different ecosystems and enters into the atmosphere. The atmospheric oxygen is used by the plants and animals during the process of respiration. The process of

respiration among green plants takes place during night-time. Thus the oxygen cycle includes the input of oxygen to the atmosphere by the photosynthesis of green plants of different ecosystems and enters into the atmosphere. The atmospheric oxygen is used by the plants and animals during the process of respiration. The process of respiration among green plants takes place during night-time. Thus the oxygen cycle includes the input of oxygen to the atmosphere by the photosynthesis of green plants and output of oxygen to the atmosphere through respiration of plants and animals in the food chain and food web.

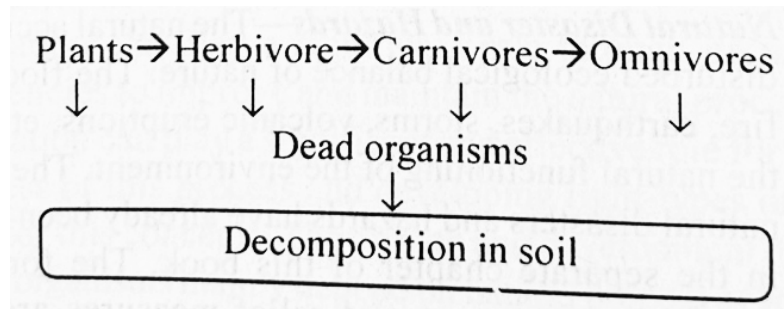
(5) The Water Cycle in Food Chain:

The water oxygen, hydrogen and carbon are the most essential elements for the survival of living organisms-plants and animals. These elements constitute 90 percent of the organic matter in the biosphere. Hydrogen in the form of water and oxygen together constitute 80.5 percent of the total weight of all the living organisms. The water is the combination of hydrogen and oxygen which enters into the biosphere and goes out of the biosphere in the form of moisture mainly in liquid form. The food involves the major part of water. The hydrogen cycle also represents the water cycle in the food chain and food webs. The water cycle is regulated by the solar energy.

(6) The Phosphorous Cycle in Food Chain:

The phosphorous is the most important second level substance in the biosphere which is most essential for the growth and development of organisms. It has very limited gaseous phase and has the main phase in the biogeochemical cycle.

The plants take up phosphorous in the form of inorganic phosphate from the soils through their roots by the process of root osmosis. The inorganic phosphates are converted into organic forms into the plants which are circulated in the food chain through different levels.



Thus, the phosphate is returned back to the soils when dead organisms and their wastes are decomposed by soil organisms. The organic compounds of phosphate are returned to the soils when these are again converted into mineral forms. This cycle is completed after a long time. The phosphorus cycle is slow and gradual.

4.6 Factors Affecting Food Chains and Food Webs

The biosphere usually contains several kinds of food chains, food webs and ecosystems. Many of these are interconnected by one or more species which is more than one food chain to form food web. These involve energy flow, bio-chemical cycles, hydrogen, carbon and oxygen cycles. There is interdependency between biotic, abiotic and solar energy which maintains the ecological balance in nature. There are several factors which are affecting the food chains and may be broadly classified into two categories: (i) Human Activity and (ii) Natural Disasters and Hazards. Another way to classify these factors may be the food chains.

(1) Disturbance of food chain and (2) Quality of food.

Both types of the factors are interrelated and interdependent which ultimately affect the quality of food. The description of these factors have been given in the following paras-

1. Factors Disturbing the Food Chain-The food chains are disturbed by human activities; natural disasters and hazards.

(a) Human Activities- Man is trying to exploit the natural resources through industrial development, transportation and automobiles, deforestation, agricultural development use of chemical fertilizers and pesticides indiscriminating hunting animals, development of tourism, power plants, explosion of population, urbanization. These human activities have polluted heavily the environment, i.e., air, water, soil which have disturbed ecological balance and natural food chains.

(b) Natural Disaster and Hazards-The natural accidents also disturbed ecological balance of nature. The floods, forest fire, earthquakes, storms, volcanic eruptions, etc. Disturb the natural functioning of the environment. The affects of natural disasters and hazards have already been discussed in the separate chapter of this book. The forecastings preventive measures and relief measures are used to maintain the ecological balance of natural.

2. Factors affecting and Quality of Food-Human activities and natural hazards not only disturb the ecological balance but also deteriorate the quality of food even for primary producers.

These may be of two types (a) Human activities and (b) Natural disaster and hazards.

(a) Human Activities- Man is trying to utilize natural resources as for as possible. There is explosion of human population which has increased the pressure on the natural resources through technological, industrial and agricultural development. The chemical fertilizers are used to produce crops of high yield. The pesticides are used to protect the food crops from harmful bacteria. It has increased the per acre yield of the food crops but deteriorate the quality of food. The natural process of food chain and ecological balance also maintain the quality food. The primary producers plants are affected by harmful bacteria, if pesticides are used to kill the bacteria, the herbivores take their food from plants, they also eat pesticides which are harmful to them. Thus the adverse effect of pesticides continues to the carnivores and to human beings whether they are vegetarian and non-vegetarian.

Human activities have polluted air, water and soil through the industrial wastes and water sewage. The normal water is not fit for drinking purpose. The quality of human food is deteriorating day by day. The wheat and other cereals are stored along with sulphur capsules which are highly poisonous.

(b) Natural Disasters and Hazards-They destroy the total ecology and food system. There are epidemics after disasters and hazards because of quality of food cannot be maintained.

4.7 Role of Education

Education can play a significant role through its formal and informal agencies to improve and maintain the natural process of food chain. Education can play a significant and effective role for providing the awareness of this process and developing right-types of attitudes and values for this concepts. The growth and development of man and

other living organisms mainly depend on natural process of food chains and food webs. Human activities can be restricted by forming legal laws, e.g., deforestation is crime, family size can also be limited. The fertile land cannot be used for industrial purpose, hunting or killing wild animal is also crime, etc. There should be an effective media in the country to forecaster about disasters and hazards-earthquakes, floods, storm, volcanic eruption, etc, so that precautionary measures can be adopted and immediate relief measure can be used quickly and effectively.

4.8 Summing Up

The formal system of education is classified into four levels, ie., primary, secondary, higher secondary and college and university levels. The awareness of this concept food chain and food webs may be provided at primary stage of students. The relevance for real-life situation can be emphasized at secondary stage. The conservation of natural resources are to be taught at higher secondary level. The solving problems and sustainable development attitude, values and appraisal should be emphasized at college and university level. It is an interdisciplinary concept, so it may be taught along related subject.

Now it is recognized that Environmental Education is an independent field of study or discipline. Some practical and field works should be organized to develop skills and understanding through the co-curricular activities, e.g. Scouting and Girls Guiding, N.C.C. camps and N.S.S. programmes so that an active participation in prevention and solving problems at their local level may be encouraged among the students. The educational programmes can promote the values and necessity of local and national levels.

At college and university level discussions seminars, workshops and conference should be organized of interdisciplinary nature. The experts should be invited for delivering lectures and deliberations. The field work and workshop should be given priority at this level.

There should be compulsory courses at B.Ed. and M.Ed level along with practical work on environmental problems. Teacher- education programme is also interdisciplinary in nature, therefore this concepts is best fit in. The methodology of teaching almost of all the subjects is taught at energy flow, water cycle, hydrogen, oxygen, carbon cycle, and biochemical cycle. The process of photosynthesis and osmosis may be given in science teaching subjects.

The formal and informal agencies of Education have the significant role to solve problems of food chains and food webs. Indian Environmental Society, adult education programmes, media and other social organisation are making efforts to provide the awareness to people of the country. These agencies are also doing field work in this context.

4.9 Questions and Exercises

A. Long Questions

1. Indicate the relationship between ecology and ecosystem. Enumerate the aspects of ecosystem and types of factors ecosystem.
2. Enumerate the functional aspects of environment. Explain the concept of interdependency in Environment.
3. Explain the concept of food chain and food webs in the light of interdependency of biotic and abiotic factors of the environment.
4. Describe the ecological production and productivity. Explain and illustrate procedure of food chain and food webs.

5. Describe the role of education in maintaining the natural process of food chain with special reference to formal and informal agencies of education.

B. Short Questions:

1. Explain the term 'food chain'.
2. Enumerate cycles of food chain.
3. Explain the term producers.
4. Indicate the meaning of consumers.
5. Explain the term energy flow.

C. True/False Questions

1. There are two levels of ecology. (True/False)
2. Man is omnivore consumer. (True/False)
3. Plants convert solar energy into food energy. (True/False)
4. There are four levels of food chain. (True/False)
5. Human activities don't influence food chain. (True/False)

Key: 1. True, 2. True, 3. True, 4. True, 5. False

Completion Types Questions:

1. Plants are the first..... in food chain.
2. Under the food chain man is consumer.
3. Generally solar energy is converted into energy by plants.
4. There are..... levels of food chain.
5. The food chain is affected byactivities.

Key: 1. producer, 2. omnivore, 3. food, 4. four, 5. man.

Multiple Choice Questions:

1. The food chain is affected by-
(a) Human activities (b) Natural events (c) Both the above (d) None of these
2. The first producer of food chain is the-
(a) Green plants (b) Animals (c) Man (d) Birds
3. The Solar energy is converted into food energy by the-
(a) Organizasm (b) Human beings (c)Plants (d) Birds
4. The Omnivor consumer is the-
(a) Green plants (b) Animals (c) Man (d) Birds
5. The Herbivor consumer is the-
(a) Cows (b) Deer (c) Rabbit (d) All the above
6. The Cornivor consumer is the-
(a) Deer (b) Lion (c) Cow (d) None of these
7. The main aspect of ecology is the-
(a) Autecology (b) Synecology (c) Both the above (d) None of these

Key: 1.(c) 2.(a)3. (c)4.(c)5.(d)6. (b).

4.10 References and Suggested Readings

1. Fien, J. 1992. *Education for the Environment: Critical Curriculum Theorizing and Environmental Education*. Melbourne:Deakin University Press.
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BLOCK- II

- UNIT- 1 ENVIRONMENTAL EDUCATION**
- UNIT- 2 ENVIRONMENTAL EDUCATION AS AN
INTERDISCIPLINARY SUBJECT**
- UNIT- 3 EDUCATION FOR ENVIRONMENTAL
AWARENESS AND ATTITUDE
CHANGE**
- UNIT- 4 STRATEGIES OF TEACHING
ENVIRONMENTAL EDUCATION AT
DIFFERENT LEVELS**

UNIT- 1

ENVIRONMENTAL EDUCATION

Unit Structure:

- 1.1 Introduction
- 1.2 Objectives
- 1.3 Meaning and Definition of Environmental Education
- 1.4 Nature of Environmental Education
- 1.5 Objectives of Environmental Education
- 1.6 Guiding Principles of Environmental Education
- 1.7 Importance of Environmental Education
- 1.8 Summing Up
- 1.9 Questions and Exercises
- 1.10 References and Suggested Readings

1.1 Introduction:

Dear learners, in the first block you have studied about the concept of environment. In this block you will study environmental awareness through education. This block has been divided into four units. In the first unit you will study about environmental education: its meaning, definition, objectives and guiding principles.

In any country the rural people may have more direct contact with the natural resource. However, due to urbanization their contact with the surrounding is decreasing. Hence it is essential that man has to understand that his welfare depends upon the proper management and utilization of the resources. The people should understand their community and its environmental problems due to excessive use of pesticides, air and water pollution, traffic problems, community capabilities and lack of institutional arrangements and so on. For this there is a vital need for an educational approach that can

educate man regarding his biophysical environment and interrelated problems and create awareness to find solutions to the problems. Hence, there is need for methodological approach to educate the people and this is the role of Environmental Education.

Environmental education is the new areas of study of the discipline of education. With recent developments and advances, '*environmental education*' is virtually a new source of concern for educators, teachers and students. As with the rapid development in each area, there are problems – both internal and external ones- to be confronted and resolved.

The area of '*environmental education*' has been discussed thoroughly at several national and international seminars, workshops and conferences. Most of the people have recognized the urgent need of environmental education, but only some have clear ideas and understands about the meaning, purpose, need and the courses of education. Therefore, an attempt has been made in this unit to explain you about the meaning, nature, scope of environmental education. Moreover, it will also elaborate you to understand the objectives and guiding principles of environmental education.

1.2 Objectives:

After going through this unit you will be able to-

- *explain* the meaning of environmental education;
- *analyze* various definitions of environmental education;
- *know* the nature of environmental education;
- *identify* the objectives of environmental education;
- *know* the guiding principles of environmental education;
- *understand* the importance of environmental education.

1.3 Meaning and Definition of Environmental Education:

The term '*environmental education*' has been discussed in various national and international seminars who tried to define it. Some of the definitions of have been provided here to understand the concept.

"Environmental Education is the process of recognizing values and classifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among man, his culture and his bio-physical surroundings. It also entails practice in decision making and self formulation of a code of behavior about problems and issues concerning environmental quality".

UNESCO (1970) Working Committee:

"Environmental Education is a way of implementing the goals of environmental protection. It is not a separate branch of science or field of study. It should be carried out according to the principles of life-long integral education".-**UNESCO (1976), Seminar**

"Environmental education appears to be a process that equips human beings with awareness, knowledge, skills, attitudes and commitment to improve environment."-**Mishra (1993)**

"Environmental education refers to the awareness of physical and cultural environment and perceives its relevance for real life situation. The problems and issues are to be identified. The imbalances of environment are to be improved in view of sustainable development."-**R.A. Sharma (1996)**

"Environmental education involves a comprehensive, life-long education, one responsive to changes in a rapidly changing world. It prepares the individual and communities for life, through an understanding of the major problems of the interaction of the

biological, physical, social, economic and cultural aspects of the individual and communities. It provides skills and attitudes needed to play a productive role in improving life and values in order to enable people to enjoy good health and high quality of life."

The environmental education aims at developing in the child and awareness and understanding of the physical and social environment in its totality. Environmental studies involve a child's investigation and systematic exploration of his own natural and social environment and prepare him to solve the problems for improving his life.

Environmental Education is a process of providing learning experiences to obtain *knowledge, understanding, skills and awareness* with desirable *attitudinal* change about man's relationship with his natural and manmade surroundings which includes the relation of population, pollution, resource allocation, transportation technology and urban and rural planning to the total human environment. Environmental education must utilize diverse learning environments and a broad array of educational approaches to teaching learning about and from the environment with due stresses on practical activities and firsthand experience. It should help learners to discover the symptoms and real causes of environmental problems and thus to develop critical thinking and problem solving skills. Environmental education should be a continuous life-long process; beginning at the pre-school stage continuing should be interdisciplinary discipline in making possible a holistic and balanced perspective.

"Environmental education is problem-centred, interdisciplinary value-oriented, community-oriented, and concerns with man's survival as species, based on student-initiated activities and involvement present and future oriented."

"Environmental activities will lead to study of natural and physical sciences, social sciences. Construction and creative skills will provide the basis for the practice of healthy living will serve as the basis for the practice of healthy living and will serve as the basis of environmental education."

The study of natural and physical sciences, social sciences and geography provide the awareness of the environment but do not employ methods and techniques to improve the imbalances and prevent the deterioration. Similarly the study of psychology provides the awareness about learning but educational psychology provides the awareness about learning as well as practices the method and techniques for improving learning. The environmental awareness is limited to the understanding aspect while environmental education has role improving life and values.

1.4 Nature of Environmental Education

Environmental education is a component of education that enables and conscientize people about their biophysical environment. In the last few decades, the concern over the environment is raising. Due to the population growth rate, followed by unchecked development, the environment and resources are depleting. Further destruction of the environment can be avoided by creating greater awareness and thereby identifying major environmental issues and by developing strategies to protect the ecosystem.

In our country, we know that many communities do not participate in environmental issues mainly due to lack of awareness and information, which are needed for the sustainable development of the nation. This lack of awareness is leading to deforestation, soil erosion, pollution and so on. It is only through education, which is the 'key social' strategy for conservation that people can gain information and understanding of biophysical environment.

Environmental education enables people in acquiring an understanding of the environment, by developing a sense of responsibility toward environmental problems and able to implement the solutions to these problems (Harvey, Inhurry, 1980). Environmental education is needed not only for students but also for the whole society as everyone depends on the environment as the resource base. Everyone should be taught about judicious utilization of biosphere in order to maximize the benefit not only to the present generation, but also to meet the needs of the future generations. Environmental education helps to make people conscious about physical, social and cultural aspects of the environment.

STOP TO CONSIDER

The environmental education aims at developing in the child and awareness and understanding of the physical and social environment in its totality. Environmental studies involve a child's investigation and systematic exploration of his own natural and social environment and prepare him to solve the problems for improving his life.

1.5 Objectives of Environmental Education

Goals of EE are to develop a world population that is aware of and concerned about, total environment and its related problems, and commitment to work individually and collectively towards solution of current problems and the prevention of new ones (UNESCO, 1975) .

These are as follows:

A number of new objectives for developing environmental education at all levels in both formal and non-formal levels were formulated at the Thilisi Conference (UNESCO, 1977).

These are as follows-

These objectives were formulated to help social group and individuals towards the following aspects.

1. **Awareness** i.e. Acquire an awareness of an sensitivity the total environment and its allied problems.
2. **Knowledge** i.e. Gain a variety of experiences and acquires a basic understanding of the environment and its associated problems.
3. **Attitude** i.e. Acquire a set of values and feelings of concern for the environment and the motivation for active participation in environmental improvement and protection.
4. **Skill** i.e. Acquire skills for identifying and solving environmental problems.
5. **Evaluation ability** i.e. Evaluate environmental measures and education programmes in terms of ecological, economic, social, aesthetic and educational factors.
6. **Participation** i.e. provides an opportunity to be actively involved at all levels in working towards the resolution of environmental problems.

The objective of environmental education established by the Tbilisi Conference was to develop certain traits in the people and in societal organizations. They were:

- Fundamental acceptance to awareness of the environment and its association with the people.

- Social standards and attitudes which are in accord with the environmental value.
- Developing Skills to solve environmental tribulations.
- Capacity to appraise environmental actions and instructive programmes.
- An intellect of accountability and importance towards the environment so as to make certain suitable proceedings to solve environmental problems.

The conference has outlined a number of guiding principles to meet the above objectives:

- It focused on the nature of environmental education - as onward looking and as an incessant life long process, regard environment in its totality, and to follow a problem solving and interdisciplinary and multidisciplinary approach.
- It outlined the strategies for the support of environmental education at the national level.

It focused on the pre-service and the in-service training of teachers in environmental education, preparation of teaching material, and diffusion of information through mass media.

Check Your Progress

- Q 1. Define Environmental Education.
- Q 2. What are the basic principles of Environmental Education?
- Q 3. State the objectives of Environmental Education.

1.6 Guiding Principles of Environmental Education

The guiding principles of environmental education are as follows-

1. To consider the environment in its totality (natural, artificial, technological, social, economic, political, moral, cultural, historical and aesthetic).

2. To consider a continuous life process (from pre-school to all higher levels-formal as well as non-formal).
3. To be interdisciplinary in study approach.
4. To emphasize active participation in prevention and solution to environment problems.
5. To examine major environmental issues form local, national, regional and international point of view.
6. To focus on current, potential environmental situations.
7. To consider environmental aspects in plans for growth and development.
8. To emphasize the complexity of environmental problems and need to develop critical thinking and problem-solving skills.
9. To promote the value and necessity of local, national and international cooperation in the prevention and solution of environment mental problems.
10. To utilize diverse learning about environment and different approaches to teaching and learning about environment.
11. To help learners to discover the symptom and the real causes of environmental problems.
12. To relate environmental sensitivity, knowledge, problem- solving and values clarification at every grade level.
13. To enable learners to have and role in planning their learning experiences and provide an opportunity for making decision and accepting their consequences.

Apart from the guiding principles, the following are the basic principles of environmental education:

1. Environmental Education must be lifelong. We have to continuously upgrade our knowledge and skills to face the day to day challenges of environmental problems we come across. Through applying improved technology connected to the environment the ability of society and response of the individuals can be improved.

2. Environmental Education should be for all. It should engage everyone. It should be for all and should include all sections of the community.

3. Environmental Education must be holistic. To address environmental challenges, people need to think broadly and understand systems, links, patterns and reasons. Hence a holistic appreciation of environmental problems is essential. For this, depending upon the situation, both formal and non-formal ways of environmental education should be introduced. The people working on environmental issue should also establish close association with each other through interdisciplinary approach. The formal and non-formal education settings should establish partnerships, and links should also be established between various groups with challenging interests on environmental issues.

4. Environmental Education must be realistic. Environmental education should never be only theoretical. This should lead to measures which result in better environmental outcomes involving practical and field orientation.

5. Environmental Education must be in harmony with societal and financial goals with an identical priority. This can be through improving the awareness of the people on environmental problems and the necessity of protecting the environment for better quality of life and sustainable development.

6. Environmental education needs to integrate the reality on condition that people with the knowledge, perceptivity and capability to influence majority in the society, leading to development of the environment, along with other justifiable social and economic goals.

STOP TO CONSIDER

The basic principles of environmental education are:

Environmental Education must be lifelong.

Environmental Education should be for all.

Environmental Education must be holistic.

Environmental Education must be realistic.

Environmental Education must be in harmony.

Environmental education needs to integrate the reality on condition.

1.7 Importance of Environmental Education

Environmental Education is a tool that helps people to develop the necessary skills and attitudes to protect the environment for better life. Through environment education, people will be able to identify the causes, and come up with solutions to protect and preserve it. Hence for better management of resources environmental awareness through environment education is necessary. Environmental Education is a style of education that can inculcate the idea of conservation into the minds of people, resulting in a positive environmental attitude, ethics and values that can lead to healthy action towards the environment thus leading to sustainable development.

The unlimited exploitation of the environment by human beings has threatened the survival of living organisms including man. Hence education for environmental awareness is required to everyone.

Environmental education can alone make us conscious about the environment. It helps us to know the importance of conservation of life and biodiversity of the environment. Environmental education enlightens with sufficient knowledge about the philosophy, genesis and consequences of local and global environmental problems and the knowledge for their control, for a sustainable environment.

Environmental Education will help us to understand the complex, conceptual connections between economic developments, benefits to society, health and well-being. It enhances the critical thinking and basic skills. Environmental education is a learning process with an inclusive approach that considers the environment as a total and involves the public in identifying and solving problems through acquiring awareness, attitudes and skills. Environmental Education helps children to understand the process that shapes their surroundings; so that they may not remain passive but become an informal and active mediator of their environment with confidence. Environmental education is important to develop a sense of conscientiousness and harmony among countries and as the base for a new international order which can give assurance for the conservation and expansion of the inclusive environment.

1.8 Summing Up

Environmental Education is a process of providing learning experiences to obtain *knowledge, understanding, skills and awareness* with desirable *attitudinal* change about man's relationship with his natural and manmade surroundings which includes the relation of population, pollution, resource allocation, transportation technology and urban and rural planning to the total human environment. Environmental education must utilize diverse learning environments and a broad array of educational approaches to teaching learning about and from the environment with due

stresses on practical activities and firsthand experience. It should help learners to discover the symptoms and real causes of environmental problems and thus to develop critical thinking and problem solving skills. Environmental education should be a continuous life-long process; beginning at the pre-school stage continuing should be interdisciplinary discipline in making possible a holistic and balanced perspective.

Environmental education (EE) is an approach, thinking, a means, and a line of work. Its applications can be observed in various ways for several purposes. Environmental education is education in, about, and for the environment. Environmental education provides opportunities to investigate environment in the outside, information about protection and environmental issues, and provides opportunities to expand awareness and skills that can be used to preserve, protect, maintain, or re-establish the environment. Environmental education must be lifelong and put emphasis on inculcating and framing attitudes and values which help to develop awareness on environment.

1.9 Questions and Exercises

A. Short-Answer Questions

1. State whether Environmental Education is or through the Environment.
2. What are the objectives of environmental education which is mentioned in the Tbilisi conference?
3. State the factors that substantiate the importance of environmental education.
4. What are the shortcomings in the system of environmental education in India?

B. Long-Answer Questions

1. Describe the meaning and nature of environmental education.
2. Explain the basic principles and objectives of environmental education.
3. Give a detailed discussion on the evolution of the subject of environmental education.

C. True/ False Questions

1. The major components of education are child and environment. (*True/False*)
2. Environmental consciousness consists of physical and biological factors. (*True/False*)
3. Environmental consciousness is related to affective aspects. (*True/False*)
4. Environmental education is related to cognitive, affective and psychomotor development. (*True/False*)
5. Environmental awareness is related to cognitive development. (*True/False*)

Key: 1. True, 2. True, 3. True, 4. True, 5. True.

Completion Type Questions:

1. Environmental education is related to cognitive, psychomotor and..... development.
2. Environmental awareness develops..... aspects.
3. Environmental consciousness is related to the..... development.
4. The main components of education is child and his.....
5. The components of environmental consciousness are physical, biological and

Key: 1. affective, 2. cognitive, 3. affective, 4 environment, 5.psychological.

Multiple Choice Questions:

1. The main aspects of environmental education-
 - (a) Environmental awareness.
 - (b) Environmental consciousness
 - (c) Both the above
 - (d) None of these
2. Environmental consciousness is related to-
 - (a) Cognitive aspect
 - (b) Affective aspect
 - (c) Psychomotor aspect
 - (d) None of these
3. Environmental awareness develops-
 - (a) Affective aspect
 - (b) Psychomotor
 - (c) Cognitive aspect
 - (d) All the above
4. The component of environmental education is the-
 - (a) Child
 - (b) His environment
 - (c) Both the above
 - (d) None of these
5. The component of environmental awareness is the-
 - (a) Physical factors
 - (b) Biological factors
 - (c) Social factors
 - (d) All the above

Key: 1. (c) 2. (b) 3. (c) 4. (c)

1.10 References and Suggested Readings

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UNIT- 2

ENVIRONMENTAL EDUCATION AS AN INTERDISCIPLINARY SUBJECT

Unit Structure:

- 2.1 Introduction
- 2.2 Objectives
- 2.3 Meaning of Discipline
- 2.4 Characteristics of a Discipline
- 2.5 Rationale for 'Environmental Education' as Discipline
- 2.6 Environmental Education as an interdisciplinary subject
- 2.7 Need of 'Environmental Education' as Discipline
- 2.8 Stage wise Course Content of Environmental Education
- 2.9 Methods and Techniques of Teaching Environmental Education
- 2.10 Summing Up
- 2.11 Questions and Exercises
- 2.12 References and Suggested Readings

2.1 Introduction:

'Environmental Education' has been discussed thoroughly at several national and international seminars, workshops and conferences. The eminent educationists as well as environmentalists have recognized the urgent need of environmental education, but only some have clear meaning, purpose and understanding. It is not very clear about courses of content of environmental field of study under the discipline of Education which is concerned with the advancements and development in each area. The problems are interdisciplinary in nature which can be resolved by employing interdisciplinary approach. Environmental Education field is also interdisciplinary in nature. Therefore, the concept of discipline, rationale for environmental education, its content and area of research have been discussed in this unit.

2.2 Objectives:

After going through this unit you will be able to -

- *understand* the Meaning of Discipline;
- *identify* the Characteristics of a Discipline;
- *know* the Rationale for 'Environmental Education' as Discipline;
- *analyse* Environmental Education as interdisciplinary subject;
- *understand* the Need of 'Environmental Education' as Discipline;
- *identify* various Methods and Techniques of Teaching of EE.

2.3 Meaning of Discipline:

A discipline is generally accepted in sense of the word means a field of study which has a well defined content and a technique of its own together with a unique system of values. It is implicit in this concept of a "*learner discipline*" that it constitutes an important part of man's cultural heritage and that its pursuit results in a specific enrichment of the human mind. Most of the subjects taught in universities and colleges are 'disciplines in this sense. These have been traditionally accepted by the academic world and will continue to be accepted for some time to come.

When new directions of thought emerge from man's struggle and efforts with life and environment or through his creative mental efforts acquired in time a degree of stability, a new discipline but during the course of its development it evolves its own distinct characteristics and acquires status in the intellectual world. Sometimes two or more branches of knowledge merge at their upper

reaches and this merge at the highest point words downwards to the lower levels and may even alter the whole pattern of the parent discipline or disciplines. The newly evolved pattern sometimes proves its validity in practice and may become a nucleus for a new discipline.

There may be a social and professional activity which, on account of its importance, becomes an area of application for several disciplines and this common area in course of time may come to be recognized as an independent field of study. Examples of such bodies of knowledge are developing an important professional or social activities are medical science growing round the art of healing, agriculture growing round the farming occupation, technology developing from craft and education round about teaching.

The important things to realize is that the necessary conditions for the growth of discipline are-

(a) *Freedom to develop:*

- (i) New ideas,
- (ii) New synthesis and
- (iii) New horizons

(b) *Increasing opportunities to experiment with them:* When a number of discipline converge into an important field of social activity, this activity gives a new meaning a two way flow of ideas and resulting in the enrichment of both. It is an inter-disciplinary approach in different disciplines.

2.4 Characteristics of a Discipline:

Every discipline has some specific features. It may be distinguished from other disciplines on the basis of these features. Every discipline has the following characteristics-

1. *One Content:* Every discipline has its own specific content or subject-matter or course of study at different level of teaching.
2. It is related to some *professional and social activity*. For example, Agriculture is related to 'farming'; psychology deals with 'behaviour', chemistry is related to '*matter*'.
3. Every discipline has its *own method of study*. For example, physics and chemistry content matter is studied through laboratory or experiment method. History requires another method such as library method.
4. Each discipline has its *own field of investigation*. For example, researches of Botany are concerned with plants and Zoology with animals of species.
5. Each discipline has its *own field of research*. The science subjects usually employ the experimental method whereas social subjects use survey method.
6. The scholar of each discipline has unique *idea, conduct, horizon* thinking and have impact of the discipline on his way of life style.
7. The content of each discipline is preserved in the libraries-separately.
8. The content of every discipline is transmitted by organizing separate departments in the colleges and universities.
9. The content of each discipline is being advanced by conducting researches in the discipline.

STOP TO CONSIDER

The necessary conditions for the growth of discipline are-

(a) *Freedom to develop:*

(i) New ideas,

(ii) New synthesis and

(iii) New horizons

(b) *Increasing opportunities to experiment with them.*

2.5 Rationale for 'Environmental Education' as Discipline:

Academically 'Environmental Education' is unquestionable related to and can be assigned a place under, the comprehensive discipline of Education. It has been shown to be an independent entity, however it can only to a limited extent be described, understood and explained but it appears to have wide relevance for the recent problems.

So it makes sense as a special educational discipline. It is considered a power instrument for improving the quality of the environment.

"Environment education is a powerful instrument to maintain ecological balance that equips human beings with awareness, knowledge, skills, attitudes and commitment to improve the quality of environment."

An academic discipline is an area of academic interest and one that poses sufficient problems to stimulate research, and one that leads to the publication of journals in the subject area.

Environmental Education has its own independent content like other disciplines. The following structures of the discipline of 'Environmental Education' would appear to emerge-

First Section-Concept of Environment Education

1. Concept of Environment and its Components

2. Concept of Education
3. Meaning of Environmental Education and relationship with other subjects
4. Environmental Education as a Discipline.

Second Section-Ecology and Environment Pollution

1. Concept of Ecology and Ecosystem.
2. Quality of Environment-Pollution and Degradation
3. Environmental Pollution-Air, water, land and noise
4. Human Ecology and Environmentalism
5. Interdependency in Environment-Food chains and food web flow of energy and biochemical cycles.

Third Section-Educational and Psychological Environment

1. Concept of Education Environment.
2. Growth and Development.
3. Population Explosion and Environment.

Fourth Section-Environmental Management

1. Meaning of Environmental Management
2. Teacher Education and Environment Education
3. Role of Media in Environmental Education
4. Social Forestry and Environmental Education
5. Problems and Remedies of Environmental Education
6. Evaluation of Environmental Education.

The core content of Environmental Education is highly interdisciplinary in nature but the difference lies in the level of objectives. The purpose of other subject is to provide the awareness of environment and environmental studies, but environmental education has to develop cognitive, affective and psychomotor abilities and efficiencies.

Check Your Progress

Q.1. Explain the term 'Discipline'.

Q.2. Enumerate the characteristics of discipline.

2.6 Environmental Education as an Interdisciplinary Subject:

The whole content of 'Environment Education' is directly and indirectly related to 'Environment'. It concerns with physical, social, biological, psychological and educational environment as whole. The core is the understanding of ecology and ecosystem and interdependency of biotic and abiotic factors. Various factors have to be studied which are polluting the environment. The educational programmes are to be introduced for maintaining the quality of the environment.

The content of 'Environmental Education' is interdisciplinary in nature. Therefore, various methods of teaching and research are used. The experimental and non-experimental methods are used, even philosophical and historical methods are employed. Some legal laws are formulated to protect the quality of the environment.

The research areas of 'Environmental Education' are also interdisciplinary. There are two types of environmental problems- natural and manmade. For natural problems (disasters and hazards), we can forecast and develop effective media of communication preventive and relief measures can be made effective and prompt Human activities have created several types of environmental problems which are very harmful at present and also in future. The programmes and projects are to be evaluated in terms of their adverse effect on man. Thus, the problems are related to 'environmental management and evaluation.

(a) Human Activities- Agriculture, industries, urbanization transportation, forestry, power plants, navigation and recreation, etc.

(b) Human Values- Traditional and modern life style, religious status, economic status, public health, education, population, character and tourism.

It covers the whole sphere of science and humanities. Its problems concern with the interaction between the living system and life.

Environmental Education as a leading subject from primary to university level. Some universities are organizing courses, seminars and conferences on environmental education, but the content relates to all levels of education. The interrelated components are to be taught for different levels.

At primary level awareness of environment is to be given to the children relating to their life situation. At secondary stage the relevance for real-life situation of environment is to be emphasized for providing the understanding. The conservation of natural resources of environment is to be explained and skills are to be developed at higher- secondary stage. The attitudes, feelings and values are to be developed for sustainable development by solving problems of the environment. The ability for evaluating environmental components and programmes are to be developed at the university level.

Thus, the curriculum for environmental education is to be developed in the graded forms from the primary to the university level, so as to realize the objectives of environmental education.

Scope of Research- The university education has recognized three major components-teaching, research and extension work. At postgraduate level four major study areas are identified.

(a) **Environmental Engineering-** It includes civil engineering, planning, human settlement, industrial design, urban ecosystem studies.

(b) **Environmental health-** It concerns with public health and hygiene, sanitary, chemical engineering, occupational health, institutional health, nutrition, etc.

(c) **Conservation and management-** It includes land use; agriculture, energy flow, waste management, wildlife management, national parks, water, management, non-polluting renewal energy development.

(d) **Social Ecology-** It includes human sociology, human ecology, population explosion, urbanization, social planning, cost- benefit, community organization and services guidance and counseling and environmental ethics.

Environmental education involves both theoretical and practical aspects of environment to improve the quality, imbalance and prevent the deterioration. It utilizes educational approaches, methods and techniques of teaching learning, and instruction, to identify the real cause of environmental problems and practices problem solving skills in formal and informal situations.

STOP TO CONSIDER

The whole content of Environment Education' is directly and indirectly related to 'Environment'. It concerns with physical, social, biological, psychological and educational environment as whole. The core is the understanding of ecology and ecosystem and interdependency of biotic and abiotic factors. The content of Environmental Education' is interdisciplinary in nature. Therefore, various methods of teaching and research are used. The

experimental and non-experimental methods are used, even philosophical and historical methods are employed. Some legal laws are formulated to protect the quality of the environment.

2.7 Need of 'Environmental Education' as Discipline

The term '*Environment Education*' is very latest but it has very ancient roots in our culture. In present situation man and environment are considered interrelated and there is interdependence in them. The nature becomes a source of sorrow and unhappiness, because the dusts of earth, light and air of atmosphere have the adverse effect on human beings. Therefore the need of introduction of 'Environmental Education' is widely recognized.

Our country has accepted the need for the environmental education, with the recommendations of the *Tiwari Committee* (1980). The people of the country recognize an urgent need of Environment Education. Besides introducing the subject of 'environment science' at all levels of education we must give much emphasis on the new approaches and programmes of environmental education, thus the idea should bring on environmental concerns in all subjects and to all facts of life.

2.8 Stagewise Course Content of Environmental Education:

The course content of environmental education has been classified stage wise. This classification of content has been made in the following stages.

1. Primary education stage
2. Lower secondary stage
3. Higher secondary stage

4. College stage and
5. University stage.

Check Your Progress

True/False Questions

1. Environmental education is not an independent field of study.

True/False

2. Environmental education is based on the interdisciplinary approach.

True/False

3. Environmental education provides the awareness, understanding and consciousness. *True/False*

Key: 1. False, 2. True, 3. True

2.9 Methods and Techniques of Teaching Environmental Education

The content of EE is largely interdisciplinary in nature. It is both *(doing)* science *(understanding)*, organized from primary to university level. The objectives of EE are not confined up to knowledge and understanding (awareness) but include skills, attitudes and values. The problem solving and development of quality of man and environment are the major functions of E.E. Thus strategies of teaching and learning have wide coverage, based on content, its components, levels of education and the objectives of EE.

The major Objectives of EE are awareness, attitudes and action. It covers cognitive psychomotor and affective domains of teaching learning objectives. Therefore a student should be allowed to observe simple phenomena of earth and the sky. He acquires

awareness about the living and non-living components and develops awareness about one's well being in the context of social and natural environment. He begins to form positive feelings and attitudes of environmental protection. He may utilize this awareness, skills attitudes in his actions as personal habits. Personal habits can contribute in improving the quality of environment. The teacher should also translate the awareness in his actions which will be the model for the students. Thus, the doing parts of much more important for objectives of E.E. A number of projects can be assigned to students in school situations for making herbarium, plantation in school campus. It is the teacher who can sensitize his students for improving the quality of environment.

The objectives of EE can also be realized through formal and non-formal systems of education. In view of above objectives and level of education the strategies of E.E. have been summarized in the three levels of education. Environmental discipline is classified into three areas.

1. Environmental Studies.
2. Environmental Studies and Environmental Engineering.

In this discipline scientific and non-scientific methods are used. The practical work is essential in this discipline too.

2.10 Summing Up

- The core content of Environmental Education is highly interdisciplinary in nature but the difference lies in the level of objectives. The purpose of other subject is to provide the awareness of environment and environmental studies, but environmental education has to develop cognitive, affective and psychomotor abilities and efficiencies.
- The whole content of Environment Education' is directly and indirectly related to 'Environment'. It concerns with physical,

social, biological, psychological and educational environment as whole. The core is the understanding of ecology and ecosystem and interdependency of biotic and abiotic factors.

- The content of 'Environmental Education' is interdisciplinary in nature. Therefore, various methods of teaching and research are used.
- The research areas of 'Environmental Education' are also interdisciplinary. There are two types of environmental problems- natural and manmade.
- At post graduate level research may be conducted in the area of Environmental Engineering, Environmental health, Conservation and management and Social Ecology.
- The major Objectives of EE are awareness, attitudes and action. It covers cognitive psychomotor and affective domains of teaching learning objectives. Therefore a student should be allowed to observe simple phenomena of earth and the sky.

2.11 Questions and Exercises:

A. Long Questions

1. Explain the term 'Discipline'. Enumerate the characteristics of discipline.
2. Describe the rationale for 'Environmental Education' as an independent field of study or discipline.
3. Enumerate the objectives and outline of the content of Environmental Education.
4. Indicate area of research of environmental education.
5. Emphasize the need and importance of 'Environmental Education' as a separate discipline.

B. Short Questions

1. Enumerate the characteristics of a discipline.
2. Explain the term 'Interdisciplinary approach'.

3. Explain the term 'Environmental Education.
4. Indicate the need of environmental education.
5. Enumerate the objectives of environmental education.

2.12 References and Suggested Readings

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UNIT- 3

EDUCATION FOR ENVIRONMENTAL AWARENESS AND ATTITUDE CHANGE

Unit Structure:

3.1 Introduction

3.2 Objectives

3.3 Meaning of Environmental Awareness

3.4 Meaning of Attitude

3.5 Education for Promoting Environmental Awareness

3.6 Environmental Education and Awareness

3.6.1 Environmental Awareness and the Community

3.6.2 Communication Strategy for Environmental
Awareness and Attitude Change

3.7 Environment and Attitude Change

3.7.1 Development Environmental Attitudes

3.7.2 Strategies to raise Environmental awareness in the
Community

3.8 Role of Media in Environmental Education

3.9 Role of Non-Government Organisation (NGO's)

3.10 Summing Up

3.11 Questions and Exercises

3.12 References and Suggested Readings

3.1 Introduction:

Education is a key process in development. It is a dynamic process of improving knowledge and understanding environment. This in turn will increase our concern and commitment to protect the environment and the action involves the acquisition of the desired attitudes and behaviour in relation to the environment. The main aim is to create awareness of the processes and consequences of our activities on the environment. There is increasing awareness that

human activities have altered the ecological system. Through education we can make the mankind realize the importance of protecting the environment to conserve and enhance the natural systems.

Environment education should strive to change the environmental behaviour of the people by increasing knowledge on environment. Thinking and approach of the people towards the environment determines their attitudes towards it. The aim of environmental education strives to change the outlook of people towards environment rather than creating awareness for solving environmental issues.

3.2 Objectives:

After going through this unit you will be able to-

- *understand* the role of education in promoting environmental awareness;
- *grasp* the concept of environmental education and environmental awareness;
- *identify* various communication strategy for environmental awareness;
- *develop* environmental attitudes for sustainable development;
- *know* the role of media and role of NGO's for environmental education.

3.3 Meaning of Environmental Awareness:

Environmental awareness means consciousness or awareness of an individual towards his environment or his surroundings. It provides scope for understanding of the ecosystem and making people aware of the environment and its associated problems. Environmental awareness may be defined as to help the social groups and

individuals to gain a variety of experiences in and acquire a basic knowledge of environment and its associated problems. Any solution to the environmental crisis needs environmental awareness and understanding. This environmental awareness and understanding can be developed through education. Therefore, education must create environmental awareness in the learners at all levels of education.

3.4 Meaning of Attitude:

Attitude is a specific mental state. It is a point of view, which one holds towards a person, object, task or idea. It stimulates the behaviour and performance of an individual. Attitude implies a mental preparedness and which provide stimulus for an individual in some directions. It refers to the predisposition to perceive, feel or behave towards specific objects in a particular manner. According to Allport, "an attitude is a mental and neural set of readiness exerting directive or dynamic influence upon the individual's response to all object and situations with which it is related." Attitudes develop gradually as a result of individual's experiences. It is learned or acquired affective tendency. It influences the reaction of the individual. An individual's attitude towards something is his predisposition to perform, perceive, think and feel in relation to it. Attitude change refers to a modification of an individual's general evaluative perception of a stimulus or set of stimuli. Changes for any reason in the person's general as well as enduring perception may affect his behaviour in a given situation.

Thus, attitudes can be defined as evaluation of ideas, events, objects or people. Attitudes are generally positive or negative, but they can also be uncertain at times. For example, sometimes we have mixed feelings about a particular issue or person. Regardless, attitudes help

determine what we do-what we eat, how we vote, what we do with our free time, and so on.

3.5 Education for Promoting Environmental Awareness:

Education helps to change the beliefs and attitudes; however, it cannot change ethics or values. Education that leads to attitudes that contradicts with the people's ethics and values will not work. To have a safe environment if some people have to make sacrifices on financial security, food, or spending time with their families then those people who value those things highly reject it. But the message that doesn't require the people to reorganize their values will be easily accepted. Hence, the educational efforts which are against the ethics of the people will not succeed.

Education, including formal education, public consciousness and guidance should be recognized as a process by which human beings and societies can reach their full potential. Education is significant for promoting sustainable development and improving the attitude of the people towards on environment and developmental issues. To be effectual, education should deal with the interface of both physical, biological and socio-economic environment and human development. It should be incorporated in all disciplines, and should make use of both formal and non-formal methods and effective means of communication.

Education that is needed for sustainable environment should enable people to understand the interdependence of life on ecological aspects, and the repercussions of their actions and decisions. It helps in increasing people's awareness of the economic, political, social, cultural, technological and environmental forces which impede sustainable development, Education develops people's awareness, competence, attitudes and values, enabling them to be effectively involved in sustainable development at local, national and

international level, and to work towards a more equitable and sustainable future.

Though education can bring change in the behaviour there are limitations on what it can achieve. In the short run educational approaches work only when the barriers to action are internal to the individual. Education is effective mainly with cheap and easily practicable behaviours. Such actions help, however, more permanent actions will have greater damage. If high cost is involved in protecting the environment there is no proof that education alone will help to do so. In such conditions, interventions are needed to reduce the barriers. Though the barriers limit the effectiveness, education may have indirect and positive effect on individual action in the long run. Successful control of environmental problems will depend on the people's perception of their environment to a great extent on the way people perceive their environment and their associated behaviour, because it is the human mind that masterminds human behaviour. As environmental problems are caused by humans, a radical change in the attitude and behaviour of the people is required. This requires modification in the perception and positive behaviour towards the environment. Hence the governments in order to bring change in the attitude of the people should focus more on the humans to solve the environmental problems than on the physical structure.

Educational programmes are more successful when they are planned according to psychological values of communication and when they openly concentrate on the relations between attitudes and actions. Even when people are being asked to act according to their attitudes, and inclined to use information, it is essential to make special efforts to get their attention and involve the recipients of the information. The external barriers such as cost, and accessibility keeps educational programmes from reaching their goals. Education works

greatest when combined with extra strategies of interventions. Hence education and other measures can proceed in synergy. The effects of both collectively are greater than from their separate effects.

Though public awareness on environmental issues is increasing, shortage of enough environmental knowledge can be an obstacle for achieving a sustainable future for mankind at both international and neighbourhood levels. Hence education for environmental awareness should include,

- Knowing about the relationship between mankind and the environment, the need for natural, social and economic systems for sustainable development.
- Appreciation of the desires and right of prospective generations.
- Approving the importance of multiplicity.
- Accepting the value of life, fairness and justice issues related with the sustainable development process.
- An understanding of the earth's carrying capacity.
- Appreciation of the need for preventative measures.

Both formal and non-formal forms of education are essential in altering people's attitudes so that they have the aptitude to review and concentrate on their sustainable development issues. It is also significant for achieving ecological and moral understanding, principles and attitudes, skills and actions reliable with sustainable development and for successful participation of the people in decision-making.

3.6 Environmental Education and Awareness:

Environmental education should not be limited to the classroom only and it should engage people from all sections. Environmental

education should be an essential part of the socio-economic development that can lead to equal opportunity and an enhanced worth of life for all. Environmental education deals with biophysical environments along with their social, cultural, economic and political aspects. Hence environmental education should extend from increasing awareness through communication to improve the individual's skill to actions that can lead to sustainable environment. Environmental education is a course of action that guides individuals to investigate environmental issues, involve in problem solving, and be critical in improving the environment. This in turn can lead to deeper understanding of environmental issues and have the abilities to have up to date knowledge and take accountable decisions. Environmental education promotes global awareness, sustainable living and dynamic residency. It involves a planned and deliberate process that seeks the execution of environmental curriculum at educational institutions at different levels. Hence environmental education should be multilevel and continuous. Special programmes for non-formal adult and community-based audiences should be emphasized in the first level. Then in the secondary school the focus should be on teaching the main disciplines within an environmental context. Finally the emphasis must be to obtain environment-based skills within the different skilled disciplines.

To create awareness on environmental aspects, communication campaigns should be planned along with developing messages and producing suitable resources and media to reach the audience. The aim of environmental awareness should focus on creating awareness in people about specific issues related to their environmental settings including living and non-living elements, e.g., land, soil, plants, animals, air, water and other humans in addition to awareness of the social and economic surroundings, and the impacts

of our connections to them. Though awareness is necessary it is not an adequate element of social change. The aims of awareness-raising activities are more inadequate in scope than environmental education and the processes should not be too complex. Awareness-raising can be an element of wider and more intense educational processes.

3.6.1 Environmental Awareness and the Community:

In order to understand the environmental consequences and its effects on the community, education and public awareness should become an integral part of sustainable development programmes. If the community member doesn't have awareness it may lead to the degradation of the environment. The empowerment of the people in the community on environmental issues not only enriches them with the environmental issues but it also helps them in realizing their faulty actions and the strategies to be adopted to conserve and protect the surrounding environment.

The community should be able to recognize the environmental problems and values and its effects on the socio-economic development and on the quality of the life of the people. This can be achieved through personally examining the environmental settings surrounding the community. Hence creating awareness and participation is fundamental to achieve sustainable development. This can happen only when the community realizes the importance of maintaining healthy and productive ecosystems and associates itself collectively with the environmental issues. Hence in creating awareness on environmental issues to public economic, social, professional, religious, ethnic, cultural and educational factors should be taken into consideration. Therefore, while planning any awareness campaign the perspectives of the public must be understood. The most suitable way to convey the message on

awareness depends on the attitude, behaviour, actions and types of social relations of the people in the community.

STOP TO CONSIDER

Public awareness on environmental issues is increasing day by day, shortage of enough environmental knowledge can be an obstacle for achieving a sustainable future for mankind at both international and neighbourhood levels. Hence education for environmental awareness should include,

- Knowing about the relationship between mankind and the environment, the need for natural, social and economic systems for sustainable development.
- Appreciation of the desires and right of prospective generations.
- Approving the importance of multiplicity.
- Accepting the value of life, fairness and justice issues related with the sustainable development process.
- An understanding of the earth's carrying capacity.
- Appreciation of the need for preventative measures

3.6.2 Communication Strategies for Environmental Awareness and Attitudinal Change:

Communication strategies for environmental awareness include preparing messages, resources and media to reach the public. Though the two disciplines are interlinked in communication campaign on environmental education, the process should not be confused. The behaviour of the people can be modified by awareness and changes in behaviour through communication campaigns. However, they cannot achieve the wider educational vision.

For effective delivery of communication the public environmental education and applied communications are the key instruments to

reach the audiences. While designing campaigns and programmes to the target groups, we should not forget to include the elements of knowledge, skills, and attitudes as they are necessary to solve environmental problems. To bring attitudinal changes on environmental issues, partnership between different institutions is needed. The role of scientists and academic institutions is significant for effective communication to the general public to adopt the sustainable and ecological policies.

3.7 Environment and Attitude Change:

Schutz (2000) believes that people's attitudes towards the environment and the type of concern they develop towards the environment, are associated with the degree to which they view themselves as interconnected with nature. People's attitude towards the environment relies on the importance that a person places on oneself, other people, and the natural environment. We can say that the attitude of the individual towards environment is based on his or her principles which will have varied value orientations and that eventually will have diverse attitudes towards the environment.

Attitude implies an amalgamation of information based on data and inspiring poignant worry leading to action. In order to have maximum impact, environmental education should give information to understand biophysical environment, to promote concern among the people to solve environmental problems and to update people in realizing their responsibility to attain the goals preferred from their attitude.

STOP TO CONSIDER

For effective delivery of communication the public environmental education and applied communications are the key instruments to reach the audiences. While designing campaigns and programmes to

the target groups, we should not forget to include the elements of knowledge, skills, and attitudes as they are necessary to solve environmental problems. To bring attitudinal changes on environmental issues, partnership between different institutions is needed. The role of scientists and academic institutions is significant for effective communication to the general public to adopt the sustainable and ecological policies.

3.7.1 Development of Environmental Attitudes:

According to Newhouse (1990), environmental attitudes are developed as a result of life experiences and not necessarily due to educational programmes designed to change attitudes. Attitudes can also be formed due to life experiences that include initial predisposition to certain behaviour together with further activities concerning that behaviour. Information is another factor which may lead to attitude change. However, the value of information in changing attitudes is also involved with other factors like source of message, message content and the characteristics of the recipients, hence it is difficult to assess. Modeling is also an effective way of producing attitude change. However, effective modeling should make the subjects believe that the rewards observed from the model will be same if they follow appropriate behaviour. The costs should not outweigh the benefits of the behaviour. However, we can say that modeling has certain shortcomings in forming positive environmental attitudes. Modeling insists on persuasion, rather than true education. Modeling at times manipulates the learner and does not provide the learner with the skills to make further decisions.

Kauchak, et al (1990) rightly suggested that environmental attitudes are formed by teaching environmental issues as moral dilemma in order for learners to analyse and draw inferences from their own personal perspectives. Hence when the teacher imparts the

knowledge, the learner will get an opportunity to assess the value of the information received. It will help them to critically assess information from different sources and allowing them to draw their own conclusions and make their own value judgments.

Check Your Progress

Q. Highlight the role of education in promoting environmental awareness.

Q. How can environmental attitudes be formed?

3.7.2 Strategies to Raise Environmental Awareness in the Community:

Environmental awareness in the community can be promoted through strategies involving communication with community members and other related stakeholders to encourage neighbourhood environmental projects and initiatives, mobilizing the students' awareness and capabilities, recommending monetary assistance via grants, schemes for projects/initiatives that elevate community awareness and that support positive advantage on their local environment. Awareness can be developed by spreading enlightening resources and fact sheets to safeguard water, prevention, garbage disposal, climate change and biodiversity. Sustaining environmental programmes and competition, environmental talks and information, seminars that aim on the community can be organized for creating environmental awareness. Strengthening the Environment Public Awareness includes raising environmental awareness among policy makers; providing environmental information through existing mass media, strengthening the capacity of journalists; encouragement of the private sector in the development of environmental programme development. Private companies must be encouraged to have

environmental education programmes as a component of company policy.

There is a need to make an attempt on the global environmental problems through systematic procedure that requires modifications in traditional educational programmes. The entire technical people are sensibly accountable for adequate public relations. These efforts in turn facilitate research in the institutions, organizations and governing bodies responsible for education. Environmental education is a multifaceted procedure, wrapping not only present actions but a strong fundamental approach to considering society in total. Environmental education provides people with the responsiveness needed to put together partnerships, recognize NGO actions, build up participatory approaches to urban development, and make sure prospective enterprises for ecological trade.

Training and awareness programmes, business programmes and actions, society's environmental events, multimedia environmental campaigns, environmental resource substance, environmental attentiveness and behaviour studies and student oriented projects can raise awareness among the people. These environmental programmes can help in elevating knowledge, instill optimistic approach and actions towards the betterment of environment and widen the sentiment of individual towards global environmental aspects. It can make the community understand how their actions can bring noteworthy change. The programmes should be based on the principles which can promote value of the environment and are appropriate to local people while addressing universal concerns. Enjoyable and attractive methods on environmental improvement action projects can create awareness for diverse groups of the community. These programmes should widen a sense of environmental citizenship and personal accountability which can transform into environmental responsive measures.

To face the challenges of raising awareness on environmental issues and planning programmes to educate the public and other learner's integrated approach along with using multimedia like TV and radio commercials, print materials, websites, etc., is needed. Environmental awareness can be increased by using a variety of communications and by promoting programmes on community actions and behavioural modifications. All these measures will lead to ecologically sustainable lifestyle in the society and sustainable work practices.

3.8 Role of Media in Environmental Education:

The role of media in promoting environmental education is vital since the newspapers, magazines, radio, and television help people in achieving awareness. Awareness is an important process in environmental education. Through formal and non-formal education awareness about the interests of vulnerable communities can be improved. In a developing country like India, environmental awareness can be created through elements like mass media, art, and traditional knowledge.

The media may play a major role in emphasizing on environmental issues such as sharing, governing power, lucidity, responsiveness, wider agreement, justice and comprehensiveness and answerability. It can promote superior environmental governance. The role of media is massive in meeting the necessities of the inclusive environment, and it can also operate:

- To transmit the thought and information and way of life from everyplace in the world
- To make sure the information and traditions sharing from the developed countries to the developing countries
- To persuade the people at all levels

- To reassign thoughts and culture resulting in a homogenization of commercial culture that threatens to disturb and modify the native values.

Media can play a vital role to inform the masses on environmental issues through articles, environmental rallies, plantation campaigns, street plays, real eco-disaster stories and success stories of protection. In order to provide information on environmental issues to public we can see more environmental magazines, newsletters and journals, besides TV and radio programmes. Now-a-days, the programmes of radio and television consist of programmes on topics like science and natural world, plays, music and dance, besides diverse areas of concern. It has an enormous delivery time to reach audiences in homes, schools and public places.

As natural systems are active and complicated, effectively delivering the environmental information is a very challenging task. With the purpose of providing information matching with the contemporary environmental and social realities of the society, the information must be reassessed and modified. The scientific academia should be trained to exchange the ideas more effectively with policy officials and educators. If transmitted properly, media can be a good educational aid to reduce the gap between scientific awareness and civic understanding. Different activities that can mould the behaviour of people's lives can be performed with a variety of actions according to the needs of individuals, groups and society at large. The mass media such as television, newspapers, radios, etc., can bring reforms among the people through campaigns. Scientific community, press and voluntary organizations can cooperate in taking environmental education to the public at large. Scientists are the first ones to raise their voices against the human actions which can lead to environmental degradation. However, due to cultural clashes, these groups frequently experience challenges in

expressing competently to converse their inventions between themselves and the citizens. Through knowledgeable professionals, exchange of information among the scientists, communities and civil society, we can see considerable increase in the knowledge of the community on environmental issues. This can be achieved through well-planned and supportive communication strategies. In involving media for promoting environmental information a number of things need to be considered. Some of these are:

Multiplicity of information: With proper guidance the issues which are in curriculum may be provided to the students using the articles on the newspapers, television and radio programmes as resource materials for classroom-based lessons.

Time significance: The information provided should of latest and up to date.

Truthfulness: In order to avoid the misunderstanding and misinformation, the information provided by the media should be close to reality and presented honestly.

Mass media have the advantages such as:

- Disseminate the information to reach a wider community
- Create understanding and broadcast information
- Help in modifying attitude and behaviour of the people

Radio, Television, Print Media and Maps

The power of mass media to influence knowledge gain, public attitude and behaviour has been well recognized these days. Mass media (electronic and print media) are vital in creating environmental consciousness and in spreading information amongst the people. Different information tools like radio, television and newspaper are spreading awareness related to climate change and environment protection among the people at a faster rate than

personal contact. The production and distribution of printed materials such as book, magazines, newspaper and brochure may help in transfer of new information's and technologies whereas radio and television are the important tools for dissemination of quick information. Radio is even more popular among the poorest and distant communities. It is exceptionally good in disseminating messages to large audiences at cheaper prices. The information provided by the radio can highlight the issues thereby bringing positive and significant change in the people. The use of this media is very effective in producing an intellectual platform for the people. Creating sensitivity to the surrounding environment is very important as we depend on the nature to fulfill our needs.

Television can be used to improve many essential aspects of everyday life. In a country like India where there is a prevalence of high illiteracy media can play a critical role. Majority of the population feels that both radio and television as reliable and in promoting information. In India there are approximately 45 million television sets and they can act as influential means of providing information. A vast majority are having cable and satellite connections. Television has turned out to be a necessity even in poor communities. Television videos and serials can be a valuable source in the spreading environmental awareness amongst the people.

Community maps are successful tools in developing a cost efficient yet competent way to increase community awareness. According to Wood (1994), what we communicate with maps is our relationship to the territory we inhabit. Maps can also be used to communicate about the environment to inspire, to psychologically connect and to create awareness. A map can also use participatory approach in which members of the community can share the information and ideas. This creates sense of inclusion and map can become an excellent means of an educational support to produce knowledge,

and as a public involvement measure helps in integrating with the community.

Check Your Progress

Q. State the role of media in creating environmental awareness.

Q. How environmental awareness can be created in the community?

3.9 Role of Non-Government Organizations (NGO's):

The role of NGO's in creating public awareness on environmental safety is recognized universally. A number of steps have been taken by NGO's to promote debate about environmental issues. Many NGO's are involved in advocacy and awareness, especially in promoting concepts such as sustainable environment, natural resource management and the renovation of ecosystems. Non-governmental organizations can also interact with the government about local environmental issues as they normally deal with the grassroots problems. They can also sensitize the policy-makers about the local needs and resources. They can operate both as an 'action group' or a 'pressure group'. NGO's by creating environmental issues can also organize public actions for safeguarding environment. They can also update the policy-makers about the interests of both the deprived and the ecosystems. NGO's can also play a significant role in providing training facilities, both at community and government levels. They can also be actively involved in research and publication on environment and development associated issues. It is essential to uphold and support authentic, small, community level NGO's in different parts of the country which can present much needed institutional support precise to the local needs.

NGO's are also concerned about organizing environmental awareness programmes in fact-finding and investigation, filing

public interest litigations, novelty and experimenting in new areas, providing knowledge and policy study, providing accurate and consistent information with a system of skilled professional team, passing pertinent information to the community and governmental agencies and unity and assistance to environmental protectors.

The NGO's have played a significant role in taking initiatives for sustainable growth. NGO campaigns are the key drivers in inter-governmental dialogues, ranging from the regulation of hazardous wastes to prohibition on landmines and the abolition of slavery. Some of the environmental NGO's in India are successful the field of environment protection, conservation and sustainable development. The 'Chipko Movement for preservation of trees by Dasholi Gram Swarajya Mandal (DGSM) in Ganeshwar and the "Narmada Bachao Andolan organized by Kalpavriksh, are some of the examples where NGO's have played a significant role in the society for protection of environment.

The Bombay Natural History Society (BNHS), the World Wide Fund for Natural India (WWF, India), Kerala Sastra Sahitya Parishad, Centre for Science and Environment (CSE) and many other agencies are playing a major role in creating propagating environmental awareness through research as well as outreach work. CSE created awareness all over the country about the violation of permissible limits of pesticides in the Cola drinks. NGO's will have an important role to develop the patterns of growth and protecting the environment with a variety of news and actions made by the organization. Similarly, Aranyak, Save Guwahati Build Guwahati, People for Animals, Nature's Beckon, Dibru- Saikhowa Wildlife Society and Irab-Kirab, Assam Science Society, Environ, and The Wildlife and Habitat Protection Society are some of the local leading NGO's in North East including Assam are playing

significant role in the field of environmental education and creating awareness among the society.

However, NGO's are facing certain challenges in disseminating knowledge on environment like shortage of trained personnel in the field of environment protection, lack of research and development facilities, financial constraints, lack of cooperation from the governmental agencies, difficulties in the mobility on account of lack of transport facilities and environmental NGO's are facing integrity crisis with many instances of misuse and scandals.

3.10 Summing Up:

- Environmental awareness means consciousness or awareness of an individual towards his environment or his surroundings. It provides scope for understanding of the ecosystem and making people aware of the environment and its associated problems. Environmental awareness may be defined as to help the social groups and individuals to gain a variety of experiences in and acquire a basic knowledge of environment and its associated problems.
- Attitude is a specific mental state. It is a point of view, which one holds towards a person, object, task or idea. It stimulates the behaviour and performance of an individual. Attitude implies a mental preparedness and which provide stimulus for an individual in some directions. It refers to the predisposition to perceive, feel or behave towards specific objects in a particular manner.
- Environmental awareness involves communication campaigns for reaching different audiences, developing messages and producing the suitable resources and media to reach these audiences. The aim of environmental awareness is to make people aware of specific issues related to their surroundings,

including living and non-living elements, e.g., land, soil, plants, animals, air, water and other humans, as well as knowledge of their built, social and economic environment, and the impact of our actions. Attitude change and environmental awareness is the primary objective of environmental education.

- Creating awareness on environment involves communication campaigns to reach diverse audiences, developing messages and producing the suitable resources and media to reach the audience. Media can play an important role to educate the masses on environmental issues through articles, environmental rallies, plantation campaigns, street plays, real eco-disaster stories and success stories of conservation efforts. The role of NGO's in creating public awareness on environmental safety is recognized universally. NGO's can be very effective in organizing public movements for the protection of environment through creation of awareness. Non-governmental organizations (NGO's) have played a significant role in initiating internationally for sustainable growth. NGO campaigns are the key drivers in inter-governmental dialogues, ranging from the regulation of hazardous wastes to prohibition on land mines and the abolition of slavery.
- People's attitude towards the environment relies on the importance that the person places on oneself, other people, and the natural environment. We can say that the attitude of the individual towards environment is based on his or her principles which will have varied value orientations and that eventually will have diverse attitudes towards the environment. Modeling is also an effective way of producing attitude change. Behavioural intentions are the best predictors of actual behaviour opinions related to the environment,

attitudes towards the environment, and attitudes towards the environment behaviour intention like willingness to make personal sacrifices in favour of environment and environmentally responsible behaviour.

- Strategies to promote environmental awareness in the community include frequent communication with community members and other related stakeholders to encourage neighbourhood environmental projects and initiatives, mobilizing the students' awareness and capabilities, recommending monetary assistance via grants schemes for projects/initiatives that elevate community awareness and that support positive advantage on their local environment. Training and awareness programmes, business programmes and actions, society's environmental events, incorporated multimedia environmental campaigns, environmental resource substance, environmental attentiveness and behaviour studies and student-oriented projects can raise awareness of the people. These environmental programmes can promote in elevating knowledge, instill optimistic approach and actions towards the environment and widen the sentiment of individual towards global environmental aspect.

3.11 Questions and Exercises:

Long-Answer Questions:

1. Give a detailed discussion on the evolution of the subject of environmental education.
2. Discuss how environmental awareness can be helpful to bring about attitudinal change in the society.
3. Critically analyse the role of NGO's in serving the cause of environmental education.

Short-Answer Questions:

1. What are the constituents of education for environmental awareness?
2. What are the communication strategies for attitudinal change on environmental issues?

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UNIT- 4
STRATEGIES OF TEACHING ENVIRONMENTAL
EDUCATION AT DIFFERENT LEVELS
(Primary, Secondary and Higher)

Unit Structure:

- 4.1 Introduction
- 4.2 Objectives
- 4.3 Environmental Education at Different Levels of Education
- 4.4 Programme of Environmental Education for Primary, Secondary and Higher Levels
 - 4.4.1 Primary Level
 - 4.4.2 Secondary Level
 - 4.4.3 Higher Level
- 4.5 Strategies and Techniques of Teaching of Environmental Education
 - 4.5.1 Primary Level
 - 4.5.2 Secondary Level
 - 4.5.3 Higher Level
- 4.6 Co-Curricular Activities in Environmental Education
- 4.7 Summing Up
- 4.8 Questions and Exercises
- 4.9 References and Suggested Readings

4.1 Introduction

In the modern world of today, education has to respond to the realities of globalization on the one hand and ethnic bonds on the other hand. To meet these challenges, UNESCO appointed the International Commission on Education for the 21st Century, chaired by Jacques Delors. In the report of the Commission entitled

as 'Learning-The Treasures Within' emphasis was given on education for all. It suggested that education for responsible environmental behaviour should be based on two major ideas:

1. Lifelong Education and
2. Four Pillars of Education.

1. Lifelong Education: In life-long education people undergo a continuous learning process throughout their life and gain the fullest potential for their development. It comprehends both an individual's intentional and incidental learning experiences. With the help of learning experiences, an individual acquires various habits, knowledge and attitudes that are essential for living together. In lifelong education, education is spread in the entire life span and it cultivates the human powers of feeling, intelligence and character formation which are necessary to live in a co-operative way.

2. Four Pillars of Education: The Delors Commission proposed four pillars of education as foundation of education in the reorganization of education in the 21st century. The four pillars of education means the four fundamental principles of learning and also the core objectives of Environmental Education. These are

(i) Learning to Know: This is the first pillar of education identified by the Commission and it emphasizes the necessity of a broad general awareness resulting out of knowledge it means primarily learning how to learn by developing one's concentration, memory skill and abilities to think. It broadens knowledge, skills, attitudes and capacity to adjust in a complex, changing and inter-dependent world.

(ii) Learning to do: It means acquiring knowledge of first hand experiences by the learner through technical training to perform need based skill. Education shall have to focus on developing abilities to communicate appropriately, working in groups and

conflict resolution. It means not only applying learning practices innovatively, skill development and practical know-how but also the development of competence, life skills, personal qualities, aptitudes and attitudes.

(iii) Learning to live together: The technological development and advanced communication network which have opened new vistas for generating awareness about other communities, countries, cultures, religions, practices and social patterns can be gainfully utilized in generating respect for the traditions, religions and cultures of others. Education of the 21st century should develop the sense of appreciation to the diversity and similarities that occur between all human beings. Knowledge of each other's cultural traditions, beliefs and practices will definitely contribute to appreciation of shared values and aspirations, as well as appreciation of each other's differences, thus contributing to the development of mutual respect and tolerance.

(iv) Learning to be: This is the fourth pillar of education. Education should enable each person to solve his own problems, make his own decisions and shoulder his own responsibilities. The essence of 'learning to be' emphasises on the full development of all the potentialities such as memory, logical thinking, aesthetic imagination, creativity and communication skill as well as physical capacities. Infact, learning should lead each individual to be a complete human being.

4.2 Objectives:

After going through this unit you will be able to-

- *know* the status of Environmental Education at Different Levels of Education;

- *Describe* various Programmes of Environmental Education for Primary, Secondary and Higher Levels;
- *analyse* various Strategies and Techniques of Teaching of Environmental Education;
- *organize* different Co-Curricular Activities in Environmental Education.

4.3 Environmental Education at Different Levels of Education:

Environmental education aims at developing responsible behaviour of the individual towards the total environment. Environmental education should not be just one more subject to add to existing programmes, but should be incorporated into programmes intended for all learners, irrespective of their age. As environment education is an integral part of the education process, it should be centred on practical problems and be of an interdisciplinary character.

Environmental education consists of curricular courses that are formal and co-curricular activities that is non-formal one. In the formal system of education preparing suitable programmes of environmental education as well as selecting proper teacher strategy is a difficult task.

The Discussion Guide for UNESCO Training Workshop on EE (1980) has provided the following two conceptual models of the EE curriculum: one is an interdisciplinary (Single subject) or infused model, the other is a multidisciplinary or infusion model.

The following figures represent the conceptual models in which relevant components of many discipline are selected, presented and dwelt upon to create a distinct environmental education unit or the course model of infused model (Figure-A) as well as it illustrates the

infusion model where environment related contents are integrated into the established discipline wherever appropriate (Figure-B)

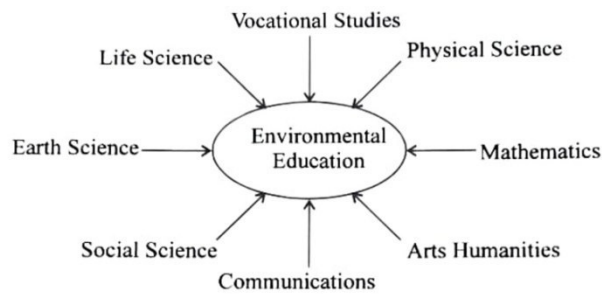


Fig A : Interdisciplinary (Infused) Model

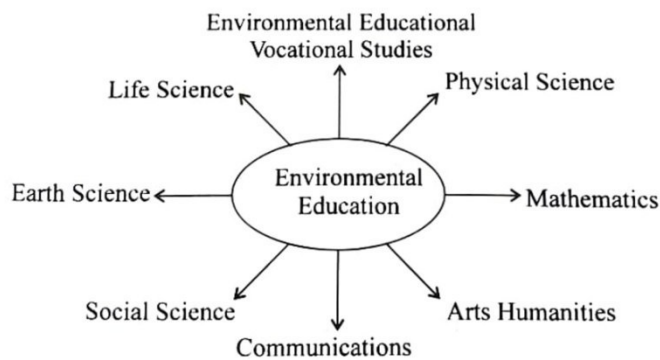


Fig B : Integrated or Multidisciplinary (Infusion) Model

STOP TO CONSIDER

The four pillars of education are:

- (i) Learning to Know
- (ii) Learning to do
- (iii) Learning to live together
- (iv) Learning to be

Interdisciplinary and multidisciplinary approaches are approaches to infusion, analysing the contents of the school curriculum into specific concepts and integrating them with the concepts emerging from an analysis of the environmental problems or issues. In the interdisciplinary approach, concepts from various disciplines are

utilized to highlight the environmental perspective or analyse an environmental problem or issue. On the other hand, in the multidisciplinary approach, environmental perspective is integrated into the other disciplines.

4.4 Programme of Environmental Education for Primary, Secondary and Higher Levels:

The Education Commission (1964-66) and other Committees recommended for inclusion of various programmes of environmental education at different levels of education

4.4.1 Primary Level:

According to the Education Commission (1964-66) the aim of teaching science in the primary school should be to develop proper understanding of the main facts concepts, principles and processes in the physical and biological environment. In the lower primary classes, the focus should be on the child's environment-social, physical and biological. In classes I and II, the accent should be cleanliness, formation of health habits and development of the power of observation. These should be emphasised again in classes I and II and IV, but the study should include personal hygiene and sanitation. The child may also be introduced to formal areas of science such as the plants and animals in his surroundings, the air he breathes, the water he drinks, the weather that affects his daily life, the earth he lives on, the simple machines that are being used in his environment, the body of which he should take care and the heavenly bodies he looks on at night. School gardening is an activity that should be encouraged especially at this stage, as it provides pupils with direct and valuable experiences of natural phenomena.

At the higher primary stage, from class VI to VIII environmental education should include some environmental activities which lead to the study of natural and physical sciences, History, Geography and Civics, Constructive and Creative skills will provide the basis for the practice of simple arts and crafts and the practice of healthy living will serve as the foundation for physical education.

The National Curriculum Document of 1974-1975 recommended environmental education for the primary stage which is reflected in the following words. "The child should learn the method of enquiry in science and should begin to appreciate science and technology in the life and world around it. The child should develop habits of cleanliness and healthful living and an understanding of the proper sanitation and hygiene of its neighborhood. The child should acquire a taste for the good and the beautiful and should take care of his surroundings."

At the middle stage, "environmental education, health and population education should receive adequate attention so that science is related meaningfully to life."

The Ishwarbhai Patel Review Committee of 1977 also made an indepth study and recommended environment-oriented curriculum at different levels of education. Realising the need to create a consciousness of the environment in all ages and sections of the society beginning with the child, the National Policy on Educational (1986) recommended environmental consciousness as a part of teaching at all levels of education including primary level.

In pursuance of the National Policy on Education 1986, National Council of Educational Research and Training (NCERT) prepared the National Curriculum where protection of the environment and conservation of natural resources were emphasized. The school curriculum should attempt to create a commitment on the part of pupils to protect the environment and conserve nature and its

resources so that the ecological balances, especially the balance between man and nature, could be maintained and preserved. Different activities should be organised at the primary level of education to make them aware about their surroundings. They should be taught about their own bodies to stay healthy, personal hygiene, sanitation, etc. Cleanliness should be regarded as next to godliness. At the primary education stage emphasis must be mostly on awareness building (75%) followed by real life situations (20%) and conservation (5%). Attempts must be made to sensitize the child to his immediate surroundings. He must be taught to keep his surroundings clean. He must be taught the art of healthy living. At the elementary level, the focus is stressed towards the environmental cleanliness. The content to be used is surroundings from home to school to outdoor situations. The role of environment is brought out through storytelling and singing songs. Teaching about the environment must be done through audio-visual aids and field visits. It has been mentioned in the National Curriculum Framework 2000 that teaching and learning would be woven around the environment of the learners and integrate environmental concerns as well at classes I and II.

The contents and concepts covered are as follows:

1. Familiarization with one's own body.
2. Awareness about immediate surroundings.
3. Need for food, water, air, shelter, clothing and recreation.
4. Importance of trees and plants.
5. Familiarization with local birds, animals and other objects.
6. Interdependence of living and non-living things.
7. Importance of cleanliness and sanitation.
8. Importance of celebration of festivals and national days.
9. Awareness of sunlight, rain and wind.
10. Caring for pet animals.
11. Awareness about air, water, soil and noise pollution.
12. Need for the protection of environment.

13. Knowledge about the source of energy.
14. Importance of the conservation of water resources and forests, and.
15. Indigenous and traditional knowledge about the protection of environment.

Upper Primary Level:

The major concepts dealt are:

1. Adaptation of living beings in environment.
2. Natural resources.
3. Water cycle
4. Food chain.
5. Importance of plants and trees in keeping the environment clean.
6. Classification of plants.
7. Role of plants and animals in environmental balance and soil conservation
8. Ecosystems.
9. Necessity of clean air for healthy living.
10. Animals and their characteristics.
11. Effects of environmental pollution.
12. Role of micro organisms in the environment.
13. Dependence of the community on the environment
14. Basic knowledge about the earth and its atmosphere.
15. Physical features of the country.
16. Population and environment.
17. Care and protection of livestock.
18. Necessity of wildlife protection.
19. Impact of deforestation.
20. Impact of industrialization on environment.

Co-scholastic activities include organization of plays, cultural programmes, debates, mock parliament, discussions, and

community activities. These may help further in achieving the objective.

4.4.2 Secondary Level:

For science in the secondary school, the Education Commission recommended..."The changing character of the sciences should be the major factor in curriculum development. The concept of biology as a method of inquiry by means of accurate and confirmable observations, quantitatively and mathematically analysed and controlled experimentation should be impressed on the minds of the young learners. Earth sciences should be introduced in the secondary school, geology and geography being taught as an integrated subject. There are also many areas in chemistry, physics and biology to which certain topics in the study of earth sciences can be naturally related."

The National Curriculum (1975) also gave importance on environmental education at the secondary stage. It observed that at the secondary stage "in science and mathematics, the student should have competence to apply his knowledge to solution of problems around him. He should have an understanding of the technological processes in agriculture and industry in his surroundings. He should be able to contribute meaningfully to environmental conservation, reduction of pollution, development of proper nutrition, health and hygiene in the community."

The Report of the Review Committee (1977) made an indepth study and commended environment-oriented curriculum. According to the recommendations of the Committee in term of curriculum frames, which was prepared by NCERT, besides science in general and the science in life in the particular, socially useful productive work

(SUPW) should also be made environment-oriented which emphasises on problems related to the environment.

Lower Secondary Education Stage:

The relevance for real-life situation can be emphasized at the secondary stage. From the lower secondary stage onwards, the quantum of awareness must decrease and there should be increased knowledge of real-life situations, conservation and sustainable development. Here, the objective must be real life experience, awareness and problem identification. The contents to be used are those used at primary school level but this must be supplemented with general science. Teaching, practicals and field visits must be part of the course content.

1. Bio-sphere.
2. Greenhouse effect.
3. Ozone layer depletion.
4. Use of fertilizers and pesticides.
5. Wildlife protection.
6. Soil chemistry.
7. Management of domestic and industrial waste.
8. Pollution of noise, air, water and soil and control measures.
9. Ecosystem.
10. Management of non-degradable substances.
11. Edible and ornamental plants.
12. Sewage disposal and cleaning of rivers.
13. Nuclear energy.
14. Radiation hazards.
15. Gas leak
16. Wind power.
17. Bio-energy.
18. Environmental laws and acts.

19. Environmental concepts also extend to subject areas like languages and social sciences which reinforce learning and internalization of all such concepts.

Higher Secondary Level:

The conservation of natural resources are to be taught at higher secondary level. Here the emphasis must be on conservation, assimilation of knowledge, problem identification and action skills. The content may be science-based and action oriented work. Field work and teaching as well as practicals must form an essential part of the course content.

In the school education NCERT has been playing a major role in designing syllabi, textbooks, help books, guide books, charts, kits, teaching materials and aids both for students and teachers of environmental education. This is the stage of diversification; students opt for either the academic stream or the vocational stream. The treatment of concepts becomes deeper and more discipline-oriented since the content caters to the demands of the concerned subject. Majority of the concepts are found in the textbooks of biology, chemistry and geography, which are optional subjects. Students opting for any one of these subject would accordingly benefit in different aspects of Environmental Education (EE).

The coverage of EE concepts include:

1. Environment and sustainable development.
2. Atmospheric pollution-global warming.
3. Greenhouse effect.
4. Acid rain
5. Ozone layer depletion.
6. Water pollution-international standards of drinking water.
7. Importance of dissolved oxygen in water.

8. Biochemical oxygen demand.
9. Land pollution.
10. Pesticides
11. Ecology.

4.4.3 Higher Level:

In India, the higher level of education is divided into two stages-undergraduate stage and post-graduate stage. Under-graduate stage is also known as college education stage. At the college education level, maximum emphasis must be given on knowledge regarding sustainable development based on experience with conservation followed, in a descending order, by conservation, real-life situations and awareness. The content must be based on science and technology.

In India, University education has three major components-teaching, research and extension. The Indian universities can play an important role in meeting environmental challenges by undertaking the activities in teaching, research and extension. Environmental education at the university education stage is looked after by the University Grants Commission. A high-powered Committee suggests areas of environmental education at post-graduate level. Environmental education at this level should aim on specialisation like any other subject.

At post-graduate level, four major areas are recognised. These are as follows:

- a. Environmental Engineering Includes areas like architecture, civil engineering, town and country planning including human settlement, slum improvement, landscape architecture, industrial design, regional science and urban ecosystem studies.

- b. Conservation and Management: Includes areas like land use, forestry, agriculture, energy, waste management, national parks, biosphere reserves, biological diversity, mining management, water management, non-polluting renewable energy development, etc.
- c. Environmental Health Public health and hygiene, sanitary, chemical engineering, occupational health, toxicology, nutrition, drug abuse, etc are included in environmental health.
- d. Social Ecology: Includes subjects like human ecology, sociology, social planning, cost benefit, community, organization and services, psychology and counselling environmental ethics and related areas of humanities.

The solving of problems and sustainable development attitude, values and appraisal should be emphasized at college and university levels. Some practical and field works should be organized to develop skills and understanding through the co-curricular activities e.g. Scouting and Girls' Guide, NCC camps and NSS programmes so an active participation in prevention and solving problems at their local level may be encouraged among the students.

At college and university level, group discussions, seminars, workshops and conferences should be organized where experts may be invited to deliver lectures and deliberations. The field work and workshop should be given top priority.

In India, almost all universities have teaching courses in environmental areas. There are also research institutes and professional institutions as Indian Institute of Technology, Engineering Colleges, Schools of Planning and Architecture which offers courses in environmental engineering. The Department of Environment assists some institutes like Centre for Environmental Education (CEE), Ahmedabad, Indian Institute of Forest

Management (II FM), Bhopal and Indira Gandhi National Forest Academy (IGNFA), Dehradun which provide formal education and training in environmental areas.

Check Your Progress

1. Mention two conceptual models of environmental education.
2. What are the subject to be emphasised in classes III and IV according to the Education Commission (1964-66)?
3. Mention the three components of university education in India.
4. What are the four major areas recognised at the post-graduate level?

4.5 Strategies and Techniques of Teaching of Environmental Education:

The content of Environmental Education (EE) is largely interdisciplinary in nature. It is both art (doing) and science (understanding), organised from primary to university level. The objectives of EE are not confined upto knowledge and understanding (awareness) but include skills, attitudes and values. The problem solving ability and development of quality of man and environment are the major functions of EE. Thus, strategies of teaching and learning have wide coverage, based on content, its components, levels of education and the objectives of EE.

The main objectives of environmental education are awareness, attitude and action which cover cognitive, psychomotor and affective domains of teaching-learning process. The student acquires awareness about the living and non-living components and develops awareness about one's wellbeing in the context of social and natural

environment. Positive feelings and attitude of environmental protection are also formed in him. He can utilize this awareness, skills and attitudes in his actions as personal habits. This will definitely help in improving the quality of the environment.

The doing part is much more important for the teacher. Therefore, the teacher should translate the awareness in his actions which will be followed by the students. The role of the teacher is very significant in realizing the objectives of environmental education. It is the teacher who can sensitize his students for improving the quality of environment.

The strategies of teaching of Environmental Education at different levels of education are as follows:

4.5.1 Primary Level:

- (a) Observation method.
- (b) Playway method.
- (c) Field Trips.
- (d) Dramatization.

4.5.2. Secondary Level:

- (a) Lecture Method.
- (b) Question Answer method.
- (c) Project.
- (d) Educational Tours.
- (e) Dramatization.
- (f) Observation.

4.5.3. Higher Level:

- (a) Lecture method
- (b) Group Discussion
- (c) Seminars and Workshops.
- (d) Survey method.
- (c) Action Research.

- (f) Experimentation.
- (g) Demonstration.
- (h) Interdisciplinary approach

Environmental Education employs scientific and non-scientific methods of teaching. All the methods provide the awareness but skills and attitudes are equally important objectives in teaching environmental education. The teaching method used in Environmental Education must be able to fulfil the aims and objectives of teaching about the environment to the fullest possible extent. It must be able to:

- impart knowledge among the students.
- provide necessary attitude for environmental conservation.
- understand the ecological energy flow system and its influence on man.
- develop skill to solve the environmental problems among the school learners.

STOP TO CONSIDER

In India, University education has three major components- teaching, research and extension. The Indian universities can play an important role in meeting environmental challenges by undertaking the activities in teaching, research and extension. Environmental education at the university education stage is looked after by the University Grants Commission. A high-powered Committee suggests areas of environmental education at post-graduate level.

Check Your Progress

1. Mention the methods of teaching environmental education at primary level.
2. Mention the methods of teaching environmental education at the secondary level.
3. What methods can be used for imparting environmental education at the higher level?
4. Mention two co-curricular activities which can be organised by the teacher for promoting environmental protection.

4.6 Co-Curricular Activities in Environmental Education:

The strategies of teaching Environmental Education can be effectively used for providing awareness, developing skills and attitudes for the environmental consciousness but action and participation is equally important in the area of environmental education. The co-curricular activities are the most appropriate means for providing opportunities for the action.

The teacher plays the most significant role in implementing the programmes and realizing the objectives of environmental education and in organising the co-curricular activities in and outside the school. Therefore, the teacher should possess the abilities of organising effectively curricular and co-curricular activities. In this context there are two main educational programmes recommended by the Education Commission (1964-66) and National Education Policy (1986) i.e. These are :-

- (a) National Social Service scheme (NSS)
- (b) Socially Useful Productive Work (SUPW)

The co-curricular activities can be organised through these programmes.

- 1) Cleaning the environment through NSS camps.
- 2) Growing plants and developing garden for the protection of the environment.
- 3) Cleaning public places, parks, etc.
- 4) Constructing roads in the village by organising NSS camps and also Scout camps.
- 5) Helping the villagers to dig pits for waste management and also to teach them how the bio-degradable and non-degradable waste should be managed.
- 6) Developing the sense of sanitation among the people by organising cultural programmes.
- 7) Developing the consciousness among the people about population education by organising camps of population education or family planning.
- 8) Encouraging the students to prepare charts related to environmental pollution, protection of the environment, proper use of natural resources, etc. These charts must be properly displayed.
- 9) Motivating students to participate in activities like debates, essay writing, storytelling, poetical recitations, dramatisation, etc. on environmental issues.

The teacher can also arrange educational excursions for students so that love for nature is aroused in them. They will learn to appreciate the natural environment.

Today, Environment is a global concept. It is not a subject of study but an approach to learning. It helps people in overcoming prejudices and programming learning experiences ranging from simple to complex. Environmental education makes the child's education problem-based and makes him understand the

environment and the dangers of pollution. The curriculum of environmental education is socially relevant as it educates the child on how unplanned and indiscriminate development endangers our own existence on this planet. While teaching environmental education the following aspects should be borne in mind :-

- 1) Environment should be considered in its totality-natural and manmade, social and technological.
- 2) It should be a life-long process, beginning with the school and continuing throughout life.
- 3) It should be interdisciplinary, drawing on the contents of other subjects.
- 4) The environmental issues should be examined from the local, national and regional and international points of view so as to enable the students to get the proper perspective and become familiar with the conditions and problems in other geographical areas.
- 5) There should be focus on the current and potential environmental issues.
- 6) Stress on the value of local, national and international cooperation in solving environmental problems.
- 7) The learners should have a role in planning the learning process.
- 8) The learners should be helped to discover the symptoms and real causes of environmental problems.
- 9) Use diverse learning environments with stress on practical activities.

4.7 Summing Up

- Environmental education should not be just one more subject to add to existing programmes, but should be incorporated into programmes intended for all learners, irrespective of their age.
- The Discussion Guide for UNESCO Training Workshop on Environmental Education (1980) provided two conceptual models of the Environmental Education Curriculum- Interdisciplinary or Infused Model and Multidisciplinary or Infusion Model.
- In the formal system of education, the Education Commission (1964-66) and other Committees recommended for inclusion of various programmes of environmental education at different levels of education.
- At the primary education stage emphasis must be mostly on awareness building (75%) followed by real-life situations (20%) and conservation (5%). Attempts must be made to sensitize the child to his immediate surroundings.
- The relevance for real-life situations must be emphasised at the secondary stage.

From the lower secondary stage onwards, the quantum of awareness must decrease and there should be increased knowledge of real-life situations, conservation and sustainable development.

- At the undergraduate stage, maximum emphasis must be given on knowledge regarding sustainable development.
- At the post-graduate level, teaching, research and extension should be emphasised equally.
- At the post-graduate level, four major areas are recognised. These are: environmental engineering, conservation and management, environmental health and social ecology.

- The problem-solving ability and development of quality of man and environment are the major functions of environmental education. Thus, strategies of teaching and learning have wide coverage, based on content, its components, levels of education and the objectives of environmental education.
- Co-curricular activities must be properly organised by the teacher to encourage the students to actively participate in the protection and conservation of the environment.

4.8 Questions and Exercises:

A. Fill in the blanks:

- (a) The two conceptual models of the Environmental Education Curriculum an interdisciplinary model andmodel.
- (b) At the primary education stage, emphasis must be mostly on.....
- (c) The relevance forcan be emphasised at the secondary stage.
- (d) At the college education level, maximum emphasis must be given on knowledge regarding.....
- (e) In India, university education has three major components-teaching, research and.....
- (f) Environmental education at the University education stage is looked after by the.....

B. Long Questions

- i. Discuss about the programmes of environmental education for Primary level.
- ii. What programmes should be included at the Secondary level to impart environmental education?

- iii. Describe the programmes of environmental education for the higher level students.
- iv. Write briefly on the strategies and techniques of teaching of environmental education at different levels of education.
- v. Discuss the role of co-curricular activities in environmental education.

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BLOCK- III

- UNIT- 1 ENVIRONMENTAL DEGRADATION
AND ENVIRONMENTAL POLLUTION**
- UNIT- 2 ENVIRONMENTAL STRESSORS**
- UNIT- 3 CONSERVATION OF ENVIRONMENT**
- UNIT- 4 ENVIRONMENTAL PROTECTION,
LAWS AND CONSTITUTIONAL
SAFEGUARDS IN INDIA**

UNIT- 1

ENVIROMENTAL DEGRADATION

Unit Structure:

- 1.1 Introduction
- 1.2 Objectives
- 1.3 Meaning of Environmental Degradation
- 1.4 Types of Environmental Degradation
- 1.5 Causes of Environmental Degradation
- 1.6 Effects of Environmental Degradation
- 1.7 Mitigation measures of Environmental Degradation
- 1.8 Meaning of Environmental Pollution
- 1.9 Definition of Environmental Pollution
- 1.10 Types of Environmental Pollution
 - 1.10.1 Air Pollution
 - 1.10.2 Water Pollution
 - 1.10.3 Soil Pollution
 - 1.10.4 Noise Pollution
- 1.11 Summing Up
- 1.12 Key Terms
- 1.13 Answers to Check Your Progress
- 1.14 Questions and Exercise
- 1.15 References and Suggested Readings

1.1 Introduction:

Environment is not only a determining factor of life on earth but also controller of the existence, growth and development of mankind and all its activities. Environment refers to the surroundings or conditions in which a person, animal or plant living

or operates. The environment “is the sum of the total of the elements, factors and conditions in the surroundings which may have an impact on the development, action or survival of an organism or group of organisms such as human beings”. Etymologically the term ‘environment’ means surroundings. Literally, it is an English expression formed by two words, i.e., ‘environ’ and ‘ment’ which means ‘encircle’ or ‘all round’. Thus, environment is a complex of many variables which surrounds man as well as all living organism. Any external force, substance or a condition which surrounds and affects the life of an organism in any way, becomes a factor of its environment. A Goudie (1984) in his book ‘The Nature of the Environment’ has, in fact, taken environment as the representative of physical components of the earth wherein man is an important factor affecting the environment.

1.2 Objectives:

After going through this unit, you will be able to –

- *understand* the meaning of environmental degradation and environmental pollution;
- *identify* the different types of environmental degradation and environmental pollution;
- *describe* the root causes and mitigation measures to be taken for environmental degradation.

1.3 Meaning of Environmental Degradation:

Environmental degradation is an umbrella concept which covers a variety of issues including pollution, biodiversity loss and animal extinction, deforestation and desertification, global warming and many more.

Environmental degradation is the deterioration of the environment through depletion of resources such as air, water and soil; the destruction of ecosystems and the extinction of wildlife. It is defined as any change or disturbance to the environment perceived to be deleterious or undesirable. Environmental degradation means overall lowering of environmental qualities because of adverse change brought in by human activities in the basic structure of the components of the environment to such an extent that these adverse changes affect adversely all biological communities in general and human society.

Environmental degradation is one of the ten threats officially cautioned by the High-level Panel on Threats, Challenges and Change of the United Nations. The United Nations International Strategy for Disaster Reduction defines environmental degradation as "The reduction of the capacity of the environment to meet social and ecological objectives, and needs". Environmental degradation is of many types. When natural habitats are destroyed or natural resources are depleted, the environment is degraded. Efforts to counteract this problem include environmental protection and environmental resources management.

Environmental degradation isn't just about preserving nature; it's crucial for economic growth and sustainable development. Climate change and environmental hazards affect development projects globally, stressing the need for integrating environmental considerations into all aspects of development. Slowing population growth has been identified as a significant factor in reducing emissions and mitigating climate change impacts. Efforts to tackle environmental degradation must be comprehensive, involving both local and global actions to ensure a sustainable future for all. According to Miller and Spoolman (2009:G5) defined Environmental Degradation as depletion or destruction of a

potentially renewable resource such as soil, grassland, forest, or wildlife that is used faster than it is naturally replenished. If such use continues, the resource becomes non-renewable or non-existent.

1.4 Types of Environmental Degradation:

The environmental degradation is a wide concept than environmental pollution which refers to lowering and deterioration of environmental quality which caused by natural process and human activities from local, regional and global level. Environmental degradation is divided into two categories on the basis of factors responsible for the lowering of environmental quality – (i) environmental pollution and (ii) hazards and events. On the basis of the category different types of environmental degradation are given below-

Degradation of soil and land: Poor agricultural practices, overuse of pesticides and fertilizers, landfill leaks, and other factors all contribute to the loss of soil quality.

Water degradation: Degradation of water involves dumping garbage into the ocean, dumping without permission, dumping a lot of industrial waste in nearby rivers or lakes, etc.

Atmospheric degradation: Atmospheric degradation includes deterioration of the air, particle pollution, and depletion of the ozone layer, among other things.

Several other types of pollution: Along with the deterioration of the land, water, and atmosphere, there are several additional forms of pollution that harm the ecosystem. For examples noise pollution and light pollution.

1.5 Causes of Environmental Degradation:

The major causes of the environmental degradation are modern urbanization, industrialization, overpopulation of growth, deforestation etc. Environmental pollution refers to the degradation of quality and quantity of natural resources. Different kinds of the human activities are the main reasons of environmental degradation. The smoke emitted by the vehicles and factories increases the amount of poisonous gases in the air. The waste products, smoke emitted by vehicles and industries are the main causes of pollution. Unplanned urbanization and industrialization have caused water, air and sound pollution. Urbanization and industrialization help to increase pollution of the sources of water. Similarly, the smoke emitted by vehicles and industries like Chlorofluorocarbon, nitrogen oxide, carbon monoxide and other dust particles pollute air.

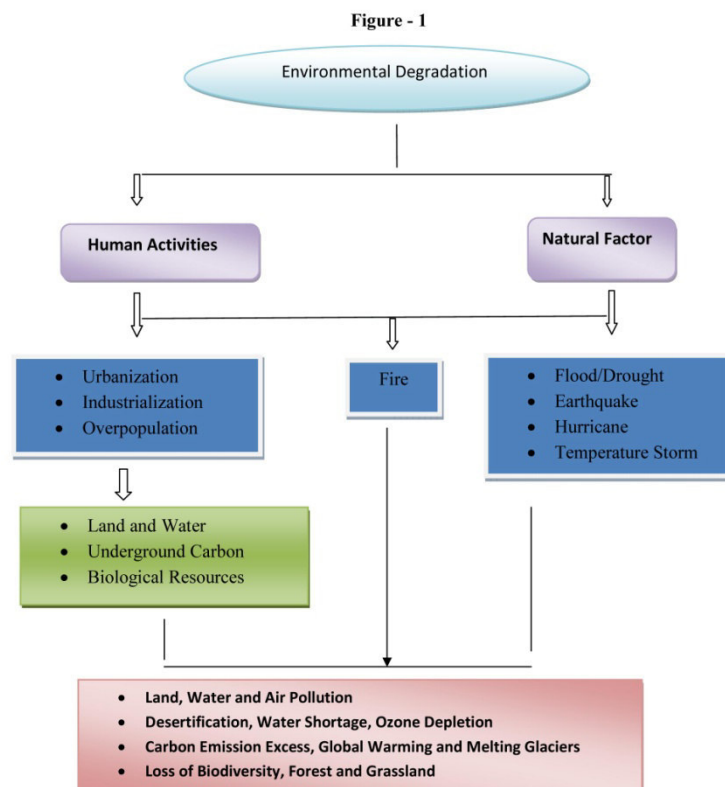


Figure 1: Different causes of environmental degradation

➤ **Human Activity:**

❖ **Population:**

India's fast economic growth and population increase are degrading the country's ecology through industrialization, urbanization, increased agricultural production, and habitat destruction. When the expanding population surpasses the capacity of support systems, it becomes a significant cause of environmental deterioration. For creative development initiatives to provide the intended outcomes, the link between the expanding population and life support systems needs to be stabilized. Population impacts the environment through the use of natural resources and waste production, leading to environmental stresses like loss of biodiversity, air and water pollution, and increased pressure on arable land. The insolvent deplete natural resources more quickly than the wealthy, making poverty both a cause and an effect of environmental degradation. Urban slums arise due to unfair resource distribution and a lack of opportunities.

❖ **Urbanization:**

India's urbanization has increased rapidly since independence, with the population residing in urban areas increasing from 11.4% in 1901 to 31.16% in 2011. By 2030, 40.76% of the country's population is expected to reside in urban areas. This rapid expansion, along with China, Indonesia, Nigeria, and the United States, is expected to lead the world's urban population surge by 2050. The rapid expansion has led to degradation of the urban environment, widened the gap between demand and supply of services, and contributed to urban poverty.

❖ **Economic Factors**

Environmental degradation is a result of market failure, where there is a divergence between private and social costs/benefits. This can be due to lack of well-defined property rights, price controls, and subsidies. Economic development, such as in India, has influenced environmental problems. Industries' manufacturing technology has led to resource depletion, water, air, and land contamination, health hazards, and degradation of ecosystems. Industrial sources, such as iron, steel, fertilizers, and cement, contribute to air pollution. Transport activities, such as road transport, have also impacted the environment. Agricultural development, overexploitation of land and water resources, and shifting cultivation practices has also contributed to environmental degradation.

❖ **Institutional Factors**

The Ministry of Environment & Forests (MOEF) is responsible for environmental protection, conservation, and development, working closely with other ministries, state governments, and organizations. However, the existing system has weaknesses, including weak enforcement capabilities, lack of coordination among Ministries, fragmented policies across agencies, and a lack of trained personnel and comprehensive databases.

❖ **Land Degradation**

Land degradation, caused by both manmade and natural factors, affects up to 40% of agricultural land globally. Factors include climate change, deforestation, poor farming practices, and overgrazing. In India, water erosion is the most significant cause. The growing population and demand for food, energy, and housing

have led to land intensification, causing depletion of forests and grazing lands. Vertical improvements in agriculture, such as HYV seeds and pesticides, contribute to this degradation.

❖ **Agricultural Runoff:**

Agriculture runoff is a major source of water pollution, causing soil and water resources to be degraded. Surface water washes over the soil, bringing fertilizers and pesticides from farmlands into water resources. Phosphorus-containing fertilizers can cause algae explosions, bacteria breaking down organic material, and acidic water, leading to dead zones where plants and animals cannot survive.

❖ **Air Pollution**

Air pollution in India is a major issue, primarily caused by fuel wood and biomass burning, ruining of fuel, vehicle emissions, and traffic congestion. India is the world's largest consumer of fuel wood, agricultural waste, and biomass for energy purposes, with traditional fuel accounting for 90% of domestic energy use in rural India and 24% in urban areas. India is the third largest emitter of total carbon dioxide in 2009, contributing 5% of human-sourced carbon dioxide emissions compared to China's 24% share.

❖ **Acid Rain:**

Acid rain, caused by coal plant emissions and air moisture can cause acidification and pollution in lakes, streams, and soil. U.S. Environmental Protection Agency (EPA) warns that excessive acid rain can lead to the death of plants and animals and deteriorating environmental conditions day by day.

❖ **Natural Sources:**

Environmental degradation is often linked with human activities, but it's also a natural process. Natural disasters like landslides, earthquakes, tsunamis, hurricanes, and wildfires can destroy local communities, either physically or through the introduction of persistent species. This can lead to long-term resource degradation, as the environment struggles to support the new species.

1.6 Effects of Environmental Degradation

- **Impact on human health:** Environmental degradation can negatively impact human health, leading to respiratory issues like pneumonia and asthma, and indirectly causing millions of deaths due to indirect effects.
- **Loss of biodiversity:** Biodiversity is crucial for ecosystem balance, fighting pollution, restoring nutrients, protecting water sources, and stabilizing climate. Major causes for loss of biodiversity include deforestation, global warming, overpopulation, and pollution.
- **Ozone layer depletion:**

The depletion of the ozone layer due to the presence of chlorofluorocarbons and hydrochlorofluorocarbons (HCFCs) in the atmosphere is causing harmful radiation back to the earth which affect human as well as plants.

- **Loss for the tourism industry:**

The tourism industry faces significant challenges due to environmental degradation, including loss of biodiversity, large landfills, and increased air and water pollution, which can significantly impact tourists' livelihoods.

- **Economic impact:**

The economic impact of environmental degradation includes reinstallation of green cover, landfill cleaning, and protection of endangered species. It can also impact the tourism industry. So environmental education can help people to understand their surroundings and address environmental concerns, ensuring the world's sustainability for future generations.

1.7 Mitigation measures of Environmental Degradation:

There are ways which can help to decrease degradation in our environment. Some of these include -

- Purchase recycled products
- Conserve water
- Do not litter or throw waste into inappropriate places
- Conserve energy
- Join an awareness group
- Talk with others about the impacts of environmental degradation

The current lack of environmental value has led to over-exploitation of natural resources and the production of cheap goods with short lifespan. This cycle affects the planet's capacity to restore environmental services. We must change our paradigm to live in harmony with nature and consider the future generations of humans and animals. Nature owes us nothing and we must respect its rights.

STOP TO CONSIDER

❖ Environmental degradation is a process through which the natural environment is compromised in some way, reducing biological diversity and the general health of the environment.

❖ Some causes of environmental degradation includes- Pollution, climate change, deforestation, loss of biodiversity, overpopulation, mining and urbanization etc.

Check Your Progress

1. What is environmental degradation?
2. What are the main causes of environmental degradation?
3. Mention two types of environmental degradation?

1.8 Environmental Pollution:

Environmental Pollution has emerged as one of the most pressing challenges of the 21st century. The issue has led to threats to human health, ecosystems, and the overall well-being of our planet. This article aims to study in detail Environmental Pollution, its meaning, types, causes, consequences, and related concepts such as pollutants & their types.

Pollution may be defined as ‘an undesirable change in the physical, chemical or biological characteristics of our air, water and land that may or will harmfully, affect human life, the lives of the desirable species, our industrial processes, living conditions and cultural assets, or that may or will waste or deteriorate our raw materials. Pollution is mostly man made, but it can also be natural. Natural pollution is caused by volcanic eruptions, emission of natural gases, soil erosion, ultraviolet rays, cosmic rays etc.

Environmental pollution can, therefore, be defined as any undesirable change in the physical, chemical or biological characteristics of any component of the environment, which can cause harmful effects on various forms of life or property.

Environmental pollution is the addition of contaminations into the natural environment that causes detrimental effects the natural resources and mankind. Any unnatural and negative changes in all the dimensions like chemical, physical and biological characteristics of any component of the ecosystem i.e. air, water or soil which can cause harmful effects on various forms of life and property is called environmental pollution.

What is Pollutant?

Any substance which causes harmful effects or uneasiness in the organisms, then that particular substance may be called as the pollutant. The materials that cause pollution are of two types –

1. **Persistent Pollution:** Those pollutants which remain consistent in the environment for a long period of time without any change in its original form are called persistent pollutants. Example: pesticides, nuclear wastes and plastics etc.
2. **Non- persistent Pollutant:** These pollutants are the opposite of persistent pollutant and break down in the simple form. If this process of breaking down is done by living organisms, then such pollutants are referred to as biodegradable pollutants.

1.9 Definition of Environmental Pollution:

The Royal Commission on Environmental Pollution in U.K. in its definition to the term “Pollution”, namely:

“The introduction by man into the environment of substances or energy liable to cause hazards to human health, harm to living resources and ecological systems, damage to structure or amenity or interference with legitimate uses of the environment”.

According to Section 1(3) of the U.K. Environment protection Act, 1990, the term ‘Pollution’ means – The release (into any environmental medium) from any process of substances which are capable causing harm to man or any other living organisms supported by the environment.

The Basic Law for Environmental Pollution Control defines environmental pollution as any activity, by corporations or individuals which compromises the health and or environment of other persons in a localized area, where the casual link is clearly established.

1.10 Types of Environmental Pollution:

Depending upon the area or the part of environment affected, pollution may be of the following types -

- Air Pollution
- Water Pollution
- Land/ Soil Pollution
- Noise Pollution

1.10.1 Air Pollution:

Air pollution is the most harmful form of pollution in our environment. It is an atmospheric condition in which certain substances (including the normal constituents in excess) are present in concentrations which can cause undesirable effects on man and his environment. These substances include gases, particulate matter, radioactive substances etc. The pollutants for air pollution are divided into two categories. Gaseous pollutants include oxides of sulphur (mostly SO_2 , SO_3)

Types of Air Pollution:

- (i) Primary pollutant: Pollutants that are emitted directly from the human or natural activities are known as primary pollutant. For example: CO₂, NO₂, CO₂, particular matters and hydrocarbons etc.
- (ii) Secondary pollutant: When primary pollutants are react with atmospheric moisture content then a new category of pollutants is form, known as secondary pollutant. For example: carbonic acid, nitric acid, sulphuric acid etc.

Causes of Air Pollutant:

- a) Urbanization
- b) Population
- c) Deforestation
- d) Industrialization
- e) Vehicle emission

Harmful effects of Air Pollution:

- (i) **Effects on Human Health-**
 - Sulphur oxides causes irritation of eye, nose, and throat, damage to lungs, Acute and Chronic asthma, bronchitis and Emphysema.
 - Nitrogen oxides cause chronic obstructive pulmonary diseases, infant and cardiovascular diseases.
 - Carbon monoxide induces headaches, dizziness, lose of vision, decreased muscular coordination and serve effects on the baby of a pregnant woman.
 - Dust particles induce stuffy noses, sinusitis, sore throats, dry cough, burning eyes, chest pain, and chronic bronchitis.

- Lead damages the brain and central nervous system, kidneys and brain.
- (ii) Effects on Plants –**
 - The rise of NO_2 , causes Abscission i.e, premature fall of leaves – results in reduction in crop production.
 - Rise of ozone causes Necrosis i.e, damaging the leaves.
 - Air pollution has qualitative and quantitative effects on the plants.
 - Rise in SO_2 causes chlorosis i.e. Yellowing of the leaves.
- (iii) Effects on Animals –**
 - The pets also suffer due to the lung diseases.
 - When animals are fed with oil cakes or grass, the remains of insecticides/ pesticides settled on vegetation, harm the digestive system very severely.
- (iv) Effect on Climate –**
 - Carbon cycle is broken (as forests are cut consumption of CO_2)
 - CO_2 is heavy gas and has capacity to absorb the heat. Rise of CO_2 has caused the global warming.
 - The release of CFC gases has made an impact on ozone layer due to the ozone depletion, cosmic rays reaches to earth increasing temperature of earth.

Control and Prevention of Air pollution:

- (i) At domestic level, burning of wood and dung cakes can be replaced by use of cleaner fuel and biogas.
- (ii) Automobile pollution can be reduced by
 - Pooling of transport or use of public transport.
 - Use of unleaded petrol and CNG
 - Regular tuning and servicing of the engines and

- Switch off the engine at red lights or when not in use.
- (iii) Following measures can reduce industrial pollution
 - Installation of tall chimneys.
 - Installation of devices that do not allow pollutants to be released in the environment, such as filters, electrostatic precipitators, scrubbers etc.

1.10.2 Water Pollution

Water is the most precious natural resources of the earth. It is pivotal for the maintenance of all forms of flora and fauna. We depend on water for irrigation, industry, domestic needs, drinking purpose, for sanitation and disposal of waste. Our water bodies are ponds, lakes, sea, rivers, oceans which have become polluted due to industrial development and urbanization.

Water pollution can be defined as alteration in physical, chemical or biological characteristics of water through natural or human activities and making it unsuitable for its designated use. According to World Health Organization (1966) -

“The contamination of water with soluble sewage and industrial waste called water pollution.”

“Foreign materials either from natural and other sources are contaminated with water supplies and may be harmful to life, because of their toxicity, reduction of normal oxygen level of water, aesthetically unsuitable effects and spread of epidemics”.

Thus from the above water pollution refers-

- ❖ Deteriorate physical, chemical and biological quality of water.
- ❖ Causes the harmful effects on man, animals and vegetation and also quality of environment.

- ❖ Deteriorate quality of environment.

Sources of Water Pollution:

- (i) Most of water pollution is **man made** it may also occur naturally by addition of soil particles through erosion animal wastes and leaching of minerals from rocks.
- (ii) The other sources of water pollution can be classified as
 - Municipal Waste Water
 - Industrial Waste
 - Inorganic Pollutants
 - Organic Pollutants
 - Agricultural Wastes
 - Marine Pollution
 - Thermal Pollution.

Types of water pollution:

Water pollution may be divided on the basis of **sources and storage of water** such as-

1. Surface water pollution
2. Lake water pollution
3. Ground water pollution
4. Sea water pollution
5. River water pollution.

Secondly, Water pollution is also classified on the basis of **source of water pollution**. For example-

1. Sewage water pollution
2. Domestic waste pollution
3. Industrial waste water pollution
4. Solid waste water pollution.

Causes of Water pollution:

There are many causes of water pollution. These are given below-

- (v) Industrial waste
- (vi) Marine Dumping
- (vii) Sewage and Wastewater
- (viii) Oil leaks and Spills
- (ix) Agricultural Runoff
- (x) Global Warming
- (xi) Radioactive Waste

Harmful effects of Water Pollution:

- Water pollution adversely affects the fish and other aquatic life.
- The presence of acids/alkalis in water destroys micro-organisms, thereby disturbing the self purification process in rivers.
- The toxic materials in water cause serious health hazards in human beings and other animals.
- Polluted water causes spread of epidemics, such as cholera, tuberculosis, jaundice, dysentery, typhoid and diarrhea in human beings.
- The use of polluted water from lakes, ponds and rivers for irrigation of agricultural fields, damage crops severely and decreases agricultural production.
- The use of water contaminated with salts increases alkalinity of the soil .
- Heavily polluted water affects the soil, decreases its fertility and kills soil micro-organisms and even certain useful bacteria.
- Contamination of sea water due to oil slicks caused the leakage of crude oil from oil tankers causes eco logical

disasters which results in the death of sea organisms including fishes.

Prevention and control of water pollution:

Water pollution can be controlled by using this mechanism. It included-

- (i) Treating industrial effluents before discharging into river, separate channels for river and sewage water.
- (ii) Avoid contamination of rivers, lakes and ponds by washing clothes, bathing, etc.
- (iii) Not throwing waste, food materials, paper, biodegradable vegetables and plastic into open drains.
- (iv) Setting up sewage water treatment plants.
- (v) Use of septic tanks in houses to avoid direct outlet of faecal matters and other wastes.
- (vi) Effluents from distilleries and solid waste containing organic matter diverted to biogas plants to generate energy.
- (vii) Maintenance or safety standards for the effluents discharged into the water system.

1.10.3 Soil Pollution:

Soil is very important environmental components for human, animals, and plants. Soil is the base of our human culture and civilization. Although one fourth of the earth surface is land, half of this surface is not useful to man due to permanent snow cover, deserts, mountains etc. and only 448 lakh sqkms of land can be used by human being for multiple activities. Any misuse or waste of land may create problems not only for the present generation but for the next generation also. The problem of land and soil pollution is growing day by day with the rapid growth of population,

urbanization, industrialization, deforestation, agricultural runoff and other developmental activities. Soil pollution is not the result of one day man's misuse of land but more due to solid waste disposal.

The top soil gets polluted by the addition of the substances to the soil which adversely affect physical, chemical and biological properties of soil and reduces its productivity. So "The contamination of soil with excess of chemicals, fertilizers, insecticides, herbicides is known as Soil Pollution". The process of soil production is very slow and hence the soil can be considered as non-renewable resource. Soil pollution may occur by dumping and disposing the waste directly on land, application of agrochemicals or indirectly through air pollution.

Sources of Soil Pollution:

The soil pollution is the result of several sources. The air and water pollutants are also equally responsible for soil pollution. The sources are divided into five categories-

1. Physical sources: soil erosion, volcanic eruption.
2. Biological sources: the micro organisms, bacteria and protozoa.
3. Air borne Sources: thermal power plants, industry and factory waste products.
4. Urban and Industrial sources: urban wastes degrade the soil properties, urban sewage pollute the soil .
5. Domestic and municipal waste: Plastic bags, kitchen waste, glass, bottles and paper etc.

Harmful effects of soil pollution:

The soil pollution affects the human beings, animals and plants adversely and degrades the quality of soil. The following are the harmful effects of soil pollution-

- Soil pollution is responsible for loss of fertility and productivity of soil.
- The municipal and domestic waste is often discharged in water bodies, thus responsible for water pollution.
- Particles in the sewage may clog the micro holes of the soil and also destroy the micro organisms necessary for the soil.
- Damage to landscape.
- Carry over the pollutants into the food chain.
- Those bacteria, which are transmitted from soil to man infect man causing dysentery, cholera, tuberculosis, typhoid, paratyphoid fever etc.

Control and Prevention of soil pollution:

Now it is high time to control and prevent soil pollution because the existence of man, animals and plants depend upon the quality of soil. It is necessary to maintain and increase the soil quality. The following are some suggestions to control soil pollution.

- (i) To check the soil erosion by using controlling measures.
- (ii) To use judiciously chemical fertilizers and pesticides and insecticides.
- (iii) To restrict the use of D.D.T.
- (iv) To dispose properly urban and industrial waste.
- (v) Crop management and proper land use.

- (vi) To educate the farmers about the use of fertilizers and biocides.
- (vii) To provide the awareness through adult education.
- (viii) Recycle the waste materials for example- plastic, metal and glass are recycled and incineration of non-recyclable waste.

1.10.4 Noise Pollution:

Sound is a normal feature of our life and a medium through which communication is possible. We hear various types of sounds every day. Sound is mechanical energy from a vibrating source. A type of sound may be pleasant to someone and at the same time unpleasant to others. The unpleasant and unwanted sound is called noise. It may be defined as the state of discomfort and restlessness caused to man by unwanted high intensity sound known as noise.

According to Maxwell (1973), "Noise is any sound that is not wanted. It is one of the more common forms of atmospheric pollution." In 1972, the UN Environment Conference at Stockholm, noise pollution has been accepted as a problem, which needs proper attention.

The World Health Organization defines noise above 65 decibels as noise pollution. To be precise, noise becomes harmful when it exceeds 75 decibels and is painful above 120 decibels.

Sources of Noise pollution: The source of noise can be divided into two categories-

1. Natural sources are associated with natural phenomena like lightning, thunder, volcanic eruption, earthquake, sound of the ocean waves etc.
2. Artificial sources are mainly responsible for noise pollution. It includes industrialization, vehicles, construction sites, loud

speakers, election campaigning, family celebration and religious functions etc.

Harmful effects of Noise Pollution:

The most notable effect of noise pollution is on hearing. Violent noise can cause temporary or permanent impairment of hearing, thus cause of deafness. Continual noise can lead to gradual decline in auditory acuity and eventual deafness. Noise causes the following effects-

- Interferes with man's communication: In a noisy area communication is severely affected.
- Hearing damage: Noise can cause temporary or permanent hearing loss. It depends on intensity and duration of sound level.
- Physiological and psychological changes: Continuous exposure to noise affects the functioning of various systems of the body. It may result in hypertension, insomnia (sleeplessness), gastro-intestinal and digestive disorders, blood pressure changes, behavioral changes, emotional changes etc.
- According to the USEPA, there are direct links between noise and health. Also, noise pollution adversely affects the lives of millions of people.

Control and Prevention of soil pollution:

- (i) Noise producing industries should be located away from residential areas.

- (ii) Inside industries proper arrangements to minimize noise should be made by constructing sound proof and also to provide such instruments to workers, which can protect their ear from noise.
- (iii) Old machines often create more noise , therefore all such machines should be well maintained, and replaced, if necessary.
- (iv) The automobile horn should be designed in such a way that the noise it produces may not be harmful.
- (v) Use of horns should be minimum and pressure horn should be banned as has been done in many countries.
- (vi) The noise created by railways can be checked by construction of ballast less rail track.
- (vii) Special arrangements should be made to check noise near air bases. Control of aircraft noise requires several changes, which should be done.
- (viii) Every government has enacted certain laws to control noise pollution. The basic need is the proper implementation of these laws and regulation and continuous monitoring.

STOP TO CONSIDER

Environmental pollution is the introduction of harmful substances or energy into the natural environment, causing adverse effects on ecosystems, human health, and the balance of nature. It occurs when pollutants—such as chemicals, waste materials, noise, heat, or light—disrupt the natural processes of air, water, soil, or other components of the environment.

Preventing and control measures of environmental pollution include promoting renewable energy, reducing emissions, managing waste effectively, and treating industrial and domestic wastewater before discharge. Sustainable agricultural practices, reforestation, and recycling can minimize soil and water pollution, while noise and light pollution can be controlled through urban planning and efficient lighting.

Check Your Progress

4. What is environmental pollution?
5. What are the major types of pollution?
6. How can we reduce environmental pollution effectively?

1.11 Summing Up:

- **Environmental Degradation:** Environmental degradation refers to the deterioration of the environment due to the depletion of natural resources, such as air, water, and soil, as well as the destruction of ecosystems and loss of biodiversity. It is caused by a combination of natural and human-induced factors, often resulting in adverse impacts on both ecosystems and human societies.
- **Environmental Pollution:** Environmental pollution is the introduction of harmful substances or energy into the environment, causing adverse effects on ecosystems, human health, and the natural balance. These pollutants, which can be chemical, physical, or biological, contaminate air, water, or soil, often resulting from human activities such as

industrial processes, agriculture, deforestation, and urbanization.

- **Air pollution:** Air pollution is the contamination of the atmosphere by harmful substances, including gases, particles, and biological molecules, that pose risks to human health, ecosystems, and the climate. It is caused by natural processes, such as volcanic eruptions, and human activities, such as industrial emissions, vehicle exhaust, deforestation, and the burning of fossil fuels. Common air pollutants include carbon monoxide, sulfur dioxide, nitrogen oxides, particulate matter, and volatile organic compounds.
- **Water Pollution:** Water pollution is the contamination of water bodies, such as rivers, lakes, oceans, and groundwater, by harmful substances or pollutants, making the water unsafe for humans, animals, and ecosystems. It is caused by human activities like industrial discharge, agricultural runoff, sewage, and plastic waste, as well as natural processes. Common pollutants include chemicals, heavy metals, plastics, pathogens, and excess nutrients, which can lead to issues such as ecosystem degradation, health hazards, and reduced water quality.
- **Land pollution:** Land pollution is the degradation of the Earth's land surfaces caused by the accumulation of waste, chemicals, and other harmful substances. It results from human activities such as deforestation, mining, industrial processes, agricultural practices, improper waste disposal, and urban development. Common pollutants include plastics, pesticides, heavy metals, and untreated sewage. Land pollution leads to soil degradation, loss of fertility, habitat destruction, and adverse effects on ecosystems and human health.

- **Noise pollution:** Noise pollution is the excessive or disruptive levels of sound in the environment that negatively affect the health and well-being of humans and wildlife. It is primarily caused by human activities such as industrial operations, traffic, construction work, loudspeakers, and urbanization. Prolonged exposure to high noise levels can lead to hearing loss, stress, sleep disturbances, and reduced productivity. In wildlife, it can disrupt communication, breeding, and migration patterns, ultimately impacting ecosystems.

1.12 Key terms:

- **Environment:** Environment can be defined as a sum total of all the living and non living elements and their effects that influence human life.
- **Degradation:** Environmental degradation is the process by which the environment is negatively impacted, such as destroying ecosystem and habitats, pollution, depleting resources etc.
- **Pollution:** Pollution is a negative / undesirable change in the environment, usually the addition of something hazardous or detrimental.

1.13 Answer to Check Your Progress:

Answer no 1. Environmental degradation is the deterioration of the natural environment through the depletion of resources, pollution, and the destruction of ecosystems. It is primarily caused by human activities such as deforestation, industrialization, and

overconsumption, leading to negative impacts on air, water, soil, and biodiversity.

Answer no 2. The main causes of environmental degradation are - Deforestation, Pollution, Overpopulation, Climate Change, Agricultural Practices etc.

Answer no 3. Two types of environmental degradation are soil degradation and noise pollution.

Answer no 4: Environmental pollution is the introduction of harmful substances or contaminants into the natural environment, leading to negative effects on ecosystems, human health, and the planet. It can occur in air, water, or soil and is mainly caused by human activities such as industrial processes, agriculture, and waste disposal.

Answer no 5. The major types of pollution are soil pollution, noise pollution, water pollution and air pollution.

Answer no 6. To effectively reduce environmental pollution we can adopt clean energy, promote sustainable transportation, reduce, reuse and recycle, support eco friendly industries, conserve resources, plant trees and enforce regulation.

1.14 Questions and Exercises:

1. How does deforestation contribute to environmental degradation?
2. What role does air pollution play in degrading the environment?
3. How does overpopulation accelerate environmental degradation?
4. How do fossil fuels contribute to environmental degradation?

5. What are the consequences of soil erosion on agriculture?
6. How does water pollution affect aquatic life?
7. What measures can reduce environmental degradation?
8. How does air pollution affect human health?
9. What are the main sources of water pollution?
10. How does noise pollution impact wildlife?
11. What causes soil pollution?
12. How does deforestation contribute to environmental degradation, and what can be done to mitigate its effects?
13. Explain the relationship between industrialization and environmental degradation with examples.
14. Describe the causes, effects, and possible solutions to air pollution in urban areas.

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UNIT- 2

ENVIRONMENTAL STRESSORS

Unit Structure:

- 2.1 Introduction
- 2.2 Objectives
- 2.3 Meaning of Environmental Stressors
 - 2.3.1 Models of Environmental Stressors
- 2.4 Effects of Environmental Stressors
 - 2.4.1 Noise pollution
 - 2.4.2 Air pollution
 - 2.4.3 Water Pollution
 - 2.4.4 Over Crowding
- 2.5 Meaning, Nature and Approaches to Disasters
 - 2.5.1 Approaches towards Disasters
 - 2.5.2 Natural and Manmade Disasters
- 2.6 Disaster Management
- 2.7 Education for Coping with Environmental Stressors
- 2.8 Summing Up
- 2.9 Key Terms
- 2.10 Answers to Check Your Progress
- 2.11 Questions and Exercise
- 2.12 References and Suggested Readings

2.1 Introduction:

In the previous unit, you have learnt about the program of education in various educational institutions. In this unit, we will be discussing about environmental stressors and their effects on health, disasters,

disaster management and education for coping with environmental disasters.

Stress is an individual's physical and emotional response to change. Stress is due to the life proceedings like divorce or separation, death of close people, moving to a different place or occupation, monetary crisis, and due to natural disasters. Environmental psychologist state that the stimulus can lead to physical and emotional damages and that requires adjustment of the people. However, the cognitive assessment of the stressor has been recognized in the process of stress.

An environmental stressor is something in our environment that can easily be perceived as annoying, distracting, uncomfortable or unpleasant. Environmental stressor comprises pollution, weather extremes, noise, heat, water, air pollution and so on. Often many of these are ignored. However, they sneak into our lives and collectively have long term negative effects on our health and became the major reasons for the stress. These environmental stressors also disturb the peacefulness of the individual. They destabilize our physical, emotional, psychological and spiritual health and long term critical effects.

2.2 Objectives:

After going through this unit, you will be able to-

- *discuss* the basics of environmental stressors;
- *evaluate* the impact of environmental stressors like noise, heat, air, water, overcrowding on quality of life;
- *explain* various disaster management strategies;
- *analyze* the role of education in coping with environmental stressors.

2.3 Meaning of Environmental Stressors:

Stress is one of the issues which are being discussed these days. Though the concept of stress is difficult to define researchers of environmental psychology are trying to adopt more relational and interactive definitions of stress. Stress is defined as the non-specific response of the organism to any demand made upon it (Setye, 1950). From an environmental point of view, Stress is a state that occurs when people are faced with demands from the environment that require them to change in some way (Veitch and Akkelin, 1995). When there is imbalance between environmental strain and reaction potentiality of the individuals then it leads to stress.

Stress occurs when environmental stimuli exceeds one's coping capacities. Hence stress is basically a relational term suggesting an inequality between environmental opportunity and individual's goals, and competence to cope with that imbalance (Baum, Singer & Baum, 1982). Stress can be termed as something that occurs to people and the people's retort to the things that are happening. During excess stress situations the people may show depressed symptoms. Once again, this may be physiological reasons. One of the stress hormones released by the adrenal cortex is cortisol. The main function of cortisol is to control swelling when an injury occurs. However, it also appears to have the effect of reducing the density of serotonin receptors in some part of the brain. Since abnormal serotonin activity is thought to be associated with mood disorders, high levels of stress can be associated with depression. Stress is a dynamic, recursive relationship between environmental demands, individual and social resources to cope with those demands, and the individual's appraisal of that relationship.

Environmental stressors are the conditions which disturb the act of the person in his attempt to sustain normal living. Environmental stressors interfere with performance through certain coarse grained

actions. The internal or external environmental stressors don't usually involve people, but relate to the conditions of the physical environment.

The nature of environmental stressors includes-

- ❖ The degree to which stressor is perceptually salient
- ❖ Type of adjustment required
- ❖ Value or valence of events
- ❖ Degree of controllability
- ❖ Predictability of stressors
- ❖ Necessity and importance
- ❖ Whether the source is tied to human behavior
- ❖ Duration and periodicity

Environmental stressors may be grouped into different categories: Cataclysmic events, Stressful events, Daily hassle and Ambient stressors.

The sudden disasters that demand adaptive response of individuals affected by the event are called cataclysmic events. The cataclysmic events affect the entire community. The examples are earthquakes, volcanoes, floods and so on. Stressful life events are the major incidents in one's life and typically require adaptive response either personal or social, such as marriage, birth, death, divorce or changes in economic conditions like change in jobs, transfer and retirement and so on.

Everyday occurrences in everyday life might occasionally lead to stress, annoyance, or aggravation. They're known as micro stressors. Environmental events, work-related challenges, and interpersonal issues are all part of the everyday headache. Most of us consider these everyday inconveniences to be a normal part of life because they are frequent yet fleeting. Even if these small issues are personal

in nature, the cumulative effect of these inconveniences may have a significant influence on people over time.

On the other hand, ambient stressors are environmental pressures like wind, pollution, overcrowding noise, which are often minor but can affect people over a long period and affect everyone in the area. They are more continuous, relatively firm and rigid conditions of the physical environments. These stressors are mostly indirect and operate in the form of background conditions. The extent of changes in psychology of the people depends mainly on the power of the stressor. The emotional responses caused by stressor become highly pessimistic and more severe, causing worsening of behavior in the society such as augmented fierceness leading to unselfish acts. This can also lead to shortage in cognitive functioning and can distress the ability of the individual in performing multiplicity of errands. This may also lead to decline in problem-solving aptitude. It makes the person to depend on regular activities originating to rigid, ritualistic means, indicates until it affects the health of the individuals.

STOP TO CONSIDER

Environmental stressors can be grouped into – physical stress, wildfires, pollution, thermal stress, radiation stress, climate stress and biological stress etc.

Check Your Progress

1. Define stress from the environmental point of view.
2. Write the nature of environmental stressors.
3. What do you mean by ambient stressors?

2.3.1 Models of Environmental Stressors:

Stimulus Model:

This model laid emphasis on the stimulations that occur to people. Either too much or too little stimulation in the environment is said to produce stress. Physical variables related to stimulation include the intensity of stimulation, the intricacies of stimulation, originally, vagueness, conflict, or inconsistent sources of information and finally leads to instability or change. In this model, researchers examine the strength of different environmental stressors or diverse types of events in life. These stimulus models of stress have lead to lots of investigation on stress as a cause of infirmity.

Response Model:

This model focuses on the physical and psychological reaction of the individuals to stress. This belief laid emphasis on the means through which stress can have effect on the cardio-vascular and immune systems. This also focused on the responses of the stress in upholding skills in order to cope with stress like relaxation training.

Interactional Model:

This model stated that if there is a disparity between the strain made by the persons and their capability to meet up the demands then it can lead to stress. Researchers in this model focused on the person's insight towards demands of life and reactions to cope with stress. The ability of the individual differences to cope with stress is also highlighted in this model. Stress is an outcome of incongruence between person and environment. It occurs when environmental opportunities are insufficient to afford important personal or group needs.

2.4 Effects of Environmental Stressors:

In the previous unit, we discuss elaborated about different environmental stressors and its impact on health and quality of life. So, in this unit we are going to summarize the effects of environmental stressors.

2.4.1 Noise Pollution:

Modernization has led to a new means of pollution, called noise pollution. Nonstop noise is polluting the environment especially in densely populated cities and towns. This is due to mechanized transport, novel amusements and entertainments. The word noise is derived from the Latin word nausea, means feeling of sickness at the stomach with an urge to vomit. Noise can be defined in different ways. The sound that causes unwanted, objectionable or unpleasant sound is noise. The importance of noise as a pollutant having a deleterious effect on peace of mind and beauty of the environment is increasing every day.

Effects of noise:

- (i) **Speech Interference:** It is the most significant non-auditory consequence since spoken communication is essential in a variety of settings, including the workplace. In real sense, noise-induced voice interference is a creation process. Background noise generally raises our hearing threshold. However, it's important to keep in mind that some continuous noises could cause less speech interruption. In a similar vein, speech interference from discontinuous noises is frequently lower than anticipated.
- (ii) **Effects on efficiency:** According to WHO, noise can act as a distracting stimulus, depending on how meaningful the stimulus might be. Noise may also affect the

psychological state of the individual exposed to it. Meaningful noise may be more distracting than meaningless noise. Similarly, a change in noise levels from those to which people are accustomed may cause adverse effects.

- (iii) **Physiological effects:** The most apparent physiological non-auditory effects of noise concern disturbance of sleep and stress reaction. Noise can also awaken sleeping people, starting from levels of ambient noise as low as 35 db, with differences in sensitivity related to age and sex. From different studies, it reveals that ambient noise above a certain level may produce variations in heart rate, blood pressure, respiration, dilation of pupils and changes in the liquids, glucoses and uric acid pattern in the blood.
- (iv) **Mental Health and behavioral Effects:** Noise may not affect the mental health of the person directly, but indirectly it may increase the growth of latent neurosis. It has often been asserted that noise reduces work output and working efficiency and affects morale. Noise impairs hearing due to damage of sensitive parts in the auditory system and this is the most severe and direct effect of noise.

Noise and physical vibrations from handheld tools may cause severe effects often described as white fingers, dead hands or pneumatic drill disease. Pain, blue coloration and numbness of finger results from moderate vibrations and in severely high vibrations cause damage to bones and joints in the hands with swelling and stiffness. Even the ultrasonic sound may have the effect

on the digestive, respiratory, cardio vascular systems and semicircular canals of the internal ear.

Control measures of noise pollution:

- Modifying some of the present practices and procedures in order to minimize the noise. For example- reducing automobile traffic, outlaying sirens, discouraging stereos without headsets, etc.
- Shielding the noise receiver, i.e, using earplug and control booths etc.
- Shifting noisy sources and things away from people. For example- isolating airports and industrial complexes etc.

2.4.2 Air Pollution:

Air is a natural resource and it is a fundamental element of human life. The undesirable solid or gaseous particles in the air may cause air pollution which may have harmful effects on human health and the environment. Air can be polluted by natural causes like volcanoes or by forest fires that may be caused by lightening. The natural events (e.g. dust storms and volcanic eruptions) and human activities (emission from vehicles, industries etc.) directly emit pollutants called primary pollutants. A major proportion (90%) of the global air pollution is due to five primary pollutants and they are- carbon di-oxides, nitrogen oxides, sulfur oxides, volatile organic compounds and suspended particulate matter. The primary pollutants in the atmosphere undergo reactions and some chemical reactions take place among them to produce pollutants called secondary pollutants, for example sulfuric acid, nitric acid and carbonic acid etc.

Effects of Air Pollution:

➤ Effects on Human Health:

- Sulphur oxides causes irritation of eye, nose, and throat, damage to lungs, Acute and Chronic asthma, bronchitis and Emphysema.
- Nitrogen oxides cause chronic obstructive pulmonary diseases, infant and cardiovascular diseases.
- Carbon monoxide induces headaches, dizziness, lose of vision, decreased muscular coordination and serve effects on the baby of a pregnant woman.
- Dust particles induce stuffy noses, sinusitis, sore throats, dry cough, burning eyes, chest pain, and chronic bronchitis.
- Lead damages the brain and central nervous system, kidneys and brain.

➤ **Effects on plants:** The leaves of plants will be destroyed if pollutants in the atmosphere percolate into the leaf through pores. When the leaves are exposed to the pollutants for a longer duration they split the waxy coating. Due to higher concentration of sulfur dioxide in the atmosphere, the flower buds will become hard and fall from the plants without flowering.

➤ **Effects of air pollution on materials:** The exterior paint of cars and houses will also be damaged due to air pollution. The air pollution has tarnished unique memorials, significant constructions, marble sculpture and other inherited and natural exquisite sites.

➤ **Effects on climate:** Metrological measurements show that wind speed decreases in large cities with increased air

pollution. Air pollution is also a cause of increased rainfall in big cities. Other effects of air pollution at international level are depletion of ozone layer, global warming, rising of sea level and acid rain which are the serious issues facing the entire world now-a-days.

Control measures of air pollution:

Air pollution can be controlled through having suitable tools in position. This consists of instruments such as scrubbers for removing pollutants from the outlet gases, closed gathering of revival methods, making use of dry and wet collectors, strainers, and electrostatic precipitators and so on. The raw materials that cause more pollution should be substituted with those that cause less pollution.

2.4.3 Water Pollution:

Water pollution occurs when harmful substances often chemicals or microorganisms contaminates a stream, river, lake, ocean, aquifer or other body of water, degrading water quality and rendering it toxic to humans or the environment. This widespread problem of water pollution is jeopardizing our health. Water pollution may affect either surface water or groundwater. This form of pollution can lead to many problems such as degradation of aquatic ecosystem and another is spreading water borne diseases.

Causes of Water Pollution:

Water pollution is a multifaceted issues caused by a combination of human activities and natural sources. Human activities include-industrial effluents, agricultural runoff, domestic sewage and mining activities release chemicals, heavy metals and toxins into waterways. Natural sources including rainfall and runoff, soil

erosion and natural disasters also contribute to water pollution. Additionally, oil spills, marine debris, and climate change further exacerbate the issues. Overall these causes of water pollution can have severe impacts on human health, ecosystems, and the economy.

Control measures for preventing water pollution:

Setting up the seepage treatment plants to take care of waste is one of the preventing methods to reduce the water pollution. The treated water can be recycled whereas feasible for gardening and for chilling purpose. Apart from this, setting standards for water purification and maintenance is also important.

2.4.4 Over Crowding:

Overcrowding is significant environmental stressors that can have far reaching consequences on human health and well being. When too many people are packed into a limited space, it can lead to increased noise pollution, reduced air quality and heightened competition for resources. This can result in increased stress levels, anxiety and decreased quality of life. Furthermore, overcrowding can exacerbate existing environmental issues, such as heat islands, water scarcity and waste management problems which are directly or indirectly threatening the sustainability of ecosystems and human settlements.

Crowding has been distinguished from the density, which is a physical measure of the number of persons per unit of space. Crowding is a psychological state that occurs when needs for space exceeds the available supply. Crowding is frequently accompanied by negative effect, including reports of tension, anxiety and stress. Sometimes crowding creates a lot of anger and distress particularly in situations like over crowded bus and long queue on reservation

counters. On the other hand it creates a great deal of enjoyment and pleasant experiences in situations like marriage, social functions at home, school, party etc. More recent researches have suggested that crowding is related to crime and negative emotions.

Crowding may have a detrimental effect on health. Studies indicate that crowding is associated with increases in blood pressure and increased secretion of stress hormones. Crowding conditions are associated with increased incidence of cold, asthmas, influenza and diarrhea, particularly in young children.

Direct and indirect health risks are associated with overcrowding to all segments of the population, mainly the aged, young children and the disabled. Overcrowding can cause or aggravate respiratory illness due to inadequate ventilation in the houses. It also increases the chances of accident in home and community, overburdens mothers and other caregivers both physically and emotionally and increases health threats of dependents. Let us discuss some of the effects of crowding in details-

- a. **Crime:** A link between crime and crowding has been noted. The most known crimes such as pick-pocketing and snatching tend to occur in crowded settings. We are all familiar with increase in this sort of crime during busy rush hour on local trains and buses, peak hours in market places etc.
- b. **Crowding in corrective institutions and psychiatric institutions:** Overcrowding in prisons has become a major problem in India as well as other parts of the world. In recent past various cases of riots among inmates and stress among prison officers have been reported in the different parts of India. Both these cases seem to be related to

overcrowding because violent criminals require greater personal space than non-violent individuals.

Similarly, individuals with mental disorders particularly patients suffering from schizophrenia and neurosis exhibit higher sensitivity to crowding.

- c. Effects on emotion and behavior:** It has been observed that crowding leads to increased physiological arousal and stress. Because of this it is not surprising to find increased incidence of high blood pressure and faster heart rate in crowded situations and increased levels of physical illness. So anger and aggression seem to be the most likely emotional responses. Sometimes crowding also leads to apathy, social withdrawal and learned helplessness.

STOP TO CONSIDER

Like air pollution, water pollution and noise pollution, Overcrowding can significantly impact on mental health, leading to stress, anxiety, and irritability due to lack of privacy and constant sensory overload. It often results in aggression, impaired cognitive functioning, and feelings of isolation despite being surrounded by people. The loss of personal autonomy and disrupted sleep further contribute to emotional instability and physical health issues.

Check Your Progress

1. Mention the sources of air pollution.
2. Write the control measures for preventing water pollution.
3. Define overcrowding?

2.5 Meaning, Nature and Approaches to Disasters:

Disasters disturb the operation of society, originating to extensive human, substance or environmental losses which the society may find difficult to cope with its own resources. Oxford English Dictionary states the word disaster derives from the 16th century French word, 'desastre'. Disaster is a combination of two terms, 'Des' and 'Astre', which mean bad or evil and star accordingly. Thus 'Disaster' signifying a 'Bad star' or 'Evil Star'. Disaster, therefore was implying loss or damage occurring due to some unfavorable star. The term disaster can be applied to any calamity or catastrophe, a serious happening in any area due to natural or manmade causes, or by accident or carelessness which have a consequence of considerable loss of existence or human pain or injury and devastation of property or degradation of environment, which is outside the coping capacity of the affected area.

The **United Nations** defines disasters as, "An event that caused 'sudden' and 'great loss'. The word sudden indicates that such an event is unexpected, unpredictable and when human beings are not prepared for it and the word 'great' only means that the loss to life and property is beyond repair or compensation and that the losses have a great bearing on the survivors, in fact changing the courses of their lives.

According to **WHO** (1995), Disaster means that any occurrence that causes damage, ecological disruption, loss of human life or deterioration of health and health services on a scale sufficient to warrant and extraordinary response from outside the affected community.

Webster's Dictionary defined Disaster as, "A grave occurrence having ruinous results".

As per **UNDHA (2001)**, “A disaster is a serious disruption of the functional of society, causing widespread human, material or environmental losses which excess the ability of affected society to cope on its own resources”.

We can term an event or hazard as disaster when it threatens property and is unforeseen and often sudden. Thus a disaster is an extremely comprehensive multidimensional occurrence with numerous social, economic, material, psychological or ecological dimensions. The term ‘disaster’ may be defined as an unexpected happening causing huge loss of life and property. It may be both natural as well as man-made. The word ‘Disaster’ itself has some meaning of each letters. The meaning of each letter are given below-

D – DESTRUCTION

I - INJURY

S - SUFFERING

A - AWFUL

S - SEVERE

T - TRAGEDIES

E - EGREGIOUS

R – RAMBUNCTIOUS

Therefore, it can be concluded that disaster is the actual occurrence of the apprehended catastrophe. It is a disturbance of natural equilibrium. Disasters proceed by cause-effect due to endogenous (inherent) and exogenous (external) factors, which combine to excite the phenomenon into a large-scale destructive event. Disasters are a result of vulnerabilities, which go on unabated/unchecked over time, which crystallizes finally in a destructive event of great magnitude.

2.5.1 Approaches towards Disaster:

Alexander (1993) has identified six different approaches that social scientists and researcher have used to study disaster. They are:

- (a) Sociological Approach
- (b) Anthropological Approach
- (c) Development Studies Approach
- (d) Disaster Medicine and Epidemiology Approach
- (e) Geographical Approach
- (f) Technical Approach

(a) Sociological Approach: Over the years Sociologists have agreed on the definition of disaster. They have “interpreted disasters as special types of social phenomena, in part because they are dramatic historical happenings (events), and also because they compel collective reactions (social catalysts)”. The sociologists study a range of different types of events. They are natural hazards (tornadoes, floods, hurricanes, earthquakes, volcanic eruptions), accidents (air disasters, explosions, large scale fires, breaking of dams). This approach focuses on vulnerability and its impact on human behavior and psychologically determined defensive reaction pattern. Impact of disasters on community is a major area of study.

(b) An Anthropological Approach: According to the Anthropologist “Disaster is seen as a process leading to an event that involves a combination of a potentially destructive agent from the natural or technological sphere and a population in a socially produced condition of vulnerability” (Oliver-Smith and Hoffman, 1999). Henry (2005) has given an anthropological contribution to the complete life cycle of disaster, from issues of vulnerable and perceived risk, to individual and social responses and coping strategies, to relief and recovery efforts. It is a community oriented

approach with focus on function of disasters in guiding the socio-economic progression of human civilization. They also search for entry point for local communities beyond which they don't provide the fundamental necessities for survival of the member.

(c) A Development Studies Approach: This approach looks at the problems of providing aid and relief to Third World Countries. Mainly it addresses the problems of refugee management, health care and the avoidance of starvation (Alexander, 1993). Most of the disaster impact occurs in developing countries. This increases poverty and human vulnerability. This approach is more concerned about the issues of vulnerability and livelihood security.

(d) A Geographical Approach: This approach has used the social science methods and emphasis is given to the spatio-temporal distribution of hazards, impacts and vulnerability. They have discussed how choices are made between different types of adjustment to natural hazards (Alexander, 1993). It focuses on chronological and chronological distribution of disaster, their impact and vulnerability.

(e) A Medicine and Epidemiology Approach: This approach mainly focuses on the management of mass casualties, treatment of physical trauma and the epidemiological surveillance of communicable diseases. The incidence of such disease generally increases after a disaster as there is a disruption of public health (Alexander, 1993). Medical support is the first priority after initial search and rescue phase (Beinin, 1985). For example disasters like floods can create epidemic in the form of diarrhea, respiratory and infectious diseases. Disasters like earthquakes and technological accidents create problems like bone fractures and psychological trauma. If medical facilities are delivered to the victims in the first few hours of disaster, that saves more number of lives (Smith, 2001).

(f) A Technical Approach: This is the approach of physical and natural scientists. They give more stress to seismology, volcanology, geomorphology and other geophysical approaches (Alexander, 1993). The emphasis here is on nature, scale, intensity and impacts on human structure or engineering. It may have some elements of human ecology.

2.5.2 Natural and Manmade Disasters:

Natural and manmade disasters are terrible events that can cause widespread damage to life, property, and the environment. They differ in origin but often share similar consequences, such as loss of life, economic disruption, and social disturbance.

A. Natural Disasters: These events are caused by natural processes of the Earth and include:

1. Geological Disasters

- Earthquakes
- Volcanic eruptions
- Landslides
- Tsunamis

2. Hydrological Disasters

- Floods
- Flash floods
- Storm surges

3. Meteorological Disasters

- Hurricanes, cyclones, and typhoons
- Tornadoes
- Severe storms
- Extreme temperatures (heat waves, cold waves)

4. **Biological Disasters**

- Pandemics and epidemics (e.g., COVID-19, influenza outbreaks)
- Locust swarms
- Animal infestations

5. **Climatological Disasters**

- Droughts
- Wildfires

Let us discuss all the natural disasters in a brief way-

1. **Geological disasters** are catastrophic events resulting from processes and movements within the Earth's crust. They include earthquakes, volcanic eruptions, landslides, and tsunamis, all of which can cause significant destruction to life, infrastructure, and the environment. These disasters often occur with little warning, making them particularly devastating. For instance, earthquakes result from tectonic plate movements, while volcanic eruptions release molten rock, ash, and gases from beneath the Earth's surface. Landslides, triggered by factors such as heavy rainfall or seismic activity, lead to the sudden collapse of land. Geological disasters highlight the immense power of Earth's natural processes and the need for preparedness and resilience in vulnerable regions.
2. **Hydrological disasters** are water-related events that arise from extreme changes in the water cycle, often causing widespread destruction and disruption. These include floods, flash floods, storm surges, and tsunamis. Floods can result from heavy rainfall, overflowing rivers, or dam failures, while tsunamis are massive sea waves triggered by undersea earthquakes or volcanic activity. Storm surges, often

associated with tropical cyclones, cause coastal flooding and erosion. Hydrological disasters can lead to loss of life, property damage, and waterborne diseases, emphasizing the importance of effective water management, early warning systems, and disaster preparedness in mitigating their impact.

3. **Meteorological disasters** are extreme weather events caused by atmospheric processes, often leading to severe damage and loss of life. These include hurricanes, cyclones, tornadoes, severe storms, and extreme temperature events like heat waves and cold waves. Driven by climatic and weather conditions, these disasters can cause flooding, wind damage, and widespread disruptions to daily life. For example, hurricanes bring destructive winds and storm surges, while heat waves can lead to drought and health crises.
4. **Biological disasters** are events caused by the spread of biological agents such as viruses, bacteria, fungi, or invasive species, leading to widespread harm to human health, agriculture, or ecosystems. Examples include pandemics like COVID-19, outbreaks of diseases such as Ebola or cholera, and infestations like locust swarms. These disasters can result in high mortality rates, strain healthcare systems, disrupt economies, and threaten food security.
5. **Climatological disasters** are extreme events caused by long-term weather patterns or climate anomalies, often exacerbated by global climate change. These include droughts, wildfires, and extreme temperatures. Droughts can lead to water scarcity, crop failure, and famine, while wildfires, often sparked by prolonged dry conditions, destroy ecosystems and threaten human settlements. Rising global

temperatures contribute to the frequency and intensity of such events, posing serious challenges to environmental sustainability and human livelihoods.

B. Manmade Disasters: These are caused by human actions, negligence, or failures and include:

1. Technological/Industrial Disasters

- Nuclear accidents (e.g., Chernobyl, Fukushima)
- Chemical spills (e.g., Bhopal gas tragedy)
- Oil spills (e.g., Deepwater Horizon)

2. Environmental Degradation

- Deforestation
- Desertification
- Pollution (air, water, and soil)

3. Social/Humanitarian Disasters

- Wars and conflicts
- Terrorist attacks
- Forced migrations (refugee crises)

4. Accidents

- Transportation accidents (plane crashes, train derailments)
- Building collapses
- Fires in urban areas

Let us discuss all the manmade disasters in a brief way-

1. Technological and industrial disasters are tragic events caused by human activities, particularly within industries or technological systems. These include nuclear accidents, such as Chernobyl and Fukushima, chemical spills like the Bhopal gas tragedy, and oil spills such as the Deepwater Horizon disaster. These incidents often involve the release of hazardous substances, leading to

environmental damage, health risks, and long-term economic impacts.

2. Environmental degradation refers to the deterioration of the natural environment due to human activities, leading to the depletion of resources and the destruction of ecosystems. It includes deforestation, soil erosion, and loss of biodiversity, pollution, and desertification. These activities disrupt the balance of ecosystems, harm wildlife, and contribute to climate change. The consequences of environmental degradation are far-reaching, affecting air and water quality, food security, and human health.

3. Social/ humanitarian disasters are crises that arise from human actions or societal breakdown, often resulting in widespread suffering, displacement, and loss of life. These disasters include wars, conflicts, terrorist attacks, and refugee crises, which displace millions of people and create severe humanitarian needs. Forced migrations, famine, and human rights violations are often consequences of such events. Social disasters can devastate communities, disrupt economies, and lead to long-term psychological and social challenges.

4. Accidents are unexpected events that cause harm, damage, or injury, often resulting from human error, negligence, or unforeseen circumstances. They can occur in various settings, including transportation (car crashes, plane crashes, and train derailments), industrial sites (factory explosions, equipment failures), and everyday activities (household accidents, falls).

Impact of Disasters

- **Human Impact:** Loss of lives, injuries, and displacement.
- **Economic Impact:** Destruction of infrastructure, loss of livelihoods, and reduced productivity.

- **Environmental Impact:** Habitat destruction, biodiversity loss, and pollution.
- **Psychosocial Impact:** Trauma, mental health issues, and social disintegration.

The scientists can predict in advance about natural atmospheric hazards, the safety measures can be used for these hazards and contingency plans can be made effective for dealing with the hazards. Some of the atmospheric hazards are caused by human activities such as dams, reservoirs and deforestation. The human activities should be evaluated in terms of impact assessment. The monitoring and feedback mechanism on the implementation are necessary measures for the safeguards. Man is the product of his social as well as his physical environment, and it is in times of disaster that these strong bonds with his origins manifest themselves and- take precedence over his ordinary behavior. Man should give up the idea of exploitation of nature and have a check on human population by introducing family planning programmes and moral check.

2.6 Disaster Management:

Disaster Management is the process of preparing for, responding to, and recovering from natural or manmade disasters. It involves a comprehensive approach to mitigate the impact of disasters and ensure the safety and well-being of affected populations. The goal is to minimize loss of life, reduce damage to property, and ensure that affected communities can recover as quickly as possible. The Disaster Management Act of 2005 defines Disaster Management as an integrated process of planning, organizing, coordinating and implementing measures which are necessary for-

1. Prevention of threat of any disaster

2. Reduction of risk of any disaster or its consequences
3. Readiness to deal with any disaster
4. Promptness in dealing with a disaster
5. Assessing the severity of the effects of any disaster
6. Rescue and relief
7. Rehabilitation and Reconstruction

Disaster management is a complex multidisciplinary approach to tackle the pre and after effects of a disaster which occurs in a particular area or a region. Disaster Management is a process of comprehensive planning of an organization or a country or a province to protect the life and property of humans from expected or anticipated hazards and disasters and to provide immediate rescue and relief facilities to affected people by a disaster and also to facilitate recovery and rehabilitation programs. Disaster management includes the development of disaster recovery plans (for minimizing the risk of disasters and for handling them when they do occur) and the implementation of such plans. Disaster/emergency management is the discipline of dealing with and avoiding risks. It involves preparing for a disaster before it happens, disaster response (e.g. emergency evacuation, quarantine, mass decontamination, etc.), as well as supporting and rebuilding society after natural or human-made disasters have occurred. There are some other terms used for disaster management. Such as – Emergency Management, which has replaced Civil defense, can be seen as a more general intent to protect the civilian population in times of peace as well as in times of war.

Principles of Disaster Management:

Disaster management is a complex multidisciplinary approach to tackle to pre and post disaster effects in a particular area or region.

The Federal Emergency Management Agency (FEMA) has formulated the following principles for disaster management plans –

- a) It should be comprehensive,
- b) It should be progressive,
- c) It should be risk driven,
- d) It should be integrated,
- e) It should be collaborative,
- f) It should be coordinated,
- g) It should be flexible,
- h) It should be professional.

Emergency managers must consider all the aspects of hazards, i.e. hazard vulnerability and hazard risks, all phases of disaster management, i.e. pre and post disaster stages, all stakeholders and all aspects of disaster impact. They should identify hazard vulnerable areas and should anticipate impending disasters and to take necessary steps in advance for preventive and preparatory measures so that the communities may become able to develop disaster resilience. They should apply sound principles of risk management which include hazard identification, risk analysis and impact analysis. All efforts being made at management levels and all levels of government and all components of society and community should be integrated. There should be well integrated efforts to ensure coordination and relationships among individuals and organizations so that there becomes team spirit and consensus among all units. They should also facilitate communication at all levels. All activities related to disaster management should be coordinated and synchronized at all levels with all stakeholders, so that common purpose of management is well achieved. Disaster management programs should adopt such management approaches which are based on scientific knowledge, disaster education, training and experience.

Disaster Management Includes:

- 1. Preparedness:** Disaster preparedness is not just getting ready for emergency response. It means a wide range of measures operating on short as well as long term basis, planned to decrease the loss of life and destruction of national assets and it is concerned with long term policies and measures to minimize the impact of disaster. Preparedness includes actions which the governments, organizations, communities and individuals facilitate to react quickly and efficiently to disaster situations. Some of these are given below-
 - **Risk Assessment:** Identifying and understanding potential hazards, such as earthquakes, floods, or industrial accidents, and assessing their likelihood and potential impacts.
 - **Planning:** Developing emergency response plans, including evacuation routes, shelters, and communication systems. These plans are typically coordinated at local, regional, and national levels.
 - **Training and Education:** Providing disaster preparedness education to the public, and training emergency responders, medical teams, and government officials.
 - **Resource Allocation:** Ensuring that adequate resources, such as food, water, medical supplies, and personnel, are available and accessible during a disaster.
- 2. Mitigation:** Mitigation involves the pre-disaster activities concerning the appraisal of threat and reducing the possible effects of disasters and ever more, activities of post disaster

to lessen the possible damage of prospect. Disaster mitigation program includes land use regulations, building codes, structural barriers to prevent or control hazards, and insurance program to lessen the economic impact of disaster.

The term mitigation more generally implies that whilst it may be possible to prevent some disaster effects, other effects will persist but can be modified or reduced provided appropriate action is taken. It includes-

- **Building Resilience:** Implementing measures to reduce the risk of disaster impacts, such as enforcing building codes for earthquake-resistant structures or improving flood defenses.
- **Environmental Protection:** Preventing environmental degradation through sustainable practices (e.g., reforestation to reduce landslides, or sustainable land management to avoid desertification).
- **Climate Adaptation:** Developing strategies to address long-term changes in climate patterns, such as preparing for more intense hurricanes or droughts.
- **Community Engagement:** Encouraging communities to be proactive in disaster risk reduction through awareness campaigns and participatory decision-making.

3. **Response:** The activities throughout the disaster comprise search and rescue, migrating the people, emergency medical services, and fire combating. Response will also cover reducing secondary damage, such as covering damaged roofs with plastic to protect the inside of buildings, and planning the revival.

- **Emergency Relief Operations:** Immediately after a disaster, responding with lifesaving measures like search-and-rescue operations, providing medical care, distributing food, water, and shelter, and restoring essential services.
- **Coordination:** Government agencies, non-governmental organizations (NGOs), and international bodies work together to provide timely and effective relief.
- **Communication:** Effective communication systems must be in place to inform the public about safety measures, evacuation instructions, and available services.

4. Recovery: The measure of recovery which includes rehabilitation and reconstruction are the chance to extend and relate risk lessening measures of disaster. Recovery can be both short term and long term. Assisting in the long-term recovery of affected areas by restoring essential services and infrastructure. Thus recovery includes

- **Rehabilitation:** Once the immediate impacts of the disaster are addressed, the focus shifts to restoring infrastructure, such as roads, utilities, and hospitals.
- **Psychosocial Support:** Providing counseling and mental health services to survivors who have experienced trauma and loss.
- **Economic Recovery:** Supporting the restoration of livelihoods, rebuilding communities, and revitalizing local economies.

- **Long-Term Resilience Building:** Integrating disaster risk reduction measures into community development and urban planning to reduce future vulnerability.

5. Reconstruction:

- **Rebuilding Communities:** Post-disaster reconstruction involves the rebuilding of homes, schools, businesses, and public infrastructure. This stage can take months or even years.
- **Sustainable Development:** Reconstruction should focus on sustainable development, ensuring that the rebuilt areas are resilient to future disasters and equipped with modern technologies and practices that improve safety.

Agencies involved in Disaster Management:

- **National Disaster Management Authority (NDMA):-**
The National Disaster Management Authority, or the NDMA, is an apex body for disaster management, headed by the Prime Minister of India. It is responsible for the supervision, direction, and control of the National Disaster Response Force (NDRF).
- **National Executive Committee (NEC):-** The NEC is composed of high profile ministerial members from the government of India that include the Union Home Secretary as Chairperson, and the Secretaries to the Government of India (GoI) like Ministries/Departments of Agriculture, Atomic Energy, Defense, Drinking Water Supply, Environment and Forests, etc. The NEC prepares the National Plan for Disaster Management as per the National Policy on Disaster Management.

- **State Disaster Management Authority (SDMA):-** The Chief Minister of the respective state is the head of the SDMA. The State Government has a State Executive Committee (SEC) which assists the State Disaster Management Authority (SDMA) on Disaster Management.
- **District Disaster Management Authority (DDMA):-** The DDMA is headed by the District Collector, Deputy Commissioner or District Magistrate depending on the situation, with the elected representatives of the local authority as the Co-Chairperson. The DDMA ensures that the guidelines framed by the NDMA and the SDMA are followed by all the departments of the State Government at the District level and the local authorities in the District.
- **Local Authorities:-** Local authorities would include Panchayati Raj Institutions (PRI), Municipalities, District and Cantonment 11 Institutional and Legal Arrangements Boards, and Town Planning Authorities which control and manage civic services.

Challenges in Disaster Management:

- **Limited Resources:** Especially in low-income countries, a lack of resources (financial, human, and technical) can hinder effective disaster management.
- **Coordination Issues:** Disasters often involve multiple stakeholders, and poor coordination can delay or hinder relief efforts.
- **Climate Change:** Increasingly severe weather events, rising sea levels, and more frequent disasters complicate disaster preparedness and response.

- **Political and Social Barriers:** Conflicts, corruption, or a lack of political will can delay relief efforts and prevent effective disaster management.

Disaster management is an ongoing process that requires cooperation, preparedness, and resilience at every level of society. By improving disaster management strategies, communities can reduce the human and economic toll of disasters and recover more quickly.

Technological Innovations in Disaster Management:

- **Early Warning Systems:** Advanced weather forecasting, seismic detection, and tsunami warning systems help provide alerts to minimize damage and save lives.
- **Geospatial Technology:** Tools like Geographic Information Systems (GIS) and satellite imagery assist in mapping disaster-prone areas, planning evacuation routes, and assessing damage post-disaster.
- **Mobile Apps:** Disaster management apps allow people to receive real-time alerts, report emergencies, and access vital information during a disaster.
- **Drones:** Drones are used in search-and-rescue operations, assessing damage in inaccessible areas, and delivering aid.

STOP TO CONSIDER

Disaster is a combination of two terms – ‘Des’ and ‘Astre’. ‘Des’ means bad or evil and ‘Astre’ means star, thus ‘Disaster’ signifying a ‘Bed Star’ or ‘Evil Star’.

Disaster management includes Prevention, Mitigation, Preparedness, Response and Recovery.

Check Your Progress

1. Disaster is derived from which language.
2. Define 'Disaster' according to WHO.
3. Mention four approaches towards disaster.
4. Write four characteristics of manmade disaster.
5. Mention the challenges of disaster management.

2.7 Education for Coping with Environmental Stressors:

Education operates as an intermediary element depending on perspective of the individuals to both increase and reduce stress. Education not only provides knowledge but also ensures right decisions. Coping is a significant characteristic of managing stress. Person's ability to cope with stress is important for personal adaptation since it influences a person's self assurance and attitude in life. We can cope with stress by either problem focused or emotion focused approaches. In both cases, the threat or damage is reduced through effective coping.

Education plays a vital role in helping individuals and communities cope with environmental stressors by equipping them with the knowledge, skills, and strategies needed to adapt and thrive in challenging conditions. It raises awareness about pressing environmental issues such as climate change, pollution, natural disasters, and biodiversity loss, enabling people to understand the causes and consequences of these stressors. Practical skill development, such as disaster preparedness training, sustainable agriculture, and water conservation techniques, empowers communities to mitigate risks and build resilience. Furthermore, education fosters collective action through community-based initiatives that combine traditional ecological knowledge with modern science. It also addresses the psychological impact of

environmental challenges by promoting emotional resilience and mental health support.

Education is a cornerstone for effectively coping with environmental stressors, as it empowers individuals and communities with the tools and understanding necessary to navigate and adapt to the challenges posed by environmental changes. It begins with fostering awareness of critical issues such as climate change, deforestation, pollution, and natural disasters, helping people grasp the interconnectedness of human activities and the environment. This knowledge forms the basis for proactive behaviors, including reducing individual carbon footprints, conserving natural resources, and advocating for environmental protection. Furthermore, education builds essential skills for adaptation and resilience, such as disaster preparedness, sustainable farming, and efficient water management, which are particularly vital in regions vulnerable to environmental crises like floods, droughts, or hurricanes.

Community-based education plays a pivotal role by leveraging local knowledge and encouraging collective action to address environmental risks. Integrating traditional ecological wisdom with scientific advancements enables communities to devise context-specific solutions, such as restoring degraded ecosystems or implementing early warning systems for natural disasters. Additionally, education addresses the mental and emotional toll of environmental stressors, promoting psychological resilience through mindfulness practices, stress management, and community support networks. Technological and scientific literacy further strengthens coping mechanisms by equipping individuals with the ability to use tools like Geographic Information Systems (GIS) for risk assessment or adopt renewable energy technologies to reduce dependency on fossil fuels.

Sustainability education underpins long-term solutions by instilling habits and values that prioritize environmental stewardship, such as waste reduction, energy conservation, and biodiversity preservation. It encourages advocacy for systemic change, empowering people to influence policies and participate in global movements for climate action. Effective implementation of environmental education can be achieved through schools, community programs, and digital platforms, ensuring accessibility and inclusivity. By fostering knowledge, skills, and a collective sense of responsibility, education enables society to mitigate environmental stressors and create a sustainable future, balancing ecological health with human well-being.

Education is important and represents a priority, because if human beings don't become aware of disaster risks, acquire the necessary knowledge and develop the appropriate behavior, attitudes and level of involvement, they will not be able to prevent them. It is important for education to facilitate and contribute to the creation of a culture of prevention and for the population and communities to take action to prepare for a disaster. Education for disaster preparedness can provide life-saving and life-sustaining information and skills that protect in particular children and young people during and after emergencies. So, it becomes very important to teach students about disaster management and avoid risk of any losses. In fact students should be trained well in disaster management tasks and should be asked to train their family as well as society too. Learning about variety of disasters, their causes and hence prevention is very important for everyone. Once disaster has occurred everyone should be aware of its controlling measures. Instead of being getting panic and enhancing the problem, it is important to understand how to manage in such situation, help themselves and help others too.

Government of India, Ministry of Human Resource Development in its tenth five year plan emphasized the need for integrating disaster management in the existing education system in India. For this purpose, disaster management in the curriculum of school & professional education has been recommended to the boards. Central Board of Secondary Education has integrated a short course on disaster management in the school curriculum. They introduced the subject on disaster management as a frontline curriculum in social science. The curriculum contains nature & type of hazards, natural & manmade disasters, role of community & schools in disaster management, efforts made for disaster preparedness & mitigation, survival skills, main emphasis of the subject, awareness & sensitization of students & teachers on various hazards, preventive & precautionary measures.

Education for coping with environmental stressors should be concerned principally with learning practices and the intentional actions that people can take. It is seen that education can help in identifying and targeting, the modifiable interdependencies that facilitate individual and united empowerment to have power over the components of environmental stressors.

2.8 Summing Up:

- Environmental stressors are the conditions which disturb the act of the person in his attempts to sustain attention. Noise, heat, air, water pollution and overcrowding are some of the common environmental stressors.
- Noise pollution is directly related to technological advancement and the main sources are vehicles, airplanes, trains, noise produced by factories, restaurants, television sets and so on.

- The sources of air pollution are industrialization, urbanization, burning of domestic fuel, modernization etc.
- Water pollution occurs when harmful substances often chemicals or microorganisms contaminates a stream, river, lake, ocean, aquifer or other body of water, degrading water quality and rendering it toxic to humans or the environment.
- The increasing population growth, industrialization and urbanization are leading to overcrowding especially an urban area.
- Disasters are sudden events which lead to huge loss to mankind. Disasters can be either natural or manmade. Some of the natural disasters are flood, earthquakes, Tsunamis, Volcanoes, and Landslides etc. The manmade disasters include nuclear bombs, wars, terrorisms, explosions and toxic waste. The disaster management strategies should include prevention, mitigations, preparedness, disaster impact, response, recovery and development.

2.9 Key Terms:

- Stress: The non-specific response of the organism to any demand made upon it.
- Environmental stressors: The conditions which disturb the act of the person in his attempt to sustain normal life.
- Cataclysmic events: The sudden catastrophes that demand adaptive response of individuals affected by the event.
- Noise: The sound that causes unwanted, objectionable or unpleasant affect.

- Crowding: An observed state which is determined by the sensitivity towards space limitation.

2.10 Answer to Check Your Progress:

- From an environmental point of view, ‘ Stress is a state that occurs when people are faced with demands from the environment that require them to change in some way’.
- The nature of environmental stressors includes-
 - (i) The degree to which stressor is perceptually
 - (ii) Type of adjustment required
 - (iii) Value or valence of events
 - (iv) Degree of controllability
 - (v) Predictability of stressors
- Ambient Stressors means environmental pressures like wind, pollution, overcrowding noise, which are often minor but can affect people over a long period and affect everyone in the area.
- The sources of air pollutions are vehicles, heating, cooling equipment, wood fires and gas powered yard, household activities, factories, and agriculture etc.
- Water pollution can be controlled by using preventing methods and we can control the use of pesticides and insecticides, plastic and do not throw in the trash, pour down the drain or dump on the ground paint, motor oil, other household hazardous waste etc.
- Overcrowding refers to a situation where the number of individuals or objects occupying a particular space exceeds its intended or optimal capacity.
- The word ‘Disaster’ is derived from French word.

- According to WHO, Disaster as “any occurrence that caused damage, economic destruction, loss of human life, deterioration of health and health services on a scale, sufficient to warrant an extraordinary response from outside the affected community or area”.
- Four approaches towards disasters include- Geographical approach, Anthropological Approach, Sociological Approach and Developmental studies approach.
- Four Characteristics of manmade disaster are
 - (i) Manmade disaster can have limited or widespread effect.
 - (ii) Usually violent in nature.
 - (iii) Mostly limited or no warning through there may be longer warning of effects of say, chemical or oil spill
 - (iv) Speed of onset usually rapid.
- Limited resources, coordination issues, climate change and political and social barriers are the major challenges of Disaster management.

2.11 Questions and Exercises:

1. State the conditions under which stress occurs.
2. Define environmental stressors.
3. What are the sources of noise pollution?
4. What is the primary effect of environmental stressors on human?
5. What is the primary goal of disaster management?
6. What is the term for the process of reducing the impact of a disaster?

7. Discuss the nature of environmental stressors.
8. Describe the various types of models of environmental stressors.
9. Discuss the different types of effects of environmental stressors.
10. Explain the basic steps involved in disaster management.
11. Discuss the role of different government agencies involved in disaster management.

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UNIT- 3

CONSERVATION OF ENVIRONMENT

Unit Structure:

- 3.1 Introduction
- 3.2 Objectives
- 3.3 Meaning of Environmental conservation
 - 3.3.1 Characteristics of Environmental Conservation
 - 3.3.2 Objectives of Environmental Conservation
- 3.4 Need of Environmental Conservation
- 3.5 Categories of Environmental Conservation
- 3.6 Types of conservation methods
- 3.7 Summing Up
- 3.8 Key Terms
- 3.9 Answers to Check Your Progress
- 3.10 Questions and Exercise
- 3.11 References and Suggested Readings

3.1 Introduction:

Environment comprises almost everything around us. Environment has been defined as the aggregate of all external conditions and influences affecting the life and the development of an organism. Human existence is quite impossible without the presence of a healthy ecosystem. Our environment comprises all living and non-living components and their interactions within a natural habitat. Environmental conservation has become one of the core issues that need to be addressed to battle climate change and global warming. Sustainable development is the need of the hour that can save mother earth from the repercussion of industrialization.

3.2 Objectives:

After going through this unit, you will be able to-

- *understand* the meaning, characteristics and objectives of environmental conservation;
- *identify* the need of environmental conservation;
- *describe* the categories and types of environmental conservation.

3.3 Meaning of Environmental Conservation:

Conservation is the careful use of land, air, water minerals and other natural resources. It is infact the planned use of the environment using all the planning foresight and cooperation that man can master. Conservation is derived from two Latin words, ‘con’ meaning “together” and ‘servare’ meaning “to keep or guard”. Literally, therefore, conservation means “to keep together”. The word was coined by Gifford Pinchot shortly after the White House Conference of 1908. So Conservation means a sacrifice of the present generation to future generation, whenever it is carried for, this conflict beginning far before the ideal is reached which conservations are inclined to advocate.

According to Dictionary of Environment (McMillan), Environmental Conservation means the planning and management of resources so as to secure their wise use and continuity of supply while maintain and enhancing their quality, value and diversity. Resources may be manmade or natural. The action of conservation includes preservation from destructive influences, natural decay or waste.

Environmental conservation is the practice of protecting, preserving, managing, and restoring natural environments and ecosystems to

maintain their health and biodiversity. This includes efforts to safeguard natural resources like water, soil, air, and wildlife habitats from degradation or depletion, ensuring that ecosystems can support both current and future generations of life. Conservation strategies aim to balance human needs with the protection of natural areas by promoting sustainable practices, reducing pollution, conserving water and energy, protecting endangered species, and advocating for policies that mitigate the effects of climate change and habitat loss.

3.3.1 Characteristics of Environmental Conservation:

The following are the main characteristics of environmental conservation

- Conservation is the careful use of natural resources.
- Conservation is the wise use of land, air, water and other minerals.
- Conservation rests on the perceptual levels the individuals.
- It concerns with human awareness and
- Consciousness of the environment.
- A core goal of conservation is to preserve biodiversity by protecting species and their habitats. This includes efforts to safeguard endangered species and maintain ecosystem stability.
- Conservation also includes the restoration of degraded ecosystems to return them to a healthy state. This can involve reforestation, soil rehabilitation, wetland restoration, and pollution cleanup.
- Conservation addresses climate change by promoting practices that reduce greenhouse gas emissions, such as

reforestation, conservation agriculture, renewable energy use, and carbon offset initiatives.

- Engaging communities and educating the public on conservation's importance helps ensure lasting environmental stewardship. Local knowledge and active participation are vital to successful conservation efforts.

3.3.2 Objectives of Environmental Conservation:

The objectives of environmental conservation are aimed at preserving the health, biodiversity, and sustainability of ecosystems, as well as ensuring that natural resources are available for future generations. Here are the main objectives:

- 1. Protecting Biodiversity:** One of the primary goals of environmental conservation is to protect the diversity of Mother Earth. This involves preserving endangered species, ecosystems, and genetic biodiversity to ensure ecological stability and resilience.
- 2. Sustainable Resource Use:** Conservation seeks to manage natural resources to ensure their availability over the long term. This includes promoting sustainable agriculture, forestry, and fishing practices.
- 3. Preventing Environmental Degradation:** Conservation aims to minimize environmental damages, such as deforestation, soil erosion, water pollution, and air pollution. This helps to prevent the loss of ecosystem that is essential for human and ecological health.
- 4. Climate Change, Mitigation and Adaptation:** Reducing greenhouse gas emissions, safeguarding carbon sinks (such as forests and wetlands), and putting adaptive measures in place to assist ecosystems and communities in adjusting to

the effects of climate change are the three main goals of environmental conservation.

- 5. Protecting Ecosystem:** Human existence and economic stability depend on ecosystem including pollination, clean air, water filtration, and soil fertility. The aim of environmental conservation is to protect these services by maintaining healthy ecosystem.
- 6. Promoting Environmental Awareness and Education:** One of the pivotal objectives of environmental conservation is to educate people about environmental issues, challenges and practices for better future..
- 7. Safeguarding Human Health and Well-being:** Environmental conservation also aims to protect human health by reducing pollution, conserving clean water, and ensuring access to nutritious food. A healthy environment contributes directly to the quality of a healthy life.
- 8. Protecting and Restoring Natural Habitats:** For saving the flora and fauna, environmental conservation need to protect existing habitats and restore those endanger species.
- 9. Supporting Sustainable Development:** Conservation aligns with sustainable development by balancing environmental health with economic growth. This approach encourages industries, cities, and nations to grow in ways that do not compromise ecosystem integrity.

3.4 Need of Environmental Conservation:

Environmental conservation is crucial for the health and stability of ecosystems, the survival of species, and the well-being of future generations. Here are some key reasons why it is necessary:

➤ **Preserving Biodiversity**

Biodiversity refers to the variety of living species on earth, including plants, animals, bacteria and fungi. So the need of conservation is to protect endangered species from extinction, helping to sustain the diversity that benefits all life on Earth.

➤ **Maintaining Ecosystem**

Ecosystems provide essential services such as clean air, water, soil fertility, pollination, and climate regulation. Forests, wetlands, oceans, and other ecosystems naturally regulate climate by absorbing carbon dioxide and releasing oxygen, reduce pollution, and help mitigate natural disasters like floods and droughts.

➤ **Climate Change Mitigation**

Human activities are responsible for climate change which leads to extreme weather events, rise of sea-level, habitat destruction, and green house gas emission etc. Conservation efforts like afforestation, soil protection, and sustainable use of land help to control CO₂, offsetting emissions and reducing climate change impacts.

➤ **Human Health and Livelihoods**

A healthy environment is directly related to a better human health. Clean air, water, and food sources reduce the risk of diseases. Moreover, many communities, particularly indigenous groups, depend on natural resources for their livelihoods, such as fishing, farming, and forestry. So environmental degradation directly threatens these sources of income and well-being for that particular communities.

➤ **Sustaining Future Generations**

Conservation ensures that the planet remains a good place to live for all living things. Without conservation, future generations will face

resource scarcity, health issues, and increased conflict over declining natural resources.

➤ **Economic Benefits**

Healthy ecosystems contribute to the economic benefits through tourism, agriculture, forestry, fisheries, and generate employment. Conservation can promote sustainable economic practices that generate long-term income without depleting resources.

Conservation of the environment is essential for a balanced, healthy planet that sustains life and provides the resources needed for society to thrive. It is our responsibility to protect and restore it. Biodiversity conservation assures sustainable utilization of potential resources.

STOP TO CONSIDER

Environmental conservation refers to the sustainable use and management of natural resources to protect ecosystems, ensure biodiversity, and maintain the health of the planet for future generations. Rachel Carson is credited with introducing the concept of environmental consciousness with the publication of her book *Silent Spring* in 1962.

Check Your Progress

1. Write a definition of conservation?
2. What are the primary objectives of conservation?
3. What are the main reasons we need conservation?

3.5 Categories of Environmental Conservation:

Conservation is the protection, preservation, management, or restoration of wildlife and natural resources such as forests and

water. Through the conservation of biodiversity and the survival of many species and habitats which are threatened due to human activities can be ensured. There is an urgent need, not only to manage and conserve the biotic wealth, but also restore the degraded ecosystems.

Humans have been directly or indirectly dependent on biodiversity for sustenance to a considerable extent. However, increasing population pressure and developmental activities have led to large scale depletion of the natural resources.

Conservation is the protection, preservation, management, or restoration of wildlife and natural resources such as forests and water. Through the conservation of biodiversity and the survival of many species and habitats which are threatened due to human activities can be ensured. There is an urgent need, not only to manage and conserve the biotic wealth, but also restore the degraded ecosystems.

(a) In –situ Conservation

The word in-situ refers for ‘on –site conservation’, it is the process of protecting an endangered plants or animals species in their natural habitat, either by protecting or cleaning up the habitat or by defending the species from predators.

In-situ conservation is on site conservation of genetic resources in natural populations of plant or animal species, such as forest genetic resources in natural populations of tree species. In-situ conservation is being done by declaring area as protected area.

In situ conservation is a vital strategy for protecting species and ecosystems that are at risk. By maintaining ecosystem integrity, supporting genetic diversity, and promoting sustainable resource

use, this method of conservation contributes significantly to ecological and human well-being. This approach focuses on preserving the dynamic and complex interactions within ecosystems, which are crucial for the sustainability of species and habitats. Wildlife and livestock conservation is mostly based on in-situ conservation. Sufficiently large reserves are maintained to enable the target species to exist in large numbers (Eisner, Thomas. 1990).

Prominent methods of this type of conservation include the creation of protected areas. Some of the protected areas designed for this method of conservation include-

- (i) National parks
- (ii) Wildlife sanctuaries
- (iii) Biosphere reserves
- (iv) Conservation reserves
- (v) Community reserves
- (vi) Sacred groves
- (vii) Coastal and Marine protected areas

INDIA has over 600 protected areas, which includes over 90 national parks, over 500 animal sanctuaries and 15 biosphere reserves

Advantages of in-situ conservation:

1. The animal is in its natural environment and can live as it would in the wild.
2. In most cases, both the animal and its habitat are conserved.
3. It is more humane than removing organisms from their natural habitats.

4. The odds of the population recovering are greater than ex-situ methods.
5. Nature is conserved in its natural state.
6. Biodiversity can be permanently preserved and protected.
7. Natural and cultural heritage is protected and preserved for surrounding areas.
8. The ecosystem is properly managed.
9. Opportunities may emerge for environmental conscious land uses (which come with economic benefits).
10. If the area has been damaged by poaching, it may be possible to improve its ecological integrity and restore it.

Disadvantages of in-situ conservation:

1. The animals are more likely to be affected by natural threats like poaching and predation.
2. When a species population is threatened, it can be difficult to control some of the factors that are harming it. For example- disease and climate change.
3. Habitats may be small and fragmented, so the area may not be large enough to ensure the survival of these species.
4. Genetic diversity may have already been dramatically decreased.
5. Environmental conditions that threatened the organisms in the area may still be present.

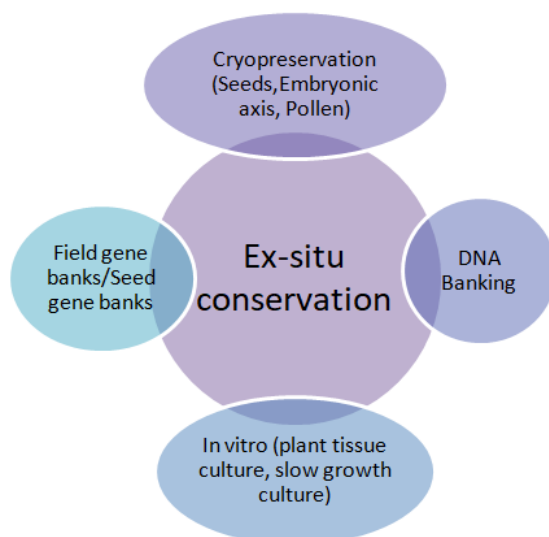
(b) Ex-Situ Conservation:

Ex-situ conservation is the preservation of components of biological diversity outside their natural habitats. In this method threatened animals and plants are removed from their native environment and

relocating them to a designated location where they can be protected and special care should be given. Ex-situ conservation accomplished by zoological parks, botanical gardens, wildlife safari parks, and seed banks etc. Many species of animals are nevertheless kept alive in zoological parks despite going extinct in the wild.

Recently ex-situ conservation has gone beyond the preservation of vulnerable species through utilizing cryopreservation technology, gametes of endangered species can be kept in viable and fertile form for extended periods of time. For propagation of plants *in vitro* fertilization of eggs and tissue culture techniques are also possible whereas, seeds of several genetic strains of commercially significant plants can be preserved for a long time through seed banks. In some cases, ex-situ conservation may be more or less a permanent solution, while in others, it may be a stepping stone toward reintroduction to the wild.

In India, the 1st zoo came into existence at BARRACKPORE in 1800. In world there are about 800 zoos. Such zoos have about 3000 species of vertebrates. Some zoos have undertaken captive breeding program.



Ex-situ Conservation (Source: <https://prepp.in/newsle-492-biodiversity-conservation-environment>)

Advantages of ex-situ preservation:

1. Endangered organisms are completely protected from predators and poachers.
2. Healthy and cared for offspring is carried out in artificial environments, thus adding additional supervision.
3. Individual species health can be tracked and medical assistance can be provided whenever necessary.
4. Genetic diversity of the population can be measured.
5. Selective breeding program can be implemented.
6. Modern reproductive technology can increase the chances of reproductive success.
7. Animals and plants can be bred to increase their numbers if they are in danger of extinction.

Disadvantages of ex-situ conservation:

1. Interbreeding among plants or animals can happen and hybridization of animals and plants is sometimes required.
2. In captive population genetic diversity is minimal.
3. Nutritional related problems could occur as the creatures are residing outside of their normal habitat.
4. Animals can be prone to a wide variety of diseases as artificial environment is not natural and is not as suitable.
5. Attempting to reproduce at times may become difficult.
6. Appropriate environmental conditions for survival could be challenging to attain.

These conservation methods collectively work to protect ecosystems, biodiversity, and natural resources, ensuring a

sustainable environment for future generations. Effective conservation often involves using a combination of these methods based on specific conservation goals and regional needs.

STOP TO CONSIDER

The concept of in situ and ex situ conservation was developed before it was officially adopted in 1992, Convention on Biological Diversity in Rio de Janeiro.

Check Your Progress

1. What are the main categories of conservation?
2. What are some examples of natural reserves used for conservation?
3. Define in situ conservation.
4. Mention two demerits of ex situ conservation.

3.6 Types of Conservation Methods:

Natural resources are essential for ecological balance and maintaining biodiversity of an area. The main types of conservation are as followed-

A. Soil conservation methods

- Biological methods
- Mechanical Methods.

B. Forest and Wildlife conservation methods

- Conservation of reserve forest
- Chipko moment
- Appikochaluvali
- Environmental Day
- Social Forestry and
- Forest conservation act 1980

C. Water conservation and land use planning methods

- Watershed management
- River valley projects
- Water land management
- Multipurpose projects

Soil conservation method is a set of management strategies for prevention of soil being eroded from the Earth's surface or becoming chemically altered by overuse, acidification, salinization or other chemical soil contamination. Major two types of soil conservation are given below-

(a) Biological soil conservation: Amongst the biological soil conservation method one way of maintaining the cover of soil by different vegetables and crops during the periods of high erosion risk. It is an effective method of soil conservation. Several types of biological soil conservation methods exist. Those are-

- **Contour Farming:** It is the farming practice of planting across a slope following its elevation contour lines. Farming on the contour creates small ridges that slow runoff water, and it increases the rate of water infiltration, reduces the hazard of erosion.
- **Crop Rotation:** The change of type of plants grown on particular piece of land from year to year or season to season. It has been found effective for reducing soil loss.
- **Strip Cropping:** Strip cropping is a method of farming used when a slope is too steep or too long. The strip crops check the surface runoff and force

them to infiltrate into the soil, thereby facilitates to the conservation of rain water.

- **Mulching:** Mulching of soil with available plant residues reduce soil loss considerably by protecting the soil from direct impact of raindrop and reducing the sediment carried with runoff. Mulches reduce soil moisture evaporation and increase amount of soil moisture by addition of organic matter to soil.
- **Reforestation:** Reforestation involves the replanting or regeneration of areas of forest which have previously been damaged or destroyed. Forest mainly controls the splash erosion.
- **Mixed cropping:** Mixed cropping is the cultivation of more than one type of crop in a piece of land at the same time, for example- corn and sugar beet. Their harvesting periods are different because of the maturity of different kind of plants. In this type of cropping pattern the soil is covered with plants, so soil erosion can be controlled with this type of cropping system.

Mechanical Methods:

Conservation achieved by supplementing the biological methods so as to increase the time of concentration of water, to reduce the velocity of water, or afford protection against damage due to run off. This method include various engineering techniques and structure which are adopted to supplement the biological methods when the latter alone are not sufficiently effective. Mechanical methods for soil conservation methods includes-

- ❖ **Basin Listing:** It is to construct small basin along the contours to rain water which also reduce its velocity.
- ❖ **Contour Terrace:** It is to construct a channel along the slope to intercept and divert the runoff water. This may be-
 - **Channel Terrace** – It is to dig channels at suitable intervals and the excavated soil deposited as a wide, slow ridge along the lower edge of the channel.
 - **Broad based ridge terrace-** It is to construct ridge along both sides of the channel.
 - **Bench terrace-** It is to construct a number of platforms along contours or suitable graded lines across the slop.
 - **Gully Control-** It is checking the formation or widening of gulling by constructing bunds, dams, drains or diversions through which excess runoff water is channeled.
 - **Stream bank protection-** It involves growing vegetation alongside the river bank, to construct drains, concrete or stone pitching etc. for checking the cutting and caving of river banks.
 - **Afforestation-** Afforestation is applied to Indian deserts, where such plants as Lowsonia Alba, Agava Americana, Thevetia Nerifolia, Calotropis Gigantean, and Tamarindus Indica serve as useful windbreaks. Trees planted as sindbreaks in deserts check the velocity of wind. Windhreaks planted across the area at 90degree to the prevailing wind, check the spread of sand dunes or desert conditions or blowing away of the fertile top soil.

(b) Forest and Wildlife conservation method: Conservation of reserve forests is essential for maintaining ecological balance, preserving biodiversity, and supporting sustainable development. These forests are protected under strict legal frameworks to prevent deforestation, poaching, and other destructive activities. Efforts to conserve them include afforestation, habitat restoration, and the protection of wildlife. Local communities often play a vital role in these initiatives through participation in sustainable practices and awareness programs. By safeguarding reserve forests, we ensure the protection of vital ecosystems, contribute to climate regulation, and secure natural resources for future generations.

❖ **The Chipko Movement:** The Chipko Movement, initiated in the 1970s in the Himalayan region of Uttarakhand (*then* part of Uttar Pradesh), was a grassroots environmental movement aimed at protecting forests from commercial deforestation. The term "Chipko," meaning "to hug" in Hindi, reflects the movement's unique method of protest, where villagers, particularly women, embraced trees to prevent them from being cut down. Spearheaded by leaders like Sundarlal Bahuguna and Chandi Prasad Bhatt, the movement emphasized the ecological and economic importance of forests for local communities. It gained national and international recognition as a pioneering example of environmental activism and nonviolent resistance. The Chipko Movement played a significant role in shaping India's environmental policies and raising awareness about the need for sustainable development. The Chipko's plan is infact a slogan of planning five Fs- food,

fodder, fuel, fiber and fertilizer trees to make communities self sufficient in all their basic needs. It will protect the environment and bring permanent peace, prosperity and happiness to mankind. Important gift of tree to us is not timber, but soil, water and oxygen. It should generate a decentralized, self renewing and long term prosperity.

❖ **The Appiko Chaluvali:** The Appiko Chaluvali, inspired by the Chipko Movement, was an environmental campaign launched in 1983 in the Western Ghats region of Karnataka, India. It aimed to protect forests from deforestation caused by commercial logging and industrial projects. The word "Appiko" means "to embrace" in Kannada, symbolizing the act of hugging trees to prevent their felling. Some 160 men and women marched eight km to the Kelase forest where the contractor's axemen under order from the forest department has turned the area into a slaughter house. They hugged the trees and compelled the axeman to stop tree felling. As the movement started, Panduranga Hegde, a student of Delhi School of Social Work, (1979) emphasized the significance of forests for ecological balance, local livelihoods, and cultural heritage. It also focused on promoting afforestation, sustainable resource use, and awareness about environmental conservation. The Appiko Chaluvali became a significant grassroots effort in India's environmental history, advocating for sustainable development and community participation in forest management.

❖ **World Environmental Day:** World Environment Day is celebrated annually on 5th June to raise awareness about environmental issues and promote global action to protect the planet. Established by the United Nations in 1972 during the Stockholm Conference on the Human Environment, it

has since become a global platform for environmental support. Each year, it focuses on a specific theme, addressing and pressing issues such as climate change, pollution, biodiversity loss, and sustainable development. Governments, organizations, and individuals participate in activities like tree planting, clean-up drives, and educational campaigns.

- ❖ **Social Forestry Approach:** Social forestry is an approach to forest management that emphasizes the involvement of local communities in planting, managing, and utilizing forests for their socio-economic and environmental benefits. It promotes afforestation on barren lands, degraded forests, and community areas. Social forestry provides fuel wood, fodder, and timber while preventing soil erosion, conserving biodiversity, and improving the local environment. It also empowers communities by generating employment and fostering sustainable development. By integrating environmental conservation with community welfare, social forestry contributes to a balanced and inclusive approach to natural resource management.
- ❖ **The Forest Conservation Act, 1980:** The Forest Conservation Act of 1980 is a significant legislation enacted by the Government of India to regulate the diversion of forest land for non-forestry purposes and to control deforestation. It aims to conserve forests and maintain ecological balance by requiring prior approval from the central government for activities such as mining, industrial development, and infrastructure projects in forested areas. The Act also emphasizes compensatory afforestation and the protection of biodiversity. The Forest Conservation Act, 1980 was amended in 1988 to incorporate stricter panel

provisions against violators. Important amendments are as followed-

- (i) No state government or other authority may direct that any forest land may be assigned by way of lease or otherwise to any person, corporation or agency without prior approval of the Central Government.
- (ii) No forest land or any portion thereof may be cleared of trees which have grown naturally in that land or portion, for the purpose of using it for reforestation without prior approval of Central Government.
- (iii) Scope of existing “non-forest purpose” has been extended to other areas as cultivation of tea, coffee, species, rubber, plams, medicinal plants etc.
- (iv) Admissible punishment to the offender of the provision of section 2 of the act.

Water conservation and Land Use planning:

Water conservation and land use planning are essential practices for sustainable resource management and environmental protection. Water conservation focuses on using water efficiently, reducing wastage, and preserving freshwater sources through methods like rainwater harvesting, watershed management, and sustainable irrigation techniques. Land use planning involves the strategic allocation and management of land resources to balance development with ecological preservation. It includes afforestation, soil conservation, and promoting sustainable agricultural practices. Integrating water conservation with effective land use planning ensures the sustainable use of resources, prevents soil erosion, mitigates climate change impacts, and enhances the overall quality

of life for present and future generations. Some of the water conservation methods are given below-

❖ **Watershed management:** It is the process of planning and implementing strategies to sustainably manage land and water resources within a defined watershed area. Availability of water in a given soil is a critical factor and is related to erosion, siltation, loss of cover and productivity. In India, floods bring much havoc causing loss of life and property each year. Due to floods, the plains have become silted with mud and sand, thus affecting the cultivable land areas. Thus management of rainfall and resultant run off is very important. Such management can be best based on natural unit called watershed. A watershed is an area bounded by the divide line of water flow. Thus it may be drainage basin or stream. Benjamin Franklin recognized the importance of watershed management in 1970 in the West (Kumar et al., 2014). Watershed management is aimed at sustainable dissemination of its resources and to enhance the effectiveness of watershed function. The Himalaya is one of the most critical watersheds in the world. So, watershed management focuses on conserving water, preventing soil erosion, and maintaining ecological balance by integrating activities such as afforestation, soil conservation, and water harvesting. By involving local communities, watershed management enhances agricultural productivity, replenishes groundwater, and mitigates the effects of drought and flooding. This holistic approach not only supports sustainable development but also protects biodiversity and ensures the long-term availability of essential natural resources.

- ❖ **A river valley project** is a large-scale development initiative aimed at harnessing the resources of a river and its valley for various purposes such as irrigation, hydropower generation, flood control, water supply, and navigation. These projects typically involve constructing dams, reservoirs, canals, and powerhouses. Environmental side-effect of river valley and hydel power projects could be classified into three categories, namely – (i) impacts within and around the area covered by dam and reservoir, (ii) down stream effects caused by alteration in hydraulic regime, (iii) regional effects in terms of overall aspects including resources use and socio economic aspects. Prominent examples in India include the Bhakra Nangal Project, Damodar Valley Project, and Hirakud Dam. While river valley projects contribute to economic growth and regional development, they also raise concerns about environmental impact, displacement of communities, and ecosystem changes, requiring careful planning and management.
- ❖ **A multipurpose river valley project:** A multipurpose project is that which simultaneously serves several purposes. A dam built across a river often serves more than one purpose at a time and is termed as a multipurpose at a time and is termed as multipurpose project. Flood control, irrigation, hydroelectric generation, navigation, fishing and tourism etc are some of the chief aims of multipurpose project. Multipurpose river valley projects are basically designed for the development of irrigation for agriculture and electricity through the construction of dams. Initially, dams were built only for storing rain water to prevent flooding but now it became multipurpose. In India, Damodar river valley project was the first in the chain of such a

development after independence. After that Bhakra Nangal Project, Indira Gandhi Rajasthan Canal, Kosi Project, Hirakud Dam, Nagarjunasagar Project and Chambal project etc. are some of the multipurpose projects which are constructed for irrigation, power, fisheries, hydroelectric power supply. The adverse effects of multipurpose river valley projects are – it effect on soil conservation, impact on society as well as on aquatic life, change in cropping pattern, territorial water disputes, and excessive sedimentation at the bottom of reservoir etc. Unfortunately, multipurpose river valley projects have numerous adverse effects but it plays an important role for the betterment of the environment and human life. It includes–

- (i) Multipurpose river valley projects reduce the threat of seasonal floods and bolster local economies.
- (ii) The project aims to integrate agricultural development with the local economy through rapid industrialization and growth. The goals include soil conservation, flood control and the development of the area's industries, transportation and irrigation facilities.
- (iii) It revolve around developing irrigation for agriculture and electricity for industries through the construction of dams. In addition to impounding river water, the dams provide water for irrigation to towns, improve navigation, create habitats for fish and wildlife and generate hydroelectric power for industrial for industrial purpose.

Role of multipurpose river valley projects includes:

Water-land management is an integrated approach that focuses on the sustainable use and conservation of both water and land resources to promote ecological balance, agricultural productivity, and economic development. This approach involves optimizing land use while ensuring efficient water management to meet the needs of both human populations and the environment. It includes practices such as efficient irrigation, soil conservation, water harvesting, and the prevention of soil erosion. In agricultural contexts, it aims to balance water use for crops with maintaining soil health. In urban areas, it involves managing water resources for drinking, sanitation, and storm water control, while planning land development to minimize environmental degradation. Proper water-land management helps in mitigating the adverse effects of drought, flooding, and climate change, supporting sustainable development, and enhancing resilience to natural disasters.

Check Your Progress

1. When Chipko movement was started?
2. What methods are used in soil conservation?
3. In which year The Forest conservation Act was enacted?

3.7 Summing Up:

- Environmental conservation is the planned management of man's surroundings to prevent its exploitation, destruction or neglect.
- Conservation involves a planned, rational use of the environment, ensuring a sustained yield from it in a manner maintaining its ecological balance. It involves recognition

and usage of multiple values of a natural resource and the restoration of depleted lands or living species.

- Conservation aims to preserve the environment for aesthetic and recreational needs and to ensure a continuous yield of useful materials from the environment.
- A delicate ecological balance is maintained between the ecosystem and its living community. Any interference -with or disruption of this balance can have far-reaching effects.
- Threatened species are likely to become endangered species. Endangered species are those that were once abundant but have since dropped drastically in number. They are in danger of being eliminated.
- Environmental conservation is the practice of protecting and sustainably managing natural resources and ecosystems to preserve biodiversity, maintain ecological balance, and ensure a healthy environment for future generations.
- Environmental conservation is essential to ensure the survival of all living beings by maintaining ecological balance and preserving natural resources. It helps combat climate change, protect biodiversity, prevent resource depletion, and sustain clean air, water, and soil. Conservation ensures that future generations inherit a healthy planet, supporting life and promoting sustainable development. Without it, ecosystems would degrade, leading to severe consequences for humanity and the planet.
- **In-situ conservation** is the protection of species within their natural habitats. It involves preserving ecosystems and maintaining biodiversity directly in the wild, allowing plants and animals to thrive in their natural environment. Examples

include national parks, wildlife sanctuaries, and biosphere reserves.

- **Ex-situ conservation** is the practice of protecting endangered species by removing them from their natural habitats and conserving them in controlled environments. Examples include zoos, botanical gardens, seed banks, and captive breeding programs.
- Soil conservation involves practices aimed at preventing soil erosion, maintaining soil fertility, and preventing land degradation. Methods include contour plowing, terracing, crop rotation, agro forestry, and planting cover crops to protect the soil from wind and water erosion. These techniques help improve soil structure, enhance water retention, and promote sustainable land use for agriculture.
- Forest and wildlife conservation methods include establishing protected areas, implementing sustainable forestry practices, enforcing anti-poaching laws, creating wildlife corridors, and engaging local communities in conservation efforts. These actions help protect habitats, preserve biodiversity, and ensure the sustainability of ecosystems.
- Water conservation methods focus on reducing water usage and ensuring its sustainable management. Key strategies include rainwater harvesting, efficient irrigation techniques (like drip irrigation), using water-saving appliances, fixing leaks, and promoting responsible water usage in households and industries. These methods help conserve water resources, reduce waste, and ensure a reliable water supply for the future.

- The main reasons for extinction of wildlife are habitat destruction, hunting, predator and pest control, introduction of foreign species and other ecological factors. But wildlife has economic, medicinal, aesthetic, and inherent value. They make a 'gene pool'. They are of great value for man's welfare or survival in the future so there is an urgent need for wildlife conservation.
- For wildlife conservation in India, there are 90 national parks, 15 biosphere reserves and over 500 wildlife sanctuaries covering 4% of the country's total land area. "Project Tiger" was launched in the-year 1973 to protect tigers. Under this project 17 tiger reserves have' been set up to provide a safe and suitable habitat for tigers to increase in numbers.

3.8 Key Terms:

Biosphere: That part of the earth and its atmosphere that can support life.

Ecosystem: A group of plants and animals occurring together plus that part of the physical environment with which they interact. An ecosystem is defined to be nearly self contained, so that the matter that flows into and out of it is small compared with the quantities that are internally recycled in a continuous exchange of the essentials of life.

Sustainable development: The development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Biosphere reserves: A biosphere reserve is a protected area that's internationally recognized by the United Nations Educational Scientific and cultural organization.

National parks: A national park is a protected area of land that is officially designated by a country's administration.

Wildlife sanctuaries: A wildlife sanctuary is a protected area where animals are safe from disturbance and can live comfortably.

3.9 Answer to Check Your Progress:

Answer no 1. According to Dictionary of Environment (McMillan), Environmental Conservation means the planning and management of resources so as to secure their wise use and continuity of supply while maintain and enhancing their quality, value and diversity. Resources may be manmade or natural. The action of conservation includes preservation from destructive influences, natural decay or waste.

Answer no 2. The primary objectives of environmental conservation are – protecting biodiversity, sustainable resource use, preventing environmental degradation, climate change, protecting ecosystem etc.

Answer no 3. The main reason we need conservation are preventing biodiversity, climate change mitigation, human health and livelihood, sustaining future generation etc.

Answer no 4. The two types of conservation of biodiversity are- in situ and ex situ conservation.

Answer no 5. National parks, wildlife sanctuaries, marine reserves, biosphere reserves etc are some example of natural reserves used for conservation.

Answer no 6. In-situ conservation is on site conservation of genetic resources in natural populations of plant or animal species, such as forest genetic resources in natural populations of tree species.

Answer no 7. Two demerits of ex situ conservation are –

- (i) Interbreeding among plants or animals can happen and hybridization of animals and plants is sometimes required.
- (ii) Nutritional related problems could occur as the creatures are residing outside of their normal habitat.

Answer no 8. The Chipko Movement was started in the 1970s in the Himalayan region of Uttarakhand.

Answer no 9. The methods of soil conservation are- contour farming, terracing, strip cropping, proper land utilization, controlled grazing etc.

Answer no 10. The Forest Conservation Act was enacted in 1980.

3.10 Questions and Exercise:

1. Why is conservation important for ecosystems?
2. What are the main reasons we need conservation?
3. What role does conservation play in combating climate change?
4. What is the significance of protecting endangered species?
5. How does in-situ conservation differ from ex-situ conservation?
6. What are the types of forest conservation?
7. What is the meaning of conservation, and how does it differ from related concepts like preservation and restoration?
8. What are the main categories of conservation and how do they complement each other?

9. How do protected areas, such as national parks and wildlife sanctuaries, contribute to in-situ conservation efforts?
10. What are the benefits and challenges associated with ex-situ conservation methods?

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UNIT- 4
ENVIRONMENTAL PROTECTION LAWS AND
CONSTITUTIONAL SAFEGUARDS IN INDIA

Unit Structure:

- 4.1 Introduction
- 4.2 Objectives
- 4.3 Meaning of Environmental Protection Laws and constitutional safeguards in India
- 4.4 The Water (Prevention and Control of Pollution) Act 1974
- 4.5 The Air (Prevention and Control of Pollution) Act 1981
- 4.6 The Environmental (Prevention) Act 1986
- 4.7 Summing Up
- 4.8 Key Terms
- 4.9 Answers to Check Your Progress
- 4.10 Questions and Exercise
- 4.11 References and Suggested Readings

4.1 Introduction:

A country's environmental problems are affected by the level of its economic development, the availability of natural resources and the lifestyle of its population. In India, rapid growth of population, poverty, urbanization, industrialization and several related factors are responsible for the rapid degradation of the environment. The main environmental problems in India relate to air and water pollution, particularly in the metropolitan and industrial zones, degradation of common property resources which affect the poor adversely due to a degeneration of their life support system, threat to

biodiversity and inadequate system of solid waste disposal and sanitation with consequent adverse impact on health, infant mortality and birth rate.

4.2 Objectives:

After going through this unit, you will be able to:

- *understand* the environmental protection laws and constitutional safeguards in India;
- *identify* various Articles and Acts related to environmental protection and preservation;
- *explain* and illustrate the Articles and Acts related to environmental protection.

4.3 Environmental protection laws and constitutional safeguards in India:

‘Environmental Law’ is an instrument to protect and improve the environment and to control or prevent any act or omission polluting or likely to pollute the environment. An environmental legal system is essentially a set of laws and administrative rules which regulate the relationships and conflicts between all the people concerned with the environment, as well as defining the relationships between people and the environment itself. The Honorable Supreme Court in *K. M. Chinnappa v. Union of India* defined “Environmental Law” as an instrument to protect and improve the environment and control or prevent any act or omission polluting or likely to pollute the environment.

In the Constitution of India, it is clearly stated that it is the duty of the State to “protect and improve the environment and to safeguard

the forests and wildlife of the country”. It imposes a duty on every citizen “to protect and improve the natural environment including forests, lakes, rivers, and wildlife”. Reference to the environment has also been made in the Directive Principles of State Policy (Part IV) as well as the Fundamental Rights (Part III). The Department of Environment was established in India in 1980 to ensure a healthy environment for the country. This later became the Ministry of Environment and Forests in 1985.

❖ **Ministry of Environment and Forests (MoEF):**

The Ministry of Environment & Forests (MoEF) is the nodal agency in the administrative structure of the Central Government for planning, promotion, coordination and overseeing the implementation of India’s environmental and forestry policies and program. The primary concerns of the Ministry are implementation of policies and program relating to conservation of the country’s natural resources including its lakes, rivers, biodiversity, forests and wildlife, ensuring the welfare of animals, and the prevention and abatement of pollution.

The broad objectives of the Ministry are:

- Prevention and control of pollution;
- Protection of the environment; and
- Ensuring the welfare of plants & animals

❖ **The Constitution of India:**

The ‘Right to Life’ contained in **Article-21** of the Constitution of India includes the right to clean and human environment. It means you have the right to live in a clean and healthy environment.

Article-38 of our Constitution requires State to ensure a social order for the welfare of people, which can be obtained by an unpolluted and clean environment only.

Article-48A of the Constitution requires the State to adopt the Protectionist policy as well as Improved Policy. Protectionist policy imposes ban on those things which lead to environmental degradation, e.g. ban on use of leaded petrol, ban on use of plastic bags etc. Improved policy refers to alternatives that can be used for improvement of environment, e.g. use of CNG or low sulphur fuel, tree plantation in industrial areas etc.

Article-48A of the Constitution declares “The State shall endeavour to protect and improve the environment and safeguard forests and wildlife of the country.” Article 48A lays down the directive principles for the protection and improvement of the environment and safeguarding of forests and wildlife. This includes implementing policies and laws to prevent deforestation, promoting afforestation and reforestation, and establishing protected areas for wildlife conservation.

Article-51A(g) of the Indian Constitution says: “It shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wild life, and to have compassion for living creatures.” It stated that it shall be the duty of each and every citizen of India to protect and improve the natural environment including lakes, rivers, forests, and wildlife. This article also focuses on showing compassion for living creatures. It is our duty to not only protect the environment from pollution but also improve its quality.

Article 253 gives the power to Parliament to create laws for the country in order to implement and treaty conventions and agreements with other countries. On the basis of this article, Parliament enacted various laws in order to protect the environment like- Water Act 1974, Air Act 1981, and the Environmental Protection Act 1984.

Article 246 divides the subjects of legislation between Union and State. It also provides the details of the Concurrent list in which both the Union and State make laws by sharing the jurisdiction comprising the protection of mines, wildlife, and mineral development.

Article 47 imposes a duty on the State in order to improve the standards of living of citizens by providing health facilities, proper nutrition, and sanitization and protecting the environment to live safely. Article 47 also pressurizes its citizens to be more conscious of the environment.

Article 19(1) (g) states that citizens cannot practice such trade or business activities that are hazardous to public health.

Article 32 & 226 helps to preserve the environment and maintain ecological balance. This article also dictates that environmental conservation is not just the duty of the government but also the responsibility of the citizens of India.

STOP TO CONSIDER

In order to support conservation of environment, Constitution was amended by 42nd Amendment Act, 1976. By virtue of the amendment, Article 48A and Article 51A(g) were inserted in the Constitution.

Check Your Progress

Q.1. What is Article 48A of the Indian constitution?

Q.2. What is Article 51A(g) of the Indian Constitution?

4.4 The Water (Prevention and Control of Pollution) Act, 1974:

The Water (Prevention and Control of Pollution) Act was enacted in 1974 to provide for the prevention and control of water pollution, and for maintaining or restoring of wholesomeness of water in the country. This is the first law passed in India whose objective was to ensure that the domestic and industrial pollutants are not discharged into rivers, and lakes without adequate treatment. The reason is that such a discharge renders the water unsuitable as a source of drinking water as well as for the purposes of irrigation and support marine life. In order to achieve its objectives, the Pollution Control Boards at Central and State levels were created to establish and enforce standards for factories discharging pollutants into water bodies. To achieve these objectives, the Act has provided various provisions, which are very comprehensive. In view of sub section 2(e), read with sections 17 and 18 of this Act, the fundamental objective of the statute is to provide clean water to citizens.

Section 2 of the Act defines certain basic terms used in the Act. While defining water pollution, it provides that:

“Pollution means such contamination of water or such alteration of physical, chemical or biological properties of water or such discharge of any sewage or trade effluent or of any other liquid, gaseous or substance into water (whether directly or indirectly) as may, or is likely to, create a nuisance or render such water harmful or injurious to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or plants or of aquatic organism”[Section 2(e)].

Thus, it is a very comprehensive definition and covers all changes in physical, chemical or biological properties of water. The definition also covers the rise in the temperature of water and discharge of radioactive substances in the water.

The main objective of this act is to provide prevention and control of water pollution and maintaining or restoring of wholesomeness and purity of water (in the streams or wells or on land). Some important provisions of this Act are given below:

- The Act vests regulatory authority in State Pollution Control Boards and empowers these Boards to establish and enforce **effluent standards** for factories discharging pollutants into water bodies. A Central Pollution Control Board performs the same functions for Union Territories and formulates policies and coordinates activities of different State Boards.
- The State Pollution Control Boards control sewage and industrial effluent discharges by approving, rejecting or impose conditions while granting consent to discharge.
- The Act grants power to the Board to ensure compliance with the Act by including the power of entry for examination, testing of equipment and other purposes and power to take the sample for the purpose of analysis of water from any stream or well or sample of any sewage or trade effluents.
- Prior to its amendment in 1988, enforcement under the Water Act was achieved through criminal prosecutions initiated by the Boards, and through applications to magistrates for injunctions to restrain polluters. The 1988 amendment strengthened the Act's implementation the pollution provisions. Board may close a defaulting industrial plant or withdraw its supply of power or water by

an administrative order; the penalties are more stringent, and a citizen's suit provision supports the enforcement machinery

Ganga Pollution Case

The Kanpur Leather Tanneries case is also known as the Ganga Pollution case. Due to a poisonous coating of chemicals manufactured by a pharmaceutical company, a matchstick thrown by a smoker in 1985 in the holy city of Haidwar beside the river Ganga triggered the water body to catch fire for at least thirty hours.

The current review concluded that inorganic pollution in river Ganga water has increased several folds in last decade and conditions are even worst due to presence of carcinogenic elements. Uttar Pradesh and West Bengal are the most contaminated states.

4.5 The Air (Prevention and Control of Pollution) Act, 1981:

The Air (Prevention and Control of Pollution) Act, 1981 was enacted to provide for the prevention, control and abatement of air pollution in India. It is a specialized piece of legislation which was enacted to take appropriate steps for the preservation of natural resources of the earth, which among other things include the preservation of the quality of air and control of air pollution.

The prime objectives of the Act are the following:

- Prevention, control and abatement of air pollution;
- Establishment of central and state pollution control boards to implement the aforesaid purpose; and
- To lay down the standards to maintain the quality of air

The term 'air pollution' means the presence in the atmosphere of any pollutant and 'air pollutant' means any solid, liquid or gaseous substance present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment. Thus air pollutants include smoke, smoot, heat, fly-ash, suspended particulate matter (SPM), noise, radioactive substances etc.

A small quantity of pollutants usually does not affect human health adversely. Such quantity or volume may be described as permissible limit as the nature also has its self purification mechanism. But, if the volume or the quantity of the pollutants is such which is deleterious/ injurious to the health of human being. In Taj Trapezium case, the apex court observed that emission of sulphur dioxide from coke/coal-using industries was causing acid raid which had a corroding effect on the gleaming white marble of the Taj Mahal. Therefore, 292 industries were ordered either to close down or to switch to using gas.

To implement the decisions taken at the United Nations Conference on the Human Environment held at Stockholm in June 1972, Parliament enacted the nationwide Air Act. The main objectives of this Act are to improve the quality of air and to prevent, control and abate air pollution in the country. Important provisions of this Act are given below:

- The Air Act's framework is similar to that of the Water Act of 1974. To enable an integrated approach to environmental problems, the Air Act expanded the authority of the central and state boards established under the Water Act, to include air pollution control.
- States not having water pollution boards were required to set up air pollution boards.

- Under the Air Act, all industries operating within designated air pollution control areas must obtain “consent” (permit) from the State Boards.
- The states are required to prescribe emission standards for industry and automobiles after consulting the central board and noting its ambient air quality standards.
- Act granted power to the Board to ensure compliance with the Act including the power of entry for examination, testing of equipment and other purposes and power to take the sample for the purpose of analysis of air or emission from any chimney, flyash or dust or any other outlet in such a manner as may be prescribed.
- Prior to its amendment in 1987, the Air Act was enforced through mild court administered penalties on violations. The 1987 amendment strengthened the enforcement machinery and introduced stiffer penalties. Now, the boards may close down a defaulting industrial plant or may stop its supply of electricity or water. Aboard may also apply to the court to restrain emissions that exceed prescribed limits. Notably, the 1987 amendment introduced a citizen’s suit provision into the Air Act and extended the Act to include noise pollution.

The London Smog of 1952: A devastating Air Pollution Disaster

The term “smog” was first used in the early 1900s to describe a mix of smoke and fog. The smoke usually came from burning coal. Great Smog of London, lethal smog that covered the city of London for five days, from 5th December to 9th December in 1952. It was caused by a combination of industrial pollution and high pressure weather conditions. The smoke and fog brought London to a near

standstill and resulted in thousands of death. Due to the London smog, around 4000-12000 people were death and 150000 were hospitalized.

4.6 The Environment Protection Act, 1986

It was the Bhopal Gas Tragedy which necessitated the Government of India to enact a comprehensive environmental legislation, including rules relating to storing, handling and use of hazardous waste. On the basis of these rules, the Indian Parliament enacted the Environment Protection Act, 1986. This is an umbrella legislation that consolidated the provisions of the Water (Prevention and Control of Pollution) Act of 1974 and the Air (Prevention and Control of Pollution) Act of 1981. Within this framework of the legislations, the government established Pollution Control Boards (PCBs) in order to prevent, control, and abate environmental pollution. The objective of the Environment Protection Act is to protect and improve the environment in the country.

In this Act, main emphasis is given to “Environment”, defined to include water, air and land and the inter-relationships which exist among water, air and land and human beings and other living creatures, plants, micro-organisms and property. “Environmental pollution” is the presence of pollutant, defined as any solid, liquid or gaseous substance present in such a concentration as may be or may tend to be injurious to the environment. “Hazardous substances” include any substance or preparation, which may cause harm to human beings, other living creatures, plants, microorganisms, property or the environment. The main provisions of this Act are given below:

Section 3 (1) of the Act empowers the centre to “take all such measures as it deems necessary or expedient for the purpose of protecting and improving the quality of the environment and preventing, controlling and abating environmental pollution”. Specifically, the Central Government is authorized to set new national standards for the quality of the environment (ambient standards) as well as standards for controlling emissions and effluent discharges; to regulate industrial locations, to prescribe procedures for managing hazardous substances; to establish safeguards preventing accidents, and to collect and dismantle information regarding environmental pollution.

- By virtue of this Act, Central Government has armed itself with considerable powers which include coordination of action by state, planning and execution of nationwide programmes, laying down environmental quality standards, especially those governing emission or discharge of environmental pollutants, placing restriction on the location of industries and so on.
- The coverage of powers include handling of hazardous substances, prevention of environmental accidents, inspection of polluting units, research, establishment of laboratories, dissemination of information, etc.
- The Environment (Protection) Act was the first environmental legislation to give the Central Government authority to issue direct orders, included orders to close, prohibit or regulate any industry, operation or process or to stop or regulate the supply of electricity, water or any other service to an industry, operation and process. Another power granted to the Central Government was to ensure compliance with the Act which included the power of entry for examination, testing of equipment and other purposes and power to analyze the sample of air, water, soil or any other substance from any place.

- The Act explicitly prohibits discharges of environmental pollutants in excess of prescribed regulatory standards. There is also a specific prohibition against handling hazardous substances except those in compliance with regulatory procedures and standards. Persons responsible for discharge of pollutants in excess of prescribed standards must prevent or mitigate the pollution and must also to report the governmental authorities.
- The Act provides provision for penalties. Any person who fails to comply with any of the provisions of the Act, or the rules, orders, or directions issued under the Act shall be punished. For each failure or contravention the punishment included a prison term up to five years or fine up to Rs. 1 lakh, or both. The Act imposed an additional fine of up to Rs. 5,000 for every day of continuing violation. If a failure or contravention occurs for more than one year after the date of conviction, an offender may punish with imprisonment term, which may be extend to seven years.
- The Environment (Protection) Act contains significant innovations for its enforcement, not contained in any other pollution control legislation at the time of the Act's adoption. Section 19 provides that any person, in addition to authorized government officials, may file a complaint with a court alleging an offence under the Act. This "Citizens' Suit" provision requires that the person has to give notice of not less than 60 days of the alleged offence of pollution to the Central Government or the competent authority. Under the Act, the Central Government may, by notification in the office Gazette make rules for the enforcement of the Act.

Note: The Environmental Protection Act, 1986 was enacted under the provisions of article 253 of the Constitution, which seeks to supplement the existing laws on the control of pollution by enacting

general legislation for environmental protection and to fill the gaps in regulations of major environmental hazards.

Bhopal Disaster

The Bhopal disaster, also referred to as the Bhopal Gas Tragedy, was a gas leak incident in India, considered one of the world's worst industrial disasters. It occurred on the night between 2nd and 3rd December, 1984 at the Union Carbide India Limited (UCIL) pesticide plant in Bhopal, Madhya Pradesh. Over 500,000 people were exposed to methyl isocyanate (MIC) gas and other chemicals. The toxic substance made its way in and around the shanty-towns located near the plant. Estimates vary on the death toll. The official immediate death toll was 2,259. The government of Madhya Pradesh confirmed a total of 3,787 deaths related to the gas release. According to other estimates, around 8,000 died within two weeks and another 8,000 or more have since died from gas-related diseases. A government affidavit in 2006 stated the leak caused 558,125 injuries including 38,478 partial disabling injuries and approximately 3,900 severe and permanent disabling injuries.

Environmental protection laws and constitutional safeguards are essential frameworks for ensuring the sustainable management of natural resources and the preservation of ecosystems. They create legal obligations for individuals, industries, and governments to prevent environmental degradation and deal with climate change. By embedding environmental protection within constitutional frameworks, nations affirm the right to a clean and healthy environment as a fundamental human right, ensuring its enforcement and prioritization. Together, these measures foster

accountability, promote ecological balance, and safeguard the planet for future generations.

Check Your Progress

1. When water prevention and control of pollution act was enacted?
2. Mention two objectives of air prevention and control of pollution act 1981.
3. Under which article The Environmental Protection Act 1986 was enacted.

4.7 Summing Up:

- The various national and international legislations, which have been framed to stop environmental degradation.
- India is one of the few countries of the world that have made specific reference in the constitution to the need for environmental protection and improvement. The Central Government and State Governments have utilized this provision to pass various Acts in order to protect the environment from destruction.
- There is a great contribution of UN in addressing global environmental challenges. To implement the agenda of UN, there is movement towards environment protection on a worldwide scale through special conventions, protocols and multilateral agreements.
- Despite of the presence of satisfactory legislative measures and administrative set-up, it is difficult to enforce the legislation due to lack of expertise, shortage of funds, and no seriousness on the part of implementing authority.

- The main objective of water act of 1974 is to provide prevention and control of water pollution and maintaining or restoring of wholesomeness and purity of water.
- The main objective of Air Act 1981 is to improve the quality of air and to prevent, control and abate air pollution in the country.
- Through environment acts Central Government gets full power for the purpose of protecting and improving the quality of the environment and preventing, controlling and abating pollution.

4.8 Key Terms:

- **Environment:** The surrounding or conditions in which a person, animal, or plant lives or operates.
- **Constitution:** A body of fundamental principles or established precedents according to which a state or other organization is acknowledged to be governed.
- **Environmental Protection:** Environmental protection is the practice of protecting the natural environment by individuals, groups and governments.

4.9 Answer to Check Your Progress:

Answer no 1: Article-48A of the Constitution declares “The State shall endeavour to protect and improve the environment and safeguard forests and wildlife of the country.” Article 48A lays down the directive principles for the protection and improvement of the environment and safeguarding of forests and wildlife. This includes implementing policies and laws to prevent deforestation,

promoting afforestation and reforestation, and establishing protected areas for wildlife conservation.

Answer no 2: Article-51A (g) of the Indian Constitution says: “It shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wild life, and to have compassion for living creatures.” It stated that it shall be the duty of each and every citizen of India to protect and improve the natural environment including lakes, rivers, forests, and wildlife. This article also focuses on showing compassion for living creatures. It is our duty to not only protect the environment from pollution but also improve its quality.

Answer no 3: The Water (prevention and control of pollution) Act was enacted 1974.

Answer no 4: Two objectives of Air (prevention and control of pollution) Act 1981, is to improve the quality of air and to prevent, control and abate air pollution in the country.

Answer no 5: The Environmental Protection Act, 1986 was enacted under Article 253.

4.10 Questions and Exercise:

1. What fundamental duty in the Indian Constitution relates to environmental protection?
2. Which constitutional amendment introduced Article 48A and Article 51A(g)?
3. When was the Air (Prevention and Control of Pollution) Act enacted?
4. What does the Wildlife (Protection) Act, 1972 aim to protect?

5. Which Act regulates hazardous waste management in India?
6. What is the purpose of the Forest Conservation Act, 1980?
7. What landmark case recognized the right to a clean environment under Article 21?
8. Explain the judicial interpretation of the Right to Life under Article 21 of the Indian Constitution in the context of environmental protection.
9. Analyze the interplay between Articles 48A and 51A(g) of the Indian Constitution in promoting environmental awareness and sustainable development.
10. Provide a detailed overview of the Environment (Protection) Act, 1986, and discuss its significance in India's legal framework for environmental conservation.
11. Discuss the objectives and key provisions of the Water (Prevention and Control of Pollution) Act, 1974, and the Air (Prevention and Control of Pollution) Act, 1981.

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BLOCK- IV

- UNIT- 1 POPULATION GROWTH IN INDIA AND ITS CAUSES**
- UNIT- 2 POPULATION GROWTH AND ITS IMPACT ON ENVIRONMENTAL DEGRADATION**
- UNIT- 3 POPULATION EDUCATION**
- UNIT- 4 POPULATION RELATED POLICIES IN INDIA**

UNIT- 1

POPULATION GROWTH IN INDIA AND ITS CAUSES

Unit Structure:

- 1.1 Introduction
- 1.2 Objectives
- 1.3 Population Growth of India
 - 1.3.1 Theories of Population Growth
- 1.4 Causes of Population Growth
 - 1.4.1 Remedial Measures to control Population Growth
- 1.5 Summing Up
- 1.6 Questions and Exercises
- 1.7 References and Suggested Readings

1.1 Introduction

As we know, India is the most populous country in the world with one-sixth of the world's population. As of April 2023, the United Nations (UN) estimates that India has surpassed China, boasting a record population of 1.425,775,850 billion. Following independence in 1947, India initiated series of Five-Year plans which aims at attaining comprehensive national development. The government of India started the National Family Planning Programme in 1952, during its first Five-Year Plan. Thus, India was the first country in the world to have initiated a national population policy to control its population growth. The rapidly growing population affects the quality of the environment as well as quality of life of the individual being. The excessive growth of population leads to deforestation, job crisis, loss of biodiversity, environmental degradation, pollution and so on. Pollution such as air pollution, noise pollution gives rise to various illnesses such as hypertension, heart diseases, asthma etc.

In 1980, the National Population Education Project was launched to educate younger generation about the issues of population growth. It aimed to help students understand the link between population and development, and develop within them responsible attitudes and behaviours. In this unit, we will be focussing on population growth in India, theories of population growth, causes of population growth and also the ways to curb population growth.

1.2 Objectives

After going through this unit, you will be able to-

- *learn* about population growth of India;
- *know* about the theories of population growth;
- *gain* an understanding about the causes of population growth;
- *know* about the ways to control population growth.

1.3 Population Growth in India

India's first census took place in 1872. Before this, several attempts were made to estimate the population of the country. India's population was only 100 million. This increased to 120 million in 1800 and 130 million in 1841. By 1871, the population had grown to 255 million. Kingsley Davis discussed India's population trends, highlighting that from 1800 to 1850, the population remained relatively stagnant at around 125 million for 50 years. The period between 1871 and 1901 saw minimal population growth due to high birth and death rates, exacerbated by famines. A slight increase in population occurred between 1901 and 1911, attributed to fewer famines and lower death rates. However, the decade 1911-1921 saw a decline in population due to the plague, influenza epidemic, and

World War 1. Influenza epidemic alone in 1918 caused 140 lakh deaths in the country. Apart from that the small outbreaks of epidemics like malaria, cholera, plague and small-pox were also prevalent in the absence of medical and sanitation facilities. Thousands of Indian soldiers lost their lives during World War 1 (1914-1918), and severe droughts in 1911, 1913, 1915, 1918, and 1930, further contributed to the population decline.

The year 1921 marked a significant turning point, known as the “Great Divide”, when India’s population growth transitioned from an era of fluctuating growth to a period of steady increase. The history of population growth in India since 1891 divides India’s population growth history into three distinct phases- 1921, 1951 and 1981 respectively. Between 1921 and 1931, India’s population increased by about 276 lakh. The subsequent censuses showed further increases, with a rise of 28 per million in 1931 and 40 per million in 1941. India’s population reached 361 million in 1951 i.e 42 million increases over 1941 year. The thirty-year period between 1921 and 1951 saw a substantial growth of 109 million, averaging 3.63 million annually, making this era as a period of rapid population growth. India’s population experienced significant growth with a 12.3 crore increase between 1901 and 1951 and a substantial 66.6 crore increase between 1951 and 2001 representing a more than five-fold rise. The period from 1951 to 1981 witnessed the most rapid population growth in India, with each decade surpassing the previous one in growth rate. Population increase was much faster due to improved food availability surpassing previous decades.

India’s first census after gaining independence was conducted in 1951, marking a significant milestone in the country’s nation-building efforts. The government introduced the Five Year Plan to boost economic development and wellbeing. However, it soon

became apparent that the rapid population growth was hindering development progress. India faced immense international pressure to control its population growth, since it was one of the largest populations globally and significantly impacted the global population trend. In response, the government launched family planning program in 1950, exploring various strategies to reach a broader population quickly. The Neo-Malthusian doctrine gained prominence in population discourse, emphasizing the need to control population growth to eradicate poverty. The then Congress government imposed Internal Emergency on the ground of internal disturbances. Coercive sterilisation was introduced as a technocratic solution to curb the population growth. Millions of people were forcibly sterilised during June 1975 to March 1977. Following the emergency, in 1977, there was Lok Sabha General Elections where ruling Congress Government lost their majority. The newly elected government, to alleviate the fear of coercive sterilisation from the mind of the people, put all the excess of family planning programme implementation on hold. Although, the population growth momentum persisted briefly, it eventually began to decline and has continued to do so. The 2021 census was postponed due to the COVID-19 pandemic, but a technical report estimated India's population to be approximately 1.36 billion as of March 1, 2021.

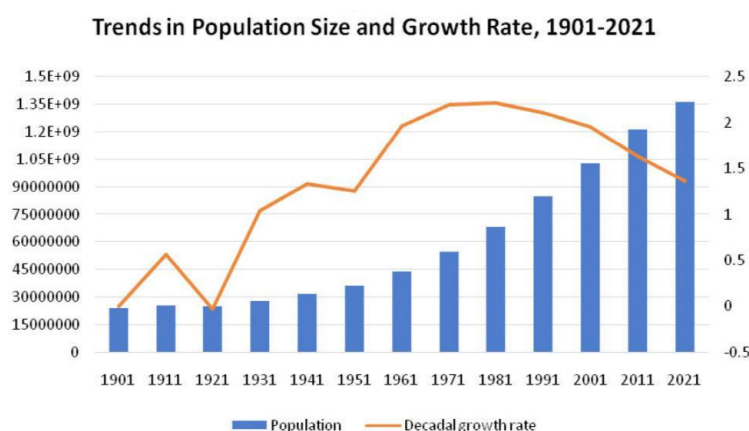


Fig. 1

India's population has continuously increased since 1901, except between 1911 and 1921. The year 1921 is known as 'Great Divide', due to decline in population growth rate. This decline, occurring between 1911 and 1921 was largely due to the devastating influenza epidemic, which claimed the lives of 7% of India's total population. Since then, the subcontinent had never experienced negative growth of population. The population growth rate surged in 1951, driven by improved healthcare and a significant decline in death rates. This decline in death rates resulted in a doubling of the population by 1981. It is only 1981 onwards that India's growth rate started declining steadily. Even when there is a steady decline in growth rate, India's population continues to grow for a certain period due to population momentum, a phenomenon where growth persists despite declining rates.

1.3.1 Theories of Population Growth

The study of population growth encompasses a range of theories that have evolved over time to explain how and why the size and structure of human population change. These theories address questions such as how populations increase. What limits that growth and how economic, social, and environmental factors interact with demographic trends?

- 1. Malthus Theory-** Thomas Robert Malthus was the first economist to develop a comprehensive and systematic theory of population. Thomas Malthus presented his population theories in his influential book, 'An Essay on the Principle of Population'. This work was sparked by debates with his father, who shared the optimistic views of their friend Godwin. Godwin envisioned a utopian society free from diseases, sadness and war achievable by removing human constraints. Malthus strongly disagreed with his optimistic

outlook, leading him to develop his own population theory. As a humanitarian, Malthus was deeply concerned about the well-being of humanity. He warned that the pressure of growing population on food resources would lead to widespread suffering ultimately causing immense human misery.

Malthus based his population principle on two fundamental assumptions: firstly, that food is essential for human survival, and secondly that the attraction between the sexes is a constant and unchanging aspect of human nature. From these assumptions, he concluded that the human capacity for reproduction far exceeds the Earth's ability to produce food, leading to a fundamental imbalance between population growth and resource availability. Malthus claimed that the global population was growing faster than the available food supply. He argued that food production increases linearly (1,2,3,4..) while population grows exponentially (1,2,4,8..)m, doubling every 25 years. As a result, the gap between food supply and population would continue to widen. Despite increases in food production, it would be insufficient to meet the needs of the expanding population. Furthermore, Malthus believed that natural disasters like famine would lead to widespread suffering, increased morality and serve as a natural check on population growth.

2. **Optimum Theory** – The Optimum Population Theory is a modern concept of population growth that explores the ideal population size for maximum wealth production. Introduced by Prof. Sidgwick in his book “Principles of Political Economy”, this theory was later expanded upon by notable economists such as Cannon, Dalton, Robbins, and Carr

Saunders. The optimum population approach is concerned to examine the relationship between population size and the production of wealth.

The Optimum Population Theory refers to the ideal population size that a country should have, taking into account its available resources. The optimum population refers to the ideal population size that enables a country to achieve maximum output with the capital, natural resources and techniques available at the moment. The Optimum Utilisation Theory, based on the Law of Diminishing Returns, states that resources must be balanced for maximum production. The optimum population size is the point at which a country's population, combined with its natural resources and technology, produces the highest per capita income. This concept is based on two assumptions- firstly, it is assumed that the ratio of working population to total population remains constant even with the growth of population of the country increases. Secondly, it is assumed at a given point of time, with the increase in population, there is no change in natural resources, techniques of production etc. The Optimum Population Theory focuses on the relationship between population size and production of wealth. It doesn't establish relationship between population growth and food supply.

3. **Natural or biological theory-** Herbert Spencer, a British philosopher, made significant contributions to the field of population studies. He analyzed the role of natural powers in social and biological development and his population principle shares similarities with the theories of Sadler and Doubleday. In his book, "The Principles of Biology",

Herbert Spencer explored the interplay between social and biological changes, and presented a natural law governing population growth. He proposed a natural law that relieves humans from responsibility for controlling population growth. According to him, individuals' efforts to improve themselves would lead to a decrease in their desire to reproduce, as there existed an inherent trade-off between individuation and genesis. He argued that as individuals focus on their personal development; their reproductive desires weaken, leading to a decline in reproductive capacity, particularly among women. This in turn slows down population growth. Spencer's idea suggests that human endeavour for individual development naturally leads to a decrease in population growth rate.

- 4. Theory of Democratic Transition-** The term 'Demographic Transition' was coined by Frank W. Notestein. This theory is comparatively recent one which explains the changes in population growth patterns as societies develop economically and socially over time. It is based on the relationship between birth rates, death rates and population growth. The birth rate and death rate work in such a way that population growth is either stationary or high or low. So population growth experiences transition from one stage to another and this transition is called demographic transition.

This theory describes how countries have to pass through four (sometimes five) stages of population growth. They are- a) High Stationary stage, b) a period of rapid population growth, c) a period of slowly growing population, d) low stationary stage, e) declining stage (optional).

In the first stage, there is high birth rate as well as high death rate but the population growth is low. In the second stage, death rate declines significantly but the birth rate remains high or less stable and the population growth accelerates rapidly. In the third stage, birth rate begins to decline and death rate remains low, leading to a slower rate of population growth. In fourth stage, both birth rates and death rates become low and population growth stabilizes. In declining stage, birth rates fall below replacement levels leading to population decline. Example- countries like Japan, Germany.

CHECK YOUR PROGRESS

1. What is population growth?
2. Who proposed the theory of population growth that population grows geometrically while food supply grows arithmetically.
 - a) Malthus
 - b) Boserup
 - c) Marx
 - d) Simon

1.4 Causes of Population Growth

There are many causes of population growth and they are related to one another. With modern advancements, there are numerous measures to control diseases, improve nutrition, address malnutrition, increase in the number of doctors and so on. The factors of population growth are rooted in culture of place in their religious beliefs such as social prestige associated with having children, and even in economic conditions of the people also plays a significant role in developing population in a country. Therefore,

some of the significant causes of population growth are described below-

1. **High Agricultural Dependence-** In rural areas, families often prefer more children to work on farms, ultimately resulting in high rate of population growth.
2. **Lack of Education–** The lack of education and illiteracy of people leads to lack of awareness among people about family planning and its inability to understand about the harmful effects of population growth on the overall well-being of society.
3. **Early Marriages–** Despite the legal marriageable age for girls being 18, the practice of early marriages still persists, leading to prolonged childbearing years as young brides often begin having children earlier in life.
4. **Migration–** Illegal migration from various regions contributes to population growth. When people from different countries migrate to a specific area and settle over there, it inevitably leads to the adverse consequences of overpopulation in that region.
5. **Increase in birth rate-** Advance in nutritional sciences has enabled us to enhance human fertility rates. Additionally, certain medications can also augment reproductive capabilities in humans. So, the development of modern medications and effective treatments for various illnesses has led to a significant increase in birth rates.
6. **Better hygiene and living conditions-** There is a growing awareness among people about the significance of maintaining good hygiene and sanitation in their lives. Improved sanitation and hygiene leads to a decrease in diseases, reduces mortality rate considerably both young and adults contributing to population growth.

7. **Standard of living-** Areas with lower standards of living tend to have higher birth rates, but also experience higher mortality rates. However, as the standard of living improves, access to better medical care leads to a decline in infant mortality rate and advancements in fertility treatments increase women's chance of becoming pregnant, ultimately contributing to population growth.
8. **Mass vaccination programs-** Widespread immunization against life threatening diseases like Hepatitis B and diphtheria has significantly improved child health, leading to increased life expectancy and a reduction in infant mortality rates. As a result, more children are growing into healthy adults ultimately contributing to an increase in population growth.
9. **Religious superstitions-** Indians consider children as a divine blessing. However, traditional beliefs perpetuated by Hindu scriptures often emphasizes the importance of having sons for performing the last rites of their parents for salvation and people also think that having many sons and grandsons brings good luck and giving daughter in marriage is also an act of "high religious merit". They are really unaware of family planning which contributes to an increase in population growth.
10. **Lack of family Planning** – Limited access to contraception and lack of family planning often results in larger families, particularly in developing countries.

CHECK YOUR PROGRESS

1. State the causes of population growth.

1.4.1 Remedial Measures to control Population Growth

The population explosion arising from excessive growth of population creates serious problems in the path of economic development in India. And this problem should be tackled carefully. The following are the ways to control population growth:

ECONOMIC MEASURES:

- 1. Improving farming methods and technology-** Primitive method of agriculture is still prevalent in various parts of the country that needs to be updated by better methods. Introducing modern techniques in the field of agriculture can boost productivity and this increased agricultural production improves living standards and reduce birth rate.
- 2. Industrial Development-** Industrialization creates new job opportunities in industries and as a result this reduces the dependence on agriculture and provides alternative sources of income. As the living standards of industrial workers will rise, they will be motivated to have smaller families. So, the government should undertake some effective measures for rapid industrialisation of the country.
- 3. Urbanisation-**The government should take steps for growth of urban centres in the country along with the creation of more job opportunities in these urban areas. As societies urbanize, birth rates often decline because urban living leads to higher costs of raising children and as a result in order to maintain their standard of living people in cities may choose to have fewer children i.e. small family norm.
- 4. Eradication of poverty-** To control population growth, the government must address poverty. Poor people often don't prioritize family planning. By providing basic economic security, ensuring a right to work, and a minimum wage, the

government can change people's attitudes towards family size, helping to slow population growth.

SOCIAL MEASURES:

The following are the social measures-

- 1. Minimum marriageable age-** By raising minimum marriageable age helps prevent early child marriages and subsequently reduces child bearing period.
- 2. Promoting literacy and education -** Education can play an effective role in checking the growth of population in India. The success of family planning programme relies on educating and motivating people to adopt responsible reproductive choices.
- 3. Improving the status of women through education-** It is very important to improve the status of women, in rural areas. Although, the Constitution of India guarantees equal status to men and women, but there are still so places where women enjoy poor social status, particularly women of rural areas and discrimination still prevails that leads to bigger family size. Therefore, empowering women through education and improvement of their social status can help prevent population growth. Educated women are very well aware about the benefits of having small family size and can make choices about their reproductive health.
- 4. Media Campaigns-** Some countries use the media to promote the benefits of smaller families through TV shows, advertisements, or public service announcements. So, it can also be of great help to control population growth.
- 5. Social security-** Expanding social security schemes among people would enable them to be self-sufficient during old age, illness or unemployment, reducing their reliance on others. With this financial security, individuals would be less inclined to have larger families as a means of support.

FAMILY PLANNING MEASURES:

The following are the family planning measures-

- 1. Arousing Consciousness-** Through public information programme, the public should be made aware of the benefits of family planning programmes.
- 2. Formation of Family Planning Centres-** By establishing family planning centres throughout the country can be very helpful and effective strategy for limiting the size of the family. The Public Health Department should prioritize establishing family planning clinics to disseminate information among the people on contraceptive use and other methods of birth control, promoting informed family plan
- 3. Research-** To implement family planning programs effectively, research in areas such as reproductive biology, fertility control should be priotized.
- 4. Access to Contraceptive methods-** Birth control pills, Intrauterine Devices (IUDs) to prevent unintended pregnancy. There are also some permanent methods like vasectomy (male) and tubal ligation (female) to prevent pregnancy.
- 5. Sex Education –** By providing sex education helps people to understand about their reproductive health, relationships ultimately reducing unintended pregnancies.

ADMINISTRATIVE MEASURES:

The following are the administrative measures-

- 1. Implementation of two-child policy-** The Government should strictly enforce a two-child norm, similar to China, to limit family size and curb population growth. People should be made aware that the family size is controllable

and also the benefits of having small family size for higher quality of life.

2. **Provision of incentives as well as disincentives-** The Government should introduce various incentive schemes such as financial benefits, job preferences, insurance incentives, promotions etc to encourage people to adopt the small family norm. Similarly, penalties or disincentives should be there for those who fail to adhere to family planning guidelines.
3. **Taxation** – Some governments use taxes or fines for families with more children, though this can be controversial. Example- In Italy, there imposes higher taxes on large families to curb population growth.

Therefore, from the above discussion, we can say that, Population control strategies need to be both ethically and culturally sensitive, as well as adaptable to the socio-economic context of each region. Policies focused on empowerment of women, spread of education, introduction of two-child norm etc tend to have more sustainable and positive outcomes.

Check Your Progress

Q. What are the remedial measures to control population growth? Discuss.

STOP TO CONSIDER

- Population dynamics refers to the study of the trends and changes in the size, structure and distribution of a population over time including factors such as birth rate, death rate and migration. Population dynamics is a broad term that covers all the changes relating to population matters.

- Through population dynamics, the students are able to understand the statistics of population growth in the past, present and the anticipated future.

1.5 Summing Up

Coming to the last part of this unit, it can be said that this unit has tried to familiarize you with the population growth of India, theories of population growth, causes of population growth and remedial measures to curb population growth.

- In simple words, population growth refers to increase in the number of people in a country or region over time.
- There are three components of population growth- Fertility, Mortality, and Mobility or Migration.
- The causes of population growth are early marriages, lack of education, migration, improved nutrition, increase in birth rate, religious superstitions and so on.
- India's rapid population growth is severely hindering its economic progress and therefore the issue of population explosion arising from high rate of population growth, demands urgent and thoughtful attention.
- Setting legal marriageable age both for male and female, introduction of two-child norm, family planning programmes, various contraceptives methods, increasing employment opportunities for women and improving their social status, provision of incentives as well as disincentives, use of mass media to disseminate information to people about various family planning programmes and availability of contraceptive methods and so on. All these helps prevent population growth.

STOP TO CONSIDER

Mass media plays an important role in controlling the growth of population. Influencing, Informing, Entertainment and Advertisement are the four main functions of mass-media in controlling growth of population. Influencing through mass media means to influence the mind and heart of the public through radio, television, newspaper etc. about different aspects of population growth. Informing means to provide important information to large sections of people regarding population matters that are of world importance. Mass media are also good source of entertainment that also develops the spirit of life-long learning and self-learning through tele-films, music, radio plays etc. which are of great importance in changing behaviours of the people. Mass media are also vital agency for the advertisement which draws people's attention towards the problems of population, family planning methods and so on to influence the minds of the people.

1.6 Questions and Exercises

1. How population density is measured?
2. Mass media plays an important role in controlling the growth of population. (True/False)
3. Why 1921 is called a 'great divide' in terms of India's population growth?
4. The practice of early marriages leads to prolonged childbearing years as young brides often begin having children earlier in life. (True/False)

Answer to Sample Answer Questions:**Answer to SAQ1 :**

There are three methods for measuring the population density: arithmetic density, physiological density, and agricultural density. Arithmetic density is the total number of people divided by the total land area. Physiological density is the number of people per unit area of arable land and agricultural density is the proportion of agricultural population to the arable land.

Answer to SAQ2 : True**Answer to SAQ3 :**

The year 1921 marks a significant turning point, known as the ‘Great Divide’, due to decline in population growth rate. This decline, occurring between 1911 and 1921 was largely due to the devastating influenza epidemic, which claimed the lives of 7% of India’s total population. Since then, the subcontinent had never experienced negative growth of population.

Answer to SAQ4 :True**1.7 References and Suggested Readings**

1. Sarma, Mukunda (2013), Environmental and Population Education, Bhabani Offset Private Limited, Guwahati
2. Sharma, R.C(1988), Population Resources, Environment and Quality of life. Delhi: Dhanpat Rai & Sons
3. Aggarwal, J.C. (2013) “Population Education” Shipra Publications, New Delhi

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UNIT- 2

POPULATION GROWTH AND ITS IMPACT ON ENVIRONMENTAL DEGRADATION

Unit Structure:

2.1 Introduction

2.2 Objectives

2.3 Meaning of Population Growth

2.3.1 Characteristics of Population Growth

2.3.2 Causes of Population Growth

2.4 Impact of Population Growth on Environmental Degradation

2.5 Summing Up

2.6 Questions and Exercises

2.7 References and Suggested Readings

2.1 Introduction

As we have already discussed in the previous unit about the population education which is an educational programme aimed at fostering rational thinking and responsible behaviour towards population-related issues. In 1997, during its 50th anniversary of independence, India pledged to intensify efforts towards achieving population stabilization. With a massive population, India ranks as the world's second most populous country after China. Various studies have projected that India is on track to surpass China as the world's most populous country by 2025. Population growth is a critical issue and has significant impact on the environment, economy and society. Population growth is influenced by factors such as birth rate, death rate, and migration rate. The current population of India is 1,457, 989, 281 as of January 17th , 2025

based on Worldometer's elaboration of the latest United Nation's data and is projected to reach 1,463,865,525 people by mid-year.

2.1 Objectives

After going through this unit, you will be able to—

- *understand* the meaning of population growth;
- *acquire* understanding of the characteristics of population growth;
- *understand* how population growth contributes to environmental degradation.

2.3 Meaning of Population Growth

Population growth refers to the changes in the number of people living in a specific area between two specific points of time or period. We can say that, population growth refers to the growth of human population or changed quantitative situation of the inhabitants of a particular area between two time periods. The change in the population growth rate can be expressed either as a percentage or in actual numbers. To calculate the rate of growth of population, the actual population of a given area during a particular time period is considered. The population of the first period is subtracted from the population of the second period and the remaining is expressed in percentage. This percentage is referred to as rate of growth of population. When the number of births is more compared to the number of deaths, then such situation is considered as positive growth. So, in positive population growth, the population is increasing. On the other hand, when the number of deaths is more compared to the number of births, then such situation is considered as negative growth. So, in negative population growth, the

population is decreasing. There are three components of population growth- Fertility, Mortality, and Mobility or Migration.

- 1) **Fertility rate**-According to Lewise and Thompson, “Fertility is generally used to indicate the actual reproductive performance of a women or groups of women”. A women is deemed fertile if she has given birth to atleast one child. Fertility rates helps us understand child-women ratio, and the number of boys and girls born in each year.
- 2) **Mortality** – Mortality rate or death rate measures number of deaths in a particular population or it indicates the permanent disappearance taken place after birth at any point of time. Mortality, is one of the factor which is responsible for influencing the health of the mothers and it also has a significant impact on both fertility and birth rates. The crude death rate is the most fundamental measure of mortality. The crude death indicates the number of deaths occurring within a given population over a specific period, typically a year. It is expressed as the number of deaths per 1000 of the population. It is calculated by dividing the total number of deaths by the total number of population and then multiplying by 1000.
- 3) **Mobility or migration**- The third component of population growth is mobility or migration which means movement of people from one place to another, whether within a country or across an international border, temporarily or permanently. Migration is a fundamental process to change the structure of population and it involves three types of changes- change in the area of out migration, change in the area of in-migration and change in the migrants themselves. Change in the area of out-migration or emigration refers to going out of a country which reduces the population and

change in the area of in-migration or immigration refers to coming into a country which increases the population. And there may be out-migration and in-migration simultaneously. It is important to take into account both these processes of mobility. The relevant concept in understanding the population growth of a particular place is net migration which means the differences between the number of immigrants and the number of emigrants divided by the population. When the number of immigrants is larger than the number of emigrants, a positive net migration rate occurs. When more people are leaving than entering the area, than such situation is considered as negative net migration rate. And when there is equal number of immigrants and emigrants, the net migration rate is balanced. Therefore, it is clear that the population growth of a particular place can be regarded as the difference between the birth rate and death rate plus the difference between immigration and emigration.

STOP TO CONSIDER

- **Birth rate-** Number of live births per year 1,000 of the population.
- **Death rate-** Number of deaths per year 1,000 of the population.
- **Fertility rates-** It is the actual reproductive performance of given human population.

2.3.1 Characteristics of Population growth

The following are the characteristics of population growth

- 1) Population growth means how the number of individuals in a population increases (or decreases) with time.

- 2) Movement of people from one place to another also impacts population growth.
- 3) The population growth is also influenced by cultural traditions or religious beliefs, and even economic conditions of people.
- 4) Population growth has significant impact on both the individual and the nation, affecting various aspects of life, from economic to environmental sustainability.
- 5) The rapid growth of population in underdeveloped countries can also lead to food problems due to limited arable land making it difficult to increase food production to feed the growing population, putting pressure on already limited food resources, and also traditional farming resources, lack of technology and inadequate irrigation systems contributes to low crop yields.
- 6) The rapid growth of population also leads to destructions of forests, growth of slums, problem of unemployment, unplanned urbanization, traffic congestion etc.
- 7) The rate of growth of population also have negative effects on health conditions. The standard of hygiene and quality of nutritions and inadequate medical facilities leads to health problems of the people.
- 8) Due to rapid growth of human population, there is heavy pressure on the use of natural resources.
- 9) High rate of population growth encourages illiteracy and poverty.

2.3.2 Causes of Population Growth

Dear students, let's revise the causes of population growth, which we previously discussed, and let's take another look at its underlying causes.

1. **High Agricultural Dependence-** In rural areas, families often prefer more children to work on farms, ultimately resulting in high rate of population growth.
2. **Lack of Education**–The lack of education and illiteracy of people leads to lack of awareness among people about family planning and its inability to understand about the harmful effects of population growth on the overall well-being of society.
3. **Early Marriages**– Despite the legal marriageable age for girls being 18, the practice of early marriages still persists, leading to prolonged childbearing years as young brides often begin having children earlier in life.
4. **Migration**– Illegal migration from various regions contributes to population growth. When people from different countries migrate to a specific area and settle over there, it inevitably leads to the adverse consequences of overpopulation in that region.
5. **Increase in Birth Rate-** Advance in nutritional sciences has enabled us to enhance human fertility rates. Additionally, certain medications can also augment reproductive capabilities in humans. So, the development of modern medications and effective treatments for various illnesses has led to a significant increase in birth rates.
6. **Better hygiene and Living Conditions-** There is a growing awareness among people about the significance of maintaining good hygiene and sanitation in their lives. Improved sanitation and hygiene leads to a decrease in diseases, reduces mortality rate considerably both young and adults contributing to population growth.

- 7. Standard of Living-** Areas with lower standards of living tend to have higher birth rates, but also experience higher mortality rates. However, as the standard of living improves access to better medical care leads to a decline in infant mortality rate and advancements in fertility treatments increase women's chance of becoming pregnant, ultimately contributing to population growth.
- 8. Mass Vaccination Programs-** Widespread immunization against life threatening diseases like Hepatitis B and diphtheria has significantly improved child health, leading to increased life expectancy and a reduction in infant mortality rates. As a result, more children are growing into healthy adults ultimately contributing to an increase in population growth.
- 9. Religious Superstitions-** Indians consider children as divine blessings. However, traditional beliefs perpetuated by Hindu scriptures often emphasizes the importance of having sons for performing the last rites of their parents for salvation and people also think that having many sons and grandsons brings good luck and giving daughter in marriage is also an act of "high religious merit". They are really unaware of family planning which contributes to an increase in population growth.

Check Your Progress

1. What do you mean by population growth?
2. Write two characteristics of population growth?

2.4 Impact of Population Growth on Environmental Degradation

The rapid growth of human population has severely degraded the quality of the environment and also the quality of man. A larger population drives up the demand for essentials such as water, food, energy and raw materials. This increased extraction can lead to resource depletion, deforestation, and water scarcity. In addition, more people means more energy consumption and waste production, which elevates pollution and greenhouse gas emissions. Such impacts contribute directly to climate change and impacts negatively on the environment and degrades the quality of life of people. The greater the population, the greater the demand of natural resources increases and as a result this will create a situation when the non-renewable resources may come to an end after sometime. And the scarcity of resources leads to price-rises which in turn has an adverse affect on the economics of countries. In India, domestic sewage and industrial waste are dumped into rivers resulting in contamination of fresh water. Overpopulation leads to the deterioration of a country's natural environment.

- 1) Energy consumption and pollution-** Increased population typically means higher energy consumption, often relying on fossil fuels. This results in greater greenhouse gas emissions and air pollution, accelerating climate change and deteriorating air quality.
- 2) Deforestation-**Deforestation represents removal of the trees for wood products and for croplands and grazing lands. Deforestation is one of the major global problem. Every year, the world loses around six million hectares of forests due to deforestation. The clearance of forests by humans has disturbed some food chains found in nature causing some species of animals to become extinct creating ecological problems. Forests plays an important role in climate change

mitigation. Carbon dioxide, the main greenhouse gas is absorbed by trees through photosynthesis. But when forests are cut down or destroyed, the number of trees available to absorb carbon dioxide (CO₂) also decreases. Deforestation has brought about environmental disaster which includes increased carbon dioxide in the atmosphere and hence increasing greenhouse effect, climate change, increase in temperature and so on. Due to deforestation, the risk of landslides hazards in hilly areas also increases. Deforestation not only leads to extinction of birds and animals but also leads to extinction of some medicinal plants. Today 40 percent medicines are obtained from plants. A plant Rosy Periwinkle has been discovered from Amazon rainforest which can cure a kind of cancer and Jajoba plant which can yield good quality of oil.

- 3) Loss of biodiversity-** Due to population growth, forests are cleared for setting up industries and for urbanization that leads to habitat loss. The habitats of various birds, animals and medicinal plants have been destroyed through human activities. Moreover, poaching and killing of wild animals coupled with the illegal trade of their body parts, has also led to the extinction of numerous animal species. As human population continues to grow rapidly, the overconsumption of resources like water, food and energy puts pressure on ecosystems, causing degradation and loss of biodiversity. Forest fires are also the reason for forest destruction. Another reason for forest destruction is Jhumming. Jhumming, also known as slash and burn agriculture, is the process of growing crops after clearing the land of trees by burning the vegetation. And frequent water crisis in many parts of the world that caused failure of agriculture leads to

migration of people and animals to other places as a result causing overload on the resources of those areas. Thus, habitat destruction and overexploitation of resources due to rapid growth of population results in a drastic decline in biodiversity.

4) Soil degradation- Soil degradation is extremely harmful and has devastating effects on the environment. As human population continues to grow rapidly, the need for food production also increases. Due to scarcity of arable land in overpopulated regions, the farmers begin to cultivate dry, hilly and nutrient-deficient areas that are ill suited for farming. Cultivating such lands makes them highly vulnerable to soil erosion and loss of nutrients.

5) Industrialization and technological development- No doubt, industrialization and technological development is important to meet the needs and requirements of the country but at the same time it has also resulted in the degradation of the environment, the depletion of natural resources and urban crowding. Industrialization has led to deforestation, unorganized mining, water pollution, air pollution, species extinction etc. Industrialization produces variety of pollutants such as smoke, plastics, metallic waste etc. which is responsible for degrading the environment. The discharge of industrial waste along with solid waste into water bodies harms aquatic life and it also causes harm to human health as well. The change in environment is due to fossil fuel burning and release of industrial chemicals which increases the concentration of carbondioxide in the atmosphere. The emission of nitrous and sulfurous gases into the atmosphere and its disposition leads to soil and water acidification. Furthermore, sulphur dioxide emitted from burning of fossil

fuels, is responsible for acid rain that reacts quickly with the atmospheric moisture and form sulfuric acid, resulting in acid rain that affects various regions of the planet. Example- The Tajmahal at Agra has lost its shine due to acid rain.

- 6) Poor standard of living-**In most of the developing countries, rapid growth of population has resulted in a poor standard of living characterized by low housing conditions, poor nutrition, poor hygiene, ignorance of people, inadequate medical facilities, problem of unemployment, overcrowded towns etc. making living conditions poorer which in turn leads to socio-economic and environmental problems.
- 7) Deteoritating Human Quality-** Quality of man is deteoritating due to rapid growth of human population. The evil corruption and immoral practices in the society are increasing rapidly. Values are declining in politics, religion, society and culture. Additionally, there is a problem of illegal immigration on large scale. Black marketing, strikes, labour problems and so on, all these contributes to the deterioration of human character and human being is polluted physically, psychologically, socially and culturally. As human's values, morals and behaviour deteoritates and they lack sense of responsibility to protect human dignity and the environment, their actions and decisions leads to involve in environmentally harmful activities.
- 8) Shortage of Educational Facilities -**Due to rapid growth of human population, there is heavy pressure on educational institutions including colleges, technical institutions and medical facilities. With the growing population, there is competition among students for limited seats in particular courses, scholarships, or internships etc. As the population

grows, the demand for educational institutions also increases. But the educational facilities for higher education are not satisfactory. Students feel frustrated by the limited opportunities and this gives rise to protests, rallies, lock outs etc. The pressure of population growth on educational institutions can create an environment conducive to student's unrest. The excessive growth of population

9) Food Problem- Rapid growth of human population gives rise to food problem in underdeveloped countries. The rise in food production is not keeping pace with the accelerating rate of population growth. The per capita availability of food grains continues to decline due to insufficient food production to meet the needs of growing population. Fall in productivity means low per capita income and hence poverty.

10) Unemployment Problems- Population growth has led to the shortage of job opportunities for semi-skilled, unskilled, and educated individuals. The educated and uneducated, skilled and unskilled workers try to emigrate to other countries and some migrate to towns in search of job. As a result, the towns become overcrowded with large number of population. This migration of people from one country to another country and from rural areas to cities in search of jobs creates problems in the life of people resulting into socio-economic and environmental problems.

Therefore, we can say that addressing overpopulation requires a multifaceted approach that involves global cooperation and the implementation of practical solutions. One of the most effective strategies is through family planning. By increasing access to contraceptives and reproductive health services, individuals can

make informed decisions about the number and timing of their children, ultimately reducing fertility rates.

STOP TO CONSIDER

Another major consequence is resource depletion. The growing population puts heavy pressure on the Earth's finite resources, leading to shortages of essential commodities such as fresh water and food. If current trends continue, many regions may face critical resource shortages in the coming decades.

Social challenges also arise from overpopulation. As more people compete for limited resources, social inequality and poverty become more pronounced. Urban areas, in particular, are facing the effects of overcrowding, including inadequate housing and poor sanitation. These challenges exacerbate social tensions and can lead to increased conflict and instability within and between nations.

2.5 Summing Up

Coming to the last part of this unit, it can be said that this unit has tried to familiarize you with the meaning of population growth, characteristics of population growth and impact of population growth on environmental degradation.

- Population growth is the change in the number of individuals in a population over time, resulting from the interplay between factors that add to the population (births and immigration) and those subtracted (deaths and emigration).
- There are three components of population growth- Fertility, Mortality, and Mobility or Migration. So, the growth rate of

population is determined by the balance of births, deaths, and migration.

- Overpopulation presents several significant challenges that affect the environment, society and the global economy. One of the most major consequences is environmental degradation. As the population grows, the demand for resources such as land, water and energy increases leading to deforestation, loss of biodiversity and increased carbon emissions. The strain on the environment has led to severe consequences, including climate change and widespread habitat destruction.
- Overpopulation is a complex issue that requires both attention and action. By understanding its causes and consequences, and by implementing its effective solutions, we can mitigate the impact of population growth on our planet.

2.6 Questions and Exercises

Long Questions:

1. Highlight the impact of population growth on environmental degradation.
2. Discuss the causes that contributes to an increase in population growth.

2.7 References and Suggested Readings

1. Sarma, Mukunda (2013), Environmental and Population Education, Bhabani Offset Private Limited, Guwahati

2. Sharma, R.C. (1988), Population Resources, Environment and Quality of life. Delhi: Dhanpat Rai & Sons
3. Aggarwal, J.C. (2013) "Population Education" Shipra Publications, New Delhi
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5. Sharma, F.A. (2005) "Environmental Education", Surya Publication, Meerut.

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UNIT- 3

POPULATION EDUCATION

Unit Structure:

- 3.1 Introduction
- 3.2 Objectives
- 3.3 Meaning of Population Education
- 3.4 Nature of Population Education
- 3.5 Importance of Population Education
- 3.6 Summing Up
- 3.7 Questions and Exercises
- 3.8 References and Suggested Readings

3.1 Introduction

As we all know, population explosion has become almost a global problem that negatively impacts overall quality of life and as well as the quality of the environment, particularly in developing countries like India. The rapid growth of population gives rise to problems such as- poverty, unemployment, juvenile delinquency, illiteracy, human trafficking, low standard of living, improper housing etc. All these problems have been on the increase day by day across the globe. The population problem being more of a social problem that needs to be tackled addressing the needs and concerns of individuals and communities. Continuous increase in population creates several types of problems including employment problems. The world population is 7.7 billion as On October 2019 according to the most United Nations estimates elaborated by Worldometers. According to current projection, the global population is likely to reach around nine billion by 2042. If current trend of population continues to grow, India may overtake China in 2045 to become the most

populous country in the world. As children of today will be the parents of tomorrow, therefore it is very necessary to include population education at different stages of education in order to create awareness among the youth and individual. That is why, population education today is one of the important innovations in the educational scenario of the world. It is through population education, where positive attitude, rational attitude and responsible behaviour can be developed within the individuals in order to tackle the population problems.

3.2 Objectives

After going through this unit, you will be able to—

- *know* the meaning of population education;
- *gain* insight into the nature of population education;
- *grasp* the importance of population education.

3.3 Meaning of Population Education

The term population refers to the total number of individuals or organisms living in a specific geographic area such as city, country, region. It is dynamic and constantly changing entity, influenced by factors like births, deaths, migration and so on. Education, on the other hand, is a process of acquiring knowledge, skills, values through formal or informal instruction with the goal of empowering individuals to reach their full potential, contributing positively to society. Considering the two terms “population” and “education”, we can say that population education is an educational programme that focuses on addressing various challenges, issues, causes and consequences of population growth. As the growing population began to impact the quality of life of people at individual,

community, national and international level, debates and discussions started on population issues and efforts were made to control population growth globally and nationally. However, encouraging people about family planning didn't work well due to a lack of understanding and motivation. To address this, population education was introduced as a strategy to equip people with knowledge, skills and attitudes in respect of population matters.

Population education is an educational process that aims to raise awareness among individuals about the root causes and consequences of population growth, highlighting how this population growth can lead to societal problems and human suffering and the criticality of the conditions for population stabilization. Population education enlightens individuals about the advantages of smaller family sizes that leads to better health, economic stability and overall family well-being, and also raises awareness about family planning schemes and population related policies. Ultimately, the goal is to educate students on the importance of maintaining a small family size, both currently and in future, to ensure a better quality of life of people. Population education fosters a rational and responsible behaviour among individuals towards population and development issues, ultimately aiming to enhance the overall well-being and quality of life for all. Population education not only focuses on the number of people (quantity) instead, it also prioritizes the development of individuals with desirable values and attitudes, ensuring that both quality and quantity of the population are addressed. Therefore, population education is concerned with both qualitative and quantitative aspects of human population. In simple words, Population education is that which creates a learning environment in order to enable individuals to understand the population situation in family, community, nation and the world at large.

When studying population education, it is also essential to keep in mind that, population education is also distinct from both family planning and sex education. Family planning aims at married couples. While sex education focuses on preventing sexual diseases and emphasis is laid on individual. But population education takes a broader approach while family planning and sex education are specialized areas within it. And together they contribute to individual well-being but population education, which is an educational programme, provides a holistic understanding of population –related issues and also raise awareness among the youth as well as among the societies.

Following are some of the notable definitions provided by different experts which give a clear concept about the meaning of population education:

According to Gopal Rao, “Population education is an educational programme which provides for the study of the population phenomenon so as to enable the students to take rational decisions towards problem arising out of rapid population growth”.

According to Burbson, “Population education is an exploration of knowledge and attitude about population, the family and sex. It includes population awareness, family living, reproduction and basic values.”

According to UNESCO, “Population education is an educational programme which provides for a study of population situation of the family, the community and world, with the purpose of the developing in the students rational and responsible attitudes and behaviours towards that situation.”

According to Harol Howe, “Population education is the educational process by which a revision of attitudes towards family size is to be

brought about. The process draws on the resources of a number of fields at all levels of education.”

In view of Lane and Wileman, “The study of human population and how it affects and is affected by several aspects of life: physical, social, cultural, political, economic and ecological”.

Prof N.D. Burleson has defined population education as, “Population education or population awareness refers to the factual knowledge about population dynamics required to understand the nature and magnitude of the burden imposed by rapid population growth.”

Thus, we can say that population education is an educational response to a felt need for a problem that helps individuals to broaden their understanding of population-related issues, helping them develop critical thinking skills and make informed decisions. It fosters a responsible attitude, enables rational decision making and empowers people to address population challenges that impact development, living standards and quality of life.

As per the above discussion, we have understood the meaning of population education. Now, we will see the nature of population education.

STOP TO CONSIDER

1. The first attempt to voice the need for population education was made, by Alva Myrdal in 1941. In her book, “Nation and Family”, she stated that a conscious population policy was essential to realize the social policy. She emphasized the role of education in the development of new population policy.
2. In 1962, an article by Warren S Thomson entitled ‘The Population Explosion’, and ‘Population-Gap in the Curriculum’,

written by Philip M. Hauster drew attention of educators to the need for including population content in the school curriculum.

3. Another significant development in the field of population education was adoption of the world population plan of action. This was approved by the world conference on population held at Bucharest in 1974.

4. The first National Seminar on Population Education held in 1969 in Bombay set the pace for the introduction of population education in the school system. The seminar proposed that population education should be introduced into the curriculum at school and college level.

5. The workshop on Population and Family Education, sponsored by the UNESCO Regional Office for Education in Asia held at Bangkok in September-October 1970, was a landmark in the history of population education.

6. National population Education Project was launched in 1980 with a view to institutionalize population education in the school education system. Gradually, the programmes of population education was expanded to non-formal education, adult education and different Five Years Plan of our country.

3.4 Nature of Population Education

The following are the nature of population education:

1. Population education is purely an educational programme that aims to equip individuals with knowledge, skills and critical thinking abilities necessary to understand the population situation in family, community, nation and the world at large.

2. Population education is population problem-centred, tackling the root causes and consequences of population growth and also examines its intricate relationship with sustainable development.
3. Population education also stresses the need for responsible choices, planned families, and wise use of resources.
4. Through population education, students are able to realize how demographic changes will influence their lives, economic progress and overall quality of life, both now and in the future.
5. Population education teaches students about the importance and advantages of having small size families because smaller families have good effect on the preservation of the health of the mother and the welfare of the children.
6. Population education is multidisciplinary in nature and borrows its content from various disciplines including sociology, psychology, biology and so on.
7. Population education is a long term and a continuous process. It is essential at all levels and forms of education, including non-formal education, with the aim to equip individuals with the knowledge and skills to address emerging population challenges throughout their lives.
8. Population education helps to understand the impact of population growth on air pollution, noise pollution, health problems, quality of education, quality of life, food problems, agriculture and so on.
9. Population education also aims at understanding the multi-dimensional causes of population growth such as early marriages, preference for sons, widow remarriage, poverty,

belief in large family system etc. These different causes of population growth will enable the younger generation to understand how these factors will contribute to high birth rate within particular societies and what necessary actions are needed to be followed to control population growth.

10. Population education refers both to the qualitative and quantitative aspects of human population.

STOP TO CONSIDER

- The scope of population education is very wide. Under its scope, it includes programmes like sex education, environmental education, family life education, Population policy, physiology of human reproduction, family planning programme, population growth, population and social development, population and economic development etc.
- Population education is related to human resource development.
- Population education is a multi-sectoral and multi-disciplinary by area of education that draws its content from multiple sectors and disciplines incorporating insights from natural sciences, social sciences and behavioural sciences.

Check Your Progress

1. Explain the term 'Population Education'.
2. Give a suitable definition of population education.
3. What are the objectives of population education?

3.5 Importance of Population Education

Population education plays a vital role in fostering critical thinking and informed decision-making towards population issues and problems. Population education holds the following importances that are discussed below:

1) Helps in understanding demographic changes-

Population education enables learners to understand the demographic transitions of population growth in different stages throughout history, from ancient civilizations to contemporary societies, which in turn helps learners to know the various reasons behind the rise and fall of the rate of population growth across different eras.

2) Helps in creating population awareness-

Population education raises awareness among people/married adults about population explosion through the utilization of various mass media like radio, posters, films etc to spread the messages of family planning programmes to the people of remotest corner of the country and along with this, to increase further awareness about population issues, there is also a great need to impart knowledge of population growth at school stages. And for this, population education is helpful.

3) Helps in understanding the evil effects of population growth on environment-

Population education is also important to understand the evil effects of population growth that causes air pollution, noise pollution, soil pollution, environmental degradation, biodiversity loss, climate change etc. Population education is helpful to

realise the adverse effects of population growth on environment and concomitant dangers from pollution.

- 4) **Helps in understanding the importance of small family size-**The objective of population education is to enable people to know that the family size can be controlled by highlighting the benefits of having small family size and its good effect on the preservation of the health of the mother and welfare of the children.
- 5) **Regulating minimum marriage age –** In India, the practice of marriage is both a religious and social traditions, which significantly contributes to the country's rapid population growth. Therefore, population education will raise awareness among the people about the legal marriageable age to prevent early marriages and control population growth.
- 6) **Improving quality of life-** Population education plays an important role in improving the quality of life of people. A high rate of population growth requires a larger allocation of resources to meet the basic needs of the increasing population. And as a result, very little resources are left for our future generations. In this regard, through the programme of population education, it raises awareness about resource scarcity, resource management, family planning ultimately contributing to improved living standards, poverty reduction and national development.
- 7) **Removal of ignorance and superstitions-** Indians consider children as a divine blessing. However, traditional beliefs perpetuated by Hindu scriptures often emphasizes the importance of having sons for

performing the last rites of their parents for salvation and people also think that having many sons and grandsons brings good luck and giving daughter in marriage is also an act of “high religious merit”. They are really unaware of family planning. In this regard, population education helps people remove these superstitions and makes them understand that the large families are really not necessary in the present day developments. .

8) Helps in establishing a true democratic society-

Population education is essential for establishing a true democratic society. The lesser is the population, the better is the more equitable, sustainable and democratic society.

9) Creating desirable attitude among young learners

towards population matters- The younger generation should be well-informed about the far-reaching impacts of population growth on nation, politics, economy and individual lives. Therefore, it is very important to impart population education at school stages in order to help children to lead a planned adult life. In this regard, population education is need of the hour to foster responsible mindset among learners towards population issues.

10)Improvement of Education-

Population education is vital for individual and family welfare and essential for a well-rounded education which aims at preparing young people for adult roles in future. This requires comprehensive approach that promotes lifelong learning, innovative teaching-methods, and value-based education, making population education essential.

STOP TO CONSIDER

The objectives of population education are :

- To help students to understand that the family size can be controlled for the benefit of individual families.
- To develop the understanding of rapid growth of population and its evil effects on quality of life of people and environment as well.
- To provide knowledge about the country's population-related policies and initiatives.

Check Your Progress

1. Write short note on nature of population education.
2. Discuss the importance of population education.
3. Why it is necessary to study population education? Discuss.

3.6 Summing Up

Coming to the last part of this unit, it can be said that this unit has tried to familiarize you with the meaning, nature and importance of population education.

- Population education as defined by UNESCO, “is an educational programme which provides for a study of the population situation of the family, community, nation and the world, with the purpose of developing in the students rational and responsible attitudes and behaviour towards the situations.”
- Family planning is a key component of population education.
- Population education is often confused by people as demography, population dynamics or population studies. To clarify, it's essential to compare the term population

education with different terminology such as population education and sex education, population education and family planning programme, population education and family life education, population education and contraception education. Contraception education is that which teaches individuals about various methods and techniques used to prevent pregnancy, known as birth control.

- The main objective of population education is to raise awareness among young people and adults about the impact of population growth on our quality of life including environment, health, jobs and so on in order to create rational and responsible attitudes and behaviour within them in response to population problems.
- With the help of population education, it is important to make people familiar with the population policies, family programme of one's own country.
- Population education also enables students to know the advantages of having small family size and its impact on quality of life.
- Population education is neither family planning nor sex education.
- Population education is an innovation which is almost universal in nature. The universal goal of population education is to stabilize the human population.

The relationship between population and education is interdependent, complex and influenced by various socio-economic factors. Education plays an important role in controlling population growth because educated individuals are well aware of family planning methods. But the rapid growth of population affects the quality of education because the excessive growth of population

increases the demand for education facilities, teachers and resources especially in developing countries and this can strain educational systems. Therefore, we can say that education is a crucial tool for managing population growth, while population dynamics influence the accessibility and quality of education.

The scope of population education is very vast as it encompasses various aspects of population dynamics and its impact on society, the environment, and development. Its scope is discussed below-

- 1. Family life education-** Population education helps people to understand the importance of family planning by creating awareness among them so that they can maintain a balance between family size and resources. Population education helps to manage population growth through responsible family planning and develops within the adults as well as the young people, the necessary skills and knowledge needed to create a better quality of life for themselves as well as for future generations.
- 2. Population and environment-** The growth of population impacts the quality of environment as well as quality of the life of the individual. Population education helps individuals to understand the consequences of population growth on the environment and promotes responsible behaviour and also to adopt eco-friendly technologies.
- 3. Sex education-** The scope of population education helps to develop positive attitude towards reproductive health. Effective guidance and counselling in sex education can empower individuals, especially young people, with accurate knowledge and skills to make informed

decisions as growing adults about their sexual and reproductive health.

- 4. Demographic studies-** Population education aims in developing understanding of demographic transitions of population growth and also helps to understand.

3.7 Questions and Exercises

1. The primary goal of population education is to educate people about population-related issues. (True/False)
2. Population education is not relevant to sustainable development. (True/False)
3. The need of population education is for
 - a. Economic development
 - b. Social development
 - c. Quality of man
 - d. All of the above

Key: (1) True, (2) False, (3) All the above.

Long Questions:

1. State the relationship between population and education.
2. Discuss the nature of scope of population education.
3. Write the importance of Population Education in the present day context.

3.8 References and Suggested Readings

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UNIT- 4

POPULATION RELATED POLICIES IN INDIA

Unit Structure:

- 4.1 Introduction
- 4.2 Objectives
- 4.3 Population related Policies in India
- 4.4 Population and Quality of Life
- 4.5 Health Studies
 - 4.5.1 Health Services
- 4.6 World Health Organization (WHO)
- 4.7 Summing Up
- 4.8 Questions and Exercises
- 4.9 References and Suggested Reading

4.1 Introduction

As we have already studied about the meaning, nature and importance of population education in the previous unit. In this unit, we will focus on various population related policies in India, relation between population and quality of life, role played by international agencies like WHO, UNESCO for population growth and in promoting population education. The rapid growth of population presents serious consequences for a country like India which is economically less developed and endowed with fewer resources. The more the population, the more there will be demand for better education, better housing facilities, more employment opportunities and so on. But due to rapid growth of population, there comes employment problems, loss of biodiversity, increase in crime, violence and other anti-social activities. Consequently, providing

better civic services and amenities that enhance the quality of life becomes extremely challenging.

4.2 Objectives

After going through this unit, you will be able to-

- *discuss* about various population related policies in India;
- *evaluate* the relation between population and quality of life;
- *learn* about Health Studies and Health Services;
- *know* about the efforts of WHO in population control.

4.3 Population related Policies in India

The phenomenon of population explosion generates serious concern about the social, economic and political consequences in the developed and underdeveloped countries of the world. Concerned persons and the policy makers are aware of the consequences of high growth rate of population on the quality of life of men and his environment. Our country, India is also suffering from the high growth rate of population. Therefore the population policies need priority for the national development.

While formulating India's population policy, it is crucial to focus on fertility as the single most important factor contributing to population growth and change. In 1916, Pyare Kishen Wattal published his book, *The Population Problem in India*, in which he advocated family planning. In 1925, Raghunath Dhondo Karve, a professor of Mathematics in a college run by Christian Missionaries, opened the first birth control centre in Bombay and faced dissimil at the hands of his orthodox employers. On June 11, 1930 the Government of Mysore, a progressive native State, opened the first

Government Birth Control Clinic in the world. In 1931, the Senate of the Madras University accepted the proposal to impart instruction in methods of conception control.

India launched the national family welfare programme in 1952 with the objective of reducing the birth rate as per the requirements of the national economy. During the first (1951-56) and second (1956-61) five year plan , the family planning programmes had a clinical approach and this was replaced by the extension and education approach during the 3rd five year plan (1961 – 66). In the first five year plan, emphasis was also laid on the ‘Rhythm-Method of family planning. During this plan, number of studies and pilot projects were carried out to provide guidelines for the future policy and development of a national programme. Since its inception in 1952, the family planning programme has undergone several revisions:

- **The Clinic Approach** – This approach relies on the idea that individuals seeking family planning services can visit clinics without any hesitation. Such an assumption, however eliminated the need to reach out to people to educate them about the importance of family planning.
- **The Extension Approach** –Later in the extension approach, influential formal and informal leaders within various community sub-groups are identified, educated and motivated to promote the idea of small family sizes among their own group.
- **The Camp Approach** –In November- December 1970, a massive vasectomy camp was held in the Ernakulum District of Kerala, where a total of 15,005 vasectomies were performed over a period of one month. This performance was repeated in July 1971 on a much large scale, when 63,418 vasectomies were performed in one-month period.

- **The Integrated Approach-**The integration of family planning services with maternal and child health services have been a fundamental principle of India's family program since its beginning. With the appointment of multi-purpose workers, a new approach in the delivery of health nutrition and family planning services has been introduced. Under the multipurpose workers scheme, a team of two workers, one male and one female, provides comprehensive health and family planning care to a population of 5,000 through a sub-centre. In October 1977, the Community Health Worker's Scheme was implemented aiming to deliver preventive and promotional health and family planning services through trained community health workers, selected by the community, to serve every village or 1,000 population.
- **The Reproductive and Child Health Approach-** This approach provides client-centered quality services and the Government of India decided to adopt the Reproductive and Child Health Approach to the Family Welfare Programme.
- **National Population Policy 2000-** The National Population Policy (NPP), 2000 is the central government's second population policy. The NPP states its immediate objective as addressing the unmet needs for contraception, healthcare infrastructure and health personnel, and providing integrated service delivery for basic reproductive and child healthcare. Its long term objective is to achieve a stable population by 2045, at a level consistent with the requirements of sustainable economic growth, social development and environmental protection.

During second five-year plan, India's family planning programme focussed on establishing more and more clinics but it did not produced fruitful results. The Extension Approach which had been

the key-note of family planning programme did produce impressionable results because of the introduction of Intra Uterine Contraceptive Devices (IUCD), but this unfortunately proved to be temporary phase because IUCD lost its popularity due to its after effects on the health of women who used it.

During the Third-Five Year plan (1961 – 66), the main objective is to stabilize the rate of growth of population over a reasonable period of time. During 1966, a full-fledged Department of family planning was established by the Ministry of Health, Family Planning and Urban Development and funding was increased to 83.00 crores. However, this allocation was deemed insufficient for a nationwide program. Despite setting targets to reduce birth rates to 32 per 1000 by 1973-74, the program could not obtain significant results.

During the fourth five year plan (1969-74) utmost importance was led to family planning programme and it was proposed to reduce birth rate from 35 per thousand to 32 per thousand by the end of the plan. The fourth plan stated that for attaining better socio-economic condition of people, the rate of growth of population is to be controlled and human skill and resources be developed in a proper way. In order to get desired results, some measures were also suggested in this plan such as a) acceptance of small-sized family, b) personal knowledge about family planning methods, c) availability of supplies and services, d) provision of audio-visual equipments, e) training and recruitment of doctors and other workers, f) acceptance on IUCD programmes, g) implementation and coordination of different organization like ministries, voluntary, agencies, local bodies etc.

During the fifth five year plan (1974-79) emphasis was laid on reducing the birth rate to 25 by 1983-84. During this plan, there was integration of family planning services with those of health, maternity, Child health care and nutrition services. In this period,

the new national population policy was declared on 16th April, 1976 with a view to raise the age of marriage to 18 for girls and 21 for boys and acceptance of family planning by the poorer sections of society. The main purpose of this policy is to educate the masses to accept the family planning programmes and to provide voluntary acceptance of clinical facilities and other services. The policy also stated that it is necessary to brought down fertility for economic development. For controlling population growth, the administrative machinery went to the extent of a massive drive for compulsory sterilization. In consequence, the member of sterilizations increased from around 7000 in 1956 to 1.84 million in 1970-71. During this period, emergency took place and sterilization was carried out at great speed through coercive measures in various places in North India.

During the sixth five year plan (1980-85) the goals were-(i) to reduce the average size of a family from 4:2 children to 2:3 children. (ii) Reduce of birth rate to 21 from the level of 33 in 1978 and also reduce death rate. (iii) Infant mortality rate from 129 per thousand to 60 or less 1984-85, and (iv) Increase the percentage of eligible couples (those who, adopt family planning methods) from 22 in 1978 to 60 in 1984-85. During this plan, great emphasis was laid on the adoption of non-terminal methods like IUD, CC and oral pills. These methods are being popularized among youth couples through education, publicity and propagating mass media. This plan stated that family planning has also to be made a part of the total national efforts for providing a better life to the people.

In the seventh five year plan (1985-90) emphasis was on securing maximum community participation and promoting maternal and child health care. During the eight five year plan (1992-97) there is stress or decentralized planning and implementation. During this plan, the project of improving primary health in the urban slums in

the cities of Delhi, Kolkata, Bangaluru was carried out. The India Population Project was initiated during this plan. Greater stress was also laid on the involvement of the NGOs. Another important aspect of this plan is to make younger couples aware about the small family norm as a social responsibility introducing certain disincentives to the non-adopter of family plan.

During the Ninth-Five Year Plan (1997-2002), it is expected that along with increased Reproductive and Child Healthcare (RCH), it would be possible to achieve the lower limits of infant Mortality Rate (50 per thousand), Crude Birth Rate (23 per thousand) and Total Fertility Rate (2.6) by the year 2002. The Reproductive and Child Healthcare (RCH) was launched in India on October 15, 1997. The programme was meant to provide high quality, integrated, client-centred services based on people's needs and the local demand and at all stages of the life cycle. The RCH programme included the services like maternal and child healthcare, legal abortion and birth control, effective nutritional service to vulnerable groups and prevention and treatment of Sexually Transmitted Disease (STD) and Reproductive Tract Infection.

The NPP 2000 refers to five schemes that involves incentive payments. For individual these includes:

- a) the Balika Samridhi Yojana run by the Department of Women and child Development to promote survival and care of the girl child, with a cash incentive of Rs 500 given at the time of birth of a girl child of birth order 1 or 2.
- b) the Maternal Benefit Scheme run by the Department of Rural Development awards an incentives of Rs 500 for the birth of the first child after 19 years of age and is limited to the first and second births only. The cash award is now to be linked to

antenatal check up institutional delivery by a trained birth attendant, registration of birth and BCG immunization.

- c) a family welfare linked Health Insurance Plan to offer health insurance to couples below the poverty line, if the couple undergoes stabilization with no more than 2 living children. The spouse undergoing stabilization is also to get a personal accident insurance cover.
- d) couples below the poverty line, who marry after the legal age at marriage register family norm and adopt a terminal method after the birth of the second child are to be rewarded.

At the global level by the year 2000, 600 million or 57% of women in the reproductive age group were using some method of contraception. However, the use of contraceptive measures is higher in developed countries i.e. 68% and lowers in developing countries i.e. 55%. Female sterilization is the most popular method of contraception used in developing countries at present. This is followed by the use of oral contraceptive pills and Intra Uterine Devices (IUDS) for women and the use of condoms for men.

The tenth five year plan (2002-2007) aims to reduce the mortality rate of the children upto 45 thousand and checking the population growth upto 16.2% till 2011. During the eleventh five year plan (2007-2012) stress was given to review the current demographic ratio, population stabilization and more of researches on health care of children, adolescent and women.

Family planning has become essential for population control. It means limiting family size through birth control which can be achieved in two ways- firstly, controlling oneself by taking various forms such as postponing marriages, raising the age of marriage etc. Secondly, by adopting birth control methods such as use of contraceptives, tablets, drug, sterilization, abortion of unwanted

child etc. But, till date, India's Family Planning programmes have achieved limited success in curbing over population because the programmes have not been tackled properly at grass root level. Despite, India being the first country to adopt family planning programmes, India's population continues to grow at an alarming rate, posing severe consequences for the future.

4.4 Population and Quality of Life

The impact of population on quality of life is multifaceted. As the population grows, it leads to various challenges that affect the overall well-being of individuals. Quality of life refers to a fulfilling and purposeful way of living that brings value and the degree of satisfaction of a number of human needs i.e. physical as well as material, emotional and spiritual. Quality of life can be assessed by examining an individual's sense of happiness or dissatisfaction with regard to different aspects of their life. As people increasingly seek a better quality of life, governments worldwide are focussing on improving it by reducing illness and death rates, ensuring access to healthcare, and promoting overall physical, mental and social well-being. But simply, raising standard of living is not enough to guarantee happiness. There should also be stronger emphasis on social policies and redefining societal goals to create a more livable environment for everyone. Quality of life itself is a complex concept because it involves both fulfilling emotional and social aspirations and meeting essential needs such as food, energy, housing etc. But humans are never satisfied because their expectations are endless. Individual needs and social expectations vary widely. World Health Organization (WHO) has defined quality of life as: 'The condition of life resulting from the combination of the effects of the complete range of factors such as those determining health, happiness (including comfort in the physical environment and a satisfying

occupation), education, social and intellectual attainments, freedom of action, justice and freedom of expression’.

The quality of life has been linked to comfort both in traditional as well as in modern cultures. In traditional societies, people typically worked as much as needed to ensure survival. Similarly, in modern societies, the quality of life still remains important. It is still linked to comfort, which is associated with increased consumption of goods. Therefore, we can say that, human societies, despite evolving over time, continue to value comfort as a key factor in determining their well-being.

According to H.P. Mehta (1993), ‘Quality of life is comprised of palatable food to digest well and enjoy, enough space and scope to contain and express the needs of the body and soul, in full awareness and respect of other persons and soul, robust health with a binding element of youthfulness and above all the share of love of life- the gift of friendship and love, the sense of wonder, endless curiosity, the perpetual thirst for giving and receiving, ceaseless striving for new creations and the capacity to accept any outcome in full understanding and with utmost serenity, cheerfulness and gratitude, (from the Article on Population Education of H.P. Mehta, 1993).

The basic criteria involved to assess the quality of life of people of any country is done through two some criteria like- 1) The quality and quantity of the basic physical needs of man such as food, fresh-water housing, clothing etc. 2) The quality and quantity of the social and cultural needs of man such as educational and employment opportunities, health and medical facilities, security and conditions of work, transportation, human freedom, recreation and entertainment, opportunities for creative development.

But, one of the major problems is that the quality of a country is affected by its increase in population which puts heavy pressure on natural resources and as a result this hinders the efforts to improve the quality of life of people. The excessive growth of human population poses a threat to human survival and also forests are cleared and trees are being cut mercilessly to accommodate people. The more people there are, the fewer resources, fewer jobs is there affecting both individuals and societies at large. And population growth is often accompanied by a rise in crime rates, violence and other anti-social activities. Another major problem that affects the quality of life is growth of prices of consumer goods and inflation. The rate of growth of population poses a significant threat to the socio-economic progress of the country and also decreases the availability of food per capita, Gross National Product (GNP), per capita income, employment opportunities, sanitation, housing facilities etc. Therefore, to address this problem arising from the rapid population growth, the strategies must be taken focussing on eradication of poverty, provision of basic minimum services and reducing fertility rates to ultimately enhance the overall well-being of the life of the individual.

The major areas of population growth that hinders the quality of life of the individual are described below:

- 1) **Population and Availability of Food-** As the human population grows, so does the demand for food. Rise in the rate of food production is less than the rise in the rate of population growth. With the population growing rapidly, the problem of malnutrition still prevails, especially among women and children, still prevails. Due to lack of nutritious food, many people are becoming physically and mentally weak. About 40% people are still living on or below line of poverty. Even though our food production has considerably increased, but

still there will be limits to further increase in the long run to meet the demands of rapidly growing population. Some countries like Australia, United States and Canada, export surplus food because they have moved many people from farming to industry, making more food available for export. In India, where food is scarce, industrialization can help improve food prospects only if the food can be used domestically, rather than being used to pay for importing manufacturing goods.

In India, over more than 70% of the labourers income is spent on food and if food prices continue to rise, this proportion increases, leaving workers with less money for other necessities to fulfill. In consequence, as food becomes more expensive, workers demand higher wages to afford basic needs. With rising wages, industrial goods becomes more expensive. These high prices makes Indian goods less competitive in the global market, leading to lower exports. As a result, foreign income (foreign exchange) decreases. Since, foreign income decreases, India cannot import enough food to meet demand. As a result, this leads to further rise in food prices domestically. As food becomes unaffordable, starvation and malnutrition increases. This entire process creates social unrest and political instability and slows down economic growth.

- 2) Population and Employment Opportunities-** The rapid growth of population increases the number of job seekers in the economy. This leads to migration of people from rural areas to urban areas in search of jobs to meet their basic needs. With the rapid increase of population, unemployment is becoming a serious issue which is affecting the economic development of the country. In developed countries, children under 15 are not allowed to work. But in India, around 13 million children are working instead of attending school, helping their parents in

farm or household chores, or even as labourers. India faces a severe issue of educated unemployment, where numerous skilled young individuals in the fields like engineering, science, teaching and arts remain jobless, resulting in a significant loss of talent and potential for the nation.

3) Population and Health service-The size and growth of population directly impact the availability, quality and accessibility of health services in a country. The rapid growth of population leads to a shortage of doctors, nurses and healthcare workers. Many people of rural areas suffer from a lack of hospitals and trained personnel, forcing people to travel long distances for treatment. The more the population, the more the people needs medical care, including hospitals, doctors, medicines and preventive services. If healthcare infrastructure doesn't expand at the same rate, it leads to overcrowding in hospitals and clinics. However, because of the rapid growth of population, the quality of healthcare services provided by healthcare centres will likely deteriorate instead of improving it. The prospects of upgrading these health centres are very low, especially in rural areas, unless population growth is brought under control.

4) Population and Housing facilities- The rapid growth of population leads to overcrowding slums, poor living conditions. The housing crisis is worse in cities due to migration of people from rural areas seeking jobs. This increasing slums in the cities is becoming a major problem because overcrowding in slums leads to unhygienic conditions which in turn increases the risk of diseases. The standard of living is low and housing conditions are often poor due to population explosion in India. Overcrowded and poorly managed housing areas often have higher crime rates. Families living in poorly built houses suffer

from stress and discomfort and also lack of security and basic amenities increases social tensions and conflicts. Despite the Indian government's initiatives to provide housing through various schemes, the problem of increasing population seems to be getting more and more serious. Therefore, due to increasing population, there is shortage of house, growth of slums, congested houses, squatter settlements creating a problem of malnutrition.

- 5) Population and Education-** A rapid increase in population lowers the standards of education, wastage and stagnation etc. In developing countries, there is limited access to education due to poverty or inadequate infrastructure. India still have an alarmingly high proportion of illiterate people and comparatively small number of literates, yet the number of people seeking employment has skyrocketed. Consequently, this demand necessitates a substantial increase in schools, colleges, teachers and resources, ultimately making education increasingly expensive. Also in some rural areas, rapid growth of population increases student's enrollment, leading to overcrowded classrooms and a shortage of teachers and resources which can reduce the quality of education. Rural areas often faces teacher shortages, lack of schools and fewer facilities.

4.5 Health Studies

Health studies enables us to understand and improve public health and healthcare from a population perspective. Health studies allows us to investigate a wide range of contemporary health issues. It encourages critical thinking and analysis of global health issues and disparities. It develops actionable plans and fosters collaborative

global partnerships to tackle health issues and environmental challenges worldwide. It critically examines the effectiveness of existing health systems in serving those in need and also employs scientific approach to understand human health and indept analysis of multiple factors influencing human health.

4.5.1 Health Services

Health services refers to broad range of services with the aim of maintaining, improving and restoring health. These services can be provided to them through public health body concerning the treatment, care and support of, in relation to health and well-being, or similar services provided by other healthcare institutions. Despite the growth of private healthcare services, public health services are struggling, lacking essential medicines and diagnostic tests. Furthermore, most hospitals are concentrated in urban areas, making healthcare institutions inaccessible to rural populations.

4.6 World Health Organization (WHO)

The World Health Organization plays a key role in shaping policies and programs related to global health, including managing population growth. WHO is actively promoting family planning by producing evidence-based guidelines on safe use and delivery of contraceptive methods, developing quality standards and providing pre-qualification of contraceptive commodities. This helps countries to introduce, adapt and implement these tools effectively, to meet their needs. Additionally, WHO participates in developing new contraceptive technologies to and leads and conducts implementation research for expanding access to and strengthening delivery contraceptive information and services. So, The UNDP, UNCEF, UNFPA, WHO, World Bank Special Programme of

Research, Development and Research Training in Human Reproduction (HRP) conducts and supports research to map and generate policy relevant evidence, tests interventions and their impact and improves technologies for safe abortion and post-abortion care.

On 11 July 2012 WHO committed to fast-track its assessment of new and existing quality contraceptives, so that no more women in low-and middle-income countries can obtain and use a broad range of safe and effective contraceptive products. Other pledges made by WHO at Family Planning Summit in London includes support to countries to integrate family planning services into basic healthcare and a systematic examination of why so many women are still unable to obtain contraception when they need it.

WHO has identified a set of recommended policy actions to help countries capitalize on this new opportunity. These include-

- Expanding the range of family planning choices.
- WHO advocates for the redistribution of tasks among existing health workers who have the right training, to help countries expand access to services.
- Making family planning an essential component of healthcare services provided during the antenatal period, immediately after delivery or after abortion, and during the year following childbirth or abortion.
- Making long-acting and permanent methods of family planning, such as intrauterine devices, contraceptive implants, vasectomy and female sterilization, available and acceptable.

- Eliminating social and non-medical restrictions on the provision of contraceptives to adolescents to help reduce early pregnancy and the associated health risks.

STOP TO CONSIDER

- **Quality of life-** Quality of life means the general well-being of a person or society in the context of health, happiness, education, justice, freedom of action, freedom of expression, social and intellectual attainments.
- **Health services-** Health services encompasses a wide array of services from diagnosing and treating diseases to promoting, maintaining and restoring overall health and wellbeing.
- The challenges of Health services in India are- shortage of qualified health workers, government hospitals are affordable but often lack resources that push people towards expensive private care, limited focus on mental health services, corruption in procurement and distribution of medicines and medical equipment. All these affect the quality healthcare system.

Check Your Progress

- Write about Health services.
- Discuss the challenges of health services in India?

4.7 Summing Up

Coming to the last part of this unit, it can be said that this unit has tried to familiarize you with the population related policies in India, population and quality of life and Health studies and Health services and efforts of World Health Organization (WHO) in controlling population growth.

- A policy is a clear statement of objectives paired with a defined plan of action to accomplish those objectives.
- The quality of a country is affected by its increase in population which puts heavy pressure on natural resources and as a result this hinders the efforts to improve the quality of life of people. The excessive growth of human population poses a threat to human survival and also forests are cleared and trees are being cut mercilessly to accommodate people. The Population growth have its impact on socio-economic development of the country which is causing great anxiety among the people which is visible through employment opportunities, health services, housing facilities and so on.
- The National Population Policy (NPP), 2000 is the central government's second population policy. The NPP states its immediate objective as addressing the unmet needs for contraception, healthcare infrastructure and health personnel, and providing integrated service delivery for basic reproductive and child healthcare. Its long term objective is to achieve a stable population by 2045, at a level consistent with the requirements of sustainable economic growth, social development and environmental protection. So, the new national policy is broad based and well-planned. However, its successful implementation depends mainly on promoting female literacy, ensuring child health and security through an improved public health delivery system and commitment of the personnel of the Department of Family Welfare.
- World Health Organizations (WHO) aims to enhance access to modern contraceptive methods, promote reproductive health and rights, and ultimately reduce unintended pregnancies and maternal mortality rates.

4.8 Questions and Exercises

Long Answer Questions:

1. Discuss the population related policies started in India to manage population growth.
2. Discuss how population growth can affect the quality of life of the individual.
3. Discuss about the efforts of WHO in population control.

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BLOCK- V

- UNIT- 1 MAN AND HIS ENVIRONMENT
THROUGH ANCIENT PERIOD TO
PRESENT PERIOD**
- UNIT- 2 ENVIRONMENTAL ETHICS**
- UNIT- 3 ENVIRONMENTAL VALUES**
- UNIT- 4 ENVIRONMENTAL EDUCATION
FOR SUSTAINABLE DEVELOPMENT**

UNIT- 1
MAN AND HIS ENVIRONMENT THROUGH
ANCIENT PERIOD TO PRESENT PERIOD

Unit Structure:

- 1.1 Introduction
- 1.2 Objectives
- 1.3 Man and his Environment during Ancient Period
 - 1.3.1 Importance of Plants for Man
 - 1.3.2 Importance of Animals for Man
 - 1.3.3 Formation of Human Body
 - 1.3.4 Roots of Environmental Education
- 1.4 Man and his Environment during the Present Period
 - 1.4.1 Human Population Explosion,
 - 1.4.2 Advancement of Technology
 - 1.4.3 Pollution due to the use of Pesticides
 - 1.4.4 Chlorofluorocarbon Problem (CFCs)
 - 1.4.5 Biodiversity in nature
 - 1.4.6 Oil spills and damaging ecosystem
 - 1.4.7 Toxic Time Bombs and Water Pollution
 - 1.4.8 Radiation Hazards and Ecological balance
 - 1.4.9 Multinationals and Environment
 - 1.4.10 Integrated approach for White and Green Revolutions
- 1.5 Role of Family Environment
- 1.6 Role of School
- 1.7 Role of Community
- 1.8 Role of Social Environment
- 1.9 Summing Up
- 1.10 Questions and Exercises
- 1.11 References and Suggested Readings

1.1 Introduction

This unit is an attempt to aware you about man of his environment and how it has emerged from the ancient time since the Rig-Veda. Man and his environment is the international and interdisciplinary area of study. As you know man has been conscious about his environment since the very beginning of this religious and cultural development. Environment is defined as the sum total aggregate of all the conditions, forces and influence. Therefore, our environment is classified into two parts: 1. Natural environment and 2. Man-made environment.

1. Natural Environment: It includes a biotic and biotic, i.e., physical environment and biological environment. The natural environment consists of physical energies or solar radiation, plants and animals.

2. Man-made Environment: It is created by human activities and his organizations. Man made environment is divided into Social, Cultural Economic, Political, Historical, Aesthetic, Psychological, Religious and Educational environment.

Man is destroying his environment in many ways. The inevitable consequence is pollution which is also destroying man. It is widely recognized that the race to rapid industrialization has left all of us with polluted rivers, contaminated soil, and depleted-wildlife and exhausted natural resources. The pollution around testifies to man's failure to recognize our interdependence with nature. It also testifies to the failure of our cultural values and norms which did not provide us with appropriate moral direction towards the environment related to the Hindus whose religion and cultural has specifically enjoined them to be respectful to the beauty and bounty incarnate. "Ancient scripture Rig-Veda bears a testimony of it. Therefore, in this unit we

shall discuss and appraise the concept of 'Man and his environment' in two stages. These are:

- ❖ Ancient since Rig-Veda and
- ❖ Present and recent period.

1.2 Objectives

After going through this unit you will be able to-

- *understand* the relationship between man and his environment during Ancient Period;
- *discuss* man and his environment during the Present Period;
- *describe* various roles of family, school, community and social environment for developing a better environment.

1.3 Man and His Environment During Reg-Veda or Ancient:

Rig-Veda is the ancient of all four Vedas. Rig-Veda consists of ten mandals with Sutas (hymns) and 10,247 Rik (Stanzas) mostly in poems. Hymns are Songs in the praise of different gods. There are three kinds of gods-the celestial god, the aerial gods and the terrestrial gods. Among those gods Agni, Indra, Marut, Vayu, Surya, Vishnu, Soma, Brihaspati are important. From those hymns social conditions of the Rig-Veda people can be known.

Man and environment were so integrally knitted that it is difficult to think man as something separate from natural environment. The Rig-Veda attitude towards the environment springs from mankind's primordial experience of being on the one hand, against on the other an offspring of the environment. The polarity of 'far' and 'near' seems apparently a paradox; but, in reality they are one and the same thing. The depiction of difference carries a deeper implication

for a respectful conservation of the environment. For a Vedic man, any attempt at subjugating the environment is incomprehensible. Instead of exploration the environment is to harm one-self and masochistic vice like contaminating one's own bed.

By earth they mean the consmogenic whole, encompassing in it hills and plants, snow-clad peaks of mountains, deserts, oceans and rivers, lakes and streams, trees, plants, animals, rocks and stones, underground minerals and treasures, weather, climate and seasons. Transcending the terrestrial form of body it is called 'Bhumi' universal mother, dispenser of all good and great. It being the basis of life, is considered a part of man. Man is of earth therefore, earthly. He cannot live without earth. Without it he is like without a body. The earth is the mother of man but man is also lord of the earth. Vedic man works to enjoy the blessings of the earth, because he realizes that earth is his home, his own family, his body and ultimately his own self. The theory of creation and the 'Prusha Prakriti' concept surcharge severely entity, be it animator, inanimate, living with same divinity.

1.3.1 Importance of Plants for Man:

The various plants are useful for the survival of man since the beginning of human life. Rishies and Munis had realized their importance and they were included in religion so that they can be preserved and protected by man.

Importance of various plants, trees, and wild life for the human life and survival of the community is indescribable: Rig-Veda Rishies had knowledge about it. They also knew that these things are their permanent renewable resources of wealth and health. If harm is done to them the ultimate effect will be one the human society.

Trees were considered to be an essential part of dwellings in Hindu family.

Various trees were worshipped by the people. From this it is evident that they had done it only to preserve the plants. The word 'Vanaspati' is used in several Suktas and preservation of trees has been indicated. These serve as medicines (1-13-11). The 'Ausadhi' has been used from the plants which cures the disease (1-34-6); (1-45-89). Forests were called as 'Vanraj' (191-3). Rigveda advocates regular plantation as a means to achieve heaven. Presents the association of trees with God/Goddess.

Tress Associated with God and Goddess

<u>Name of Tree</u>	<u>Name of God/Goddess</u>
1. Tulsi	Ram, Marayan, Vishnu, Krishna, Jagannath, Lakshmi
2. Peepal	Vishnu, Lakshmi, Vanadurga, etc.
3. Vata	Brahma, Vishnu, Maheshwar, Kala, Kuber, Drishna, Panchanan, Lakshmi
4. Kadamba	Krishna.
5. Ashoka	Buddha, Indra, Vishnu, Aditya, etc.
6. Mango	Lakshmi, Govardhan, Buddha.
7. Bel	Maheshwar, Shiva, Durga, Lakshmi, Suri.

Not only plantation was treated as sacred ceremony or religious activity and regular protection and patronage was also prescribed. Thus various trees and plants are not only worshipped but cutting of green trees has also been prohibited. Rig-Veda society had been very much aware of the fact that indiscriminate destruction of the plants and forests would result in disease and pollution of the atmosphere.

The importance of grass was also understood by the Rig-Veda people. The occupation was mainly agriculture and cattle breeding. The primary form of food for cattle is grass. Grass feeds the animals, the animals nourish man, and man dies and goes to the grass again.

1.3.2 Importance of Animals for Man:

The plants, trees, animals and wildlife are every useful-for Rishies survival of man. It has been realized during the Vedic period and these animals were also considered as a part of religion. The animals and wildlife are associated with God and Goddess so that animals can be protected by man.

Preservation animal was also advocated in the Rigveda. Among animals, the worship of cow has been given a special place. Several animals have been named as vehicles of Gods/Goddesses as listed in the following para.

Animals and Wildlife Associated with God/Goddess

Animals	Name of God/Goddess
1. Cow	Krishna
2. Bull (Nandi)	Shiva
3. Bull, Dog and Bird	Dattatreya
4. Fish	Kama
5. Eagle	Vishnu
6. Horse	Sun
7. Elephant	Indra, Ganesh, Lakshmi
8. Lion	Durga
9. Peacock	Kartikeya
10. Monkey	Hanuman
11. Serpent	Shiva
12. Swan	Saraswati
13. Rat	Ganesh
14. Wildgoose	Brahama

It has been mentioned in the suktas to preserve animals (1-48-15: 1-164-40). If any one did any harm to the horse then he was Punished (1-162-20), The hymns have been sung in the praise of agni to preserve the animals (1-31-12, 13, 14).

Several animals had been used as symbols in the Regiveda. 'Gau' literally means a cow. According to Vedas she is the daughter of Kamadeva, the god of cosmic element, passion, who is also the first manifestation of physical creation. The basic process of physical creation is the sound wave or the cow that is why the term 'Shabda Brahma' is used.

The vedic synonym for a goat is 'Aja' and that for Lamb is 'Mesha'. The Brahman has been described as the 'Aja Ekapadaada'.

Life force being interlinked with fire energy, the cosmic life force in the cavity (garta) of the heart of the nucleus is Aja-grata.

Mesha is the term frequently used in the Vedas as an epithet for the chief God Indra who is the greatest fighting, piercing and resistance breaking spirit. Mesha is a symbol for the fire in flames. The blazing fire or the fire in active flames is a Mesha.

The Sankrit, term for dog is 'Shuan'. The function of the life-force in the human body is manifested through the nostrils again are the organs for smelling. Again 'prana' is the life breath. The dog is the only animal with a long-range power of smelling and sound-hearing. So, it is considered as a symbol of 'Prana'.

1.3.3 Formation of Human Body:

According to the Vedic Rishis the body is composed of earth, water, fire, ether, and air. Water has been worshipped in the Rig-Veda, Water purifies the heart and body. Water is medicine, etc. (1-23-19; 1-46-40) Saraswati is the goddess of river current.

Vayu (air) is really the spirit of flow in a force; this is mobility. Vayuistife breath, and in the long run is associated with the dyonibited of the cosmos which is 'Prana'. So pollution of air was prohibited and punishable.

Rig-Veda Rishis were aware of the seasons. The Regiveda's general term for seasons is 'Ritu'. This is established in many verses such as 7-103-9 or 2-13-7. It is the only in the hymn (10-99-10) already quoted that Indra is given the title or protector of the seasons.

1.3.4 Roots of Environmental Education:

Today's Environmental Education never separates academic and intellectual pursuit for a vedic man. It was implicitly there in his life. It is difficult to think of man as something separate from nature/environment, because life and environment were so integrally knitted.

It is believed that to harm environment is to harm oneself. To hindus, relation with nature and animals is not that of dominion and subjugation but rather a relationship of mutual respect and kindness. Several animals have been named as vehicle of God/Goddess. In dealing with the hymns of Rig-Veda, the important questions arise, to what extent these hymans are understandable.

The religious ornament Rig-Veda describes the importance of environment to a great extent. Preservation of animals and plants are clearly mentioned. Ecology was sacred science for them. The people of that time protected the environment from pollution by all means. Not only they protected the external environment (Natural) but also the environment made by them. At the same time they protected their international environment (inner self) from pollution by obeying the moral and religious norms and maintained as well-balanced life free from pollution. They are of the view that to harm

environment is to harm the self. Environment is the part and parcel of human life.

STOP TO CONSIDER

Rig-Veda is the ancient of all four Vedas. Rig-Veda consists of ten mandals with Sutas (hymns) and 10,247 Rik (Stanzas) mostly in poems. Hymns are Songs in the praise of different gods. There are three kinds of gods-the celestial god, the aerial gods and the terrestrial gods. Among those gods Agni, Indra, Marut, Vayu, Surya, Vishnu, Soma, Brihaspati are important. From those hymns social conditions of the Rig-Veda people can be known.

1.4 Man and his Environment during the Present Period:

The present pattern of human activity on the earth resulting in the degradation of the environment remains unchanged, science and technology will not be able to prevent degradation of the environment.

Although the present status of the problems is dealt with under a few separate headings below, it should be stated at the very outset that the problem is indivisible. The newly emerging 'systems view of life lays great stress on the interconnectedness and interdependence of all phenomena-physical, biological, psychological and socio-cultural, Even the physical and biological problems of environment are multidimensional as well as interdisciplinary. The Nobel Laureate Ilya Prigogine says "you can hardly locate the discipline to which the problem belongs."

It is practically impossible to list all the factors that pollute and degrade our environment and nature. One comes across pollution almost at every step in life. In fact, it is so pervasive that you cannot get away from it. Some selected and important factors have been

discussed in the following paragraphs briefly. Let us go through one by one.

- Human Population Explosion,
- Advancement of Technology
- Pollution due to the use of Pesticides
- Chlorofluorocarbon Problem (CFCs)
- Biodiversity in nature
- Oil spills and damaging ecosystem
- Toxic Time Bombs and Water Pollution
- Radiation Hazards and Ecological balance
- Multinationals and Environment
- Integrated approach for White and Green Revolutions.

1.4.1 Human Population Explosion:

There are two types of explosions. Population explosion and knowledge explosion. The human population explosion has created several types of problems and has affected the environment adversely. Pollution and environmental degradation are directly related to extraordinary increase in human population during the present century. At the beginning of the 20th century, the world population was about 1.5 billion and by the end of the century it is expected to be about 6 billion. Because of the pressures of agriculture for more food and industries for further development, deforestation is going on a very large scale resulting in soil erosion, change in the world climate and depletion of natural resources. In developing countries domestic sewage and industrial effluents are often dumped untreated into rivers resulting in contamination of fresh water.

Worldwide industrial air pollution has become as serious problem. Emission of sulphur dioxide and oxides of nitrogen is continuously increasing and acid precipitation adversely affecting the quality of fresh water. Phenomenal increase in human population and the consequent increase in the use of the fossil fuel and deforestation have resulted in increase in the heart trapping green house gases such as carbon dioxide. If the present trend of increase in human population is not checked, even the small, increase of 1.5°C in the world temperature will prove disastrous to all living organisms.

1.4.2 Advancement of Technology:

Technological advancement is the major human activity which has degraded the natural environment and created several types of problems in the developed countries to the world. Developing countries like India need not follow the west and adopt highly sophisticated and capital oriented technology which creates physically and mentally unhealthy, environment full of pollution, congestion and noise. Apart from improving and giving further impetus to small scale industries, we can go in for what is known as an intermediate technology. *Schumacher* defines the level of technology in terms of equipment cost per workplace. On the basis of this consideration, intermediate technology is quite cheap. It does not preclude the indigenous technology know-know, small and intermediate industrial complexes should be set up in towns. Apart from halting migration to big cities, such technological centres will go a long way in minimizing degradation of the environment, which is unavoidable in highly modern industrial units centered in big cities. We don't need mass production. What we need is production by masses. Small and intermediate technological centres can employ more people and produce clothing, household goods, agricultural

implements, cheap housing materials and selected food and milk products of high quality.

1.4.3 Pollution due to the Use of Pesticides:

The chemical compounds and pesticides are used in agriculture/farming for killing insects and weeds which are harmful for the growth of crops. Pesticides are chemical compounds used for controlling pest of different kinds. For examples, fungicides are used to control fungus infections, herbicides are use to kill weeds which, if not removed, will harm the growth of crops. The most commonly used pesticides are generally insecticides which are used to kill various types of harmful insects. Dichlorodiphenyl Trichloroethane commonly known as DDT was the first important insecticide which was very effective and used all over the world. Since DDT was effective against mosquito and flies also, it was used for the control of disease like malaria and typhus by destroying these insect carriers of the disease. In due course of time when insects developed resistance against DDT, a host of other powerful insecticides like Parathion and Malathion were synthesized. Later on carbonates were synthesized. 1-naphthyl-N-methyl carbonate commonly known as Carbaryl or Sevin is manufactured by the condensation of a naphhtol with methyl-iso-cyanate abbreviated as MIC. It was during the production of MIC methyl amine and dangerous carbonyl chloride that the worst gas leak disaster in Bhopal occurred in December 1984.

1.4.4 Chlorofluorocarbon Problem (CFCs):

The first synthesis of CFC (Chlorofluorocarbon) was accomplished in 1930. It is a colorless, non-toxic chemical which revolutionized refrigeration industry and later on found many applications in

pharmaceutical and electronic industries as hailed as a great achievement. However, when around 1974 it was found to be related to the thinning of the protective ozone layer in the Arctic regions, scientist, environmentalists and politicians were all equally alarmed. A global conference was held in Vienna in 1985 to discuss the problem. Later in 1987 forty-eight nations met in Montreal and it was decided to reduce the consumption of CFCs by 50 percent by the end of the century. However, some of the developing countries including India, did not sign the Montreal Protocol as the terms prescribed for them were not for. Subsequently, in June 1990 India along with some other countries agreed to phase out the use of CFCs. The developed countries agreed to finance the developing countries to switch over to CFC substitutes.

The ultraviolet radiation that reaches the surface of Earth from the stratosphere increases due to the thinning of the ozone layer. This increase in the UV radiation is harmful to phytoplankton which includes the free floating algae in the sea. If phytoplankton is substantially affected, it will have an adverse effect on the sea fauna which feeds on it. In fact, the entire ecological chain may break down. With two percent increase in the intensity of UV radiation, ozone concentration goes down by one percent. This much increase in the intensity of UV radiation is enough to cause five percent increase in the human skin cancers.

While efforts are being made to find harmless substitutes of CFCs, some doubt is being expressed that use of some other chlorine containing chemicals such as carbon tetrachloride may also be contributing to the phenomenon of ozone depletion. This is an example of the dark side of economic growth and development based on materialistic concept of life.

1.4.5 Biodiversity in Nature:

It refers to variety and variability among the living animals and plants. The laws of evolution are operational all the time resulting in the creation of new species and extinction of some through natural selection. While it is difficult to estimate the total number of all the species on the planet of Earth, it is generally believed that at least half of them are yet to be identified. The tragedy is that due to overpopulation and subsequent increase in deforestation, overhunting and both agricultural and industrial growth, many of these unidentified species may become extinct even before we come to know them. The rate at which known and unknown species are becoming extinct is simply staggering. It is well known that some species are important for the survival of the others. In fact, this interspecific dependence is very delicate and the loss of a few species may destabilize the entire ecosystem.

1.4.6 Oil Spills and Damaging Ecosystem:

One of the tragedies of the recent Gulf War was the spillage of crude oil in the Gulf waters. The total damage to the ecosystem of the region has not been fully known even so far. The oil is believed to have affected life as far away as the Iran coast. Apart from killing the marine life, the spilled oil disrupted the desalination plants on the western coast of the Gulf. These disrupted the desalination plants on the western coast of the Gulf. These desalination plants fulfill nearly half the water requirements of the Arabian states.

Crude oil disasters during its transportation are not uncommon. The first major oil spill was in 1967 when a Liberian tanker was damaged on the southwest coast of Great Britain spilling over 50,000 tons of crude oil in the sea. It adversely affected the ecology of the 150 kilometer of the coastline killing very large number of

fish and birds. In 1969 an off shore oil well on the coast of Santa Barbara in US accidentally discharged large quantities of oil causing extensive damage to sea life. In 1978 there was a major disaster along the French coast and in 1989 over ten million gallons of crude oil was spilled into the sea waters of Alaska. In 1989 a Maltese tanker collided with a British vessel and spilled over 5000 tones of furnace oil into Indian sea near Bombay. There are many more cases of oil spillage all over the world. There are various ways of treating the oil spills and in fact they do break down with time. However, by the time irreparable damage is done to sea life and surrounding environment.

1.4.7 Toxic Time Bombs and Pollution:

The highly developed nations are simply obsessed with passion for continuous growth, expansion and export particularly of consumer goods. The technology their use has created very unhealthy environment for life. Besides this, they have posed a very serious problem of disposal of toxic chemical waste products of high technology. The Americans realized the seriousness of the problem when a trench near the Niagara Falls for many years as a dumping ground for highly toxic chemicals was discovered. The chemicals and polluted surrounding water resources and had caused high rate of birth defects and various forms of concern among the residents of the area. An emergency had to be declared and the residents of the area were evacuated to safer place. The U.S. Environment Protection Agency estimated that of the more than 50,000 known areas where hazardous materials are stored or buried only seven percent of them could be safe. These unsafe areas have been termed 'Toxic Time Bomb's which may explode any time without a warning. It has been estimated that annual hazardous toxic chemicals waste products in U.S. alone is over twenty five million

tones. Similarly, The U.S. produces a thousand new chemical compounds every year some of which may prove to harmful in the long run as has already happened in the case of CFCs discussed above.

1.4.8 Radiation Hazards And Ecological Balance:

There is a fear of third world war and use nuclear weapons. It will not only destroy human population but will destroy total environment in which it would be difficult to survive for any living organisms.

Even if there is no nuclear war, the hazards of nuclear technology far exceed the benefits by way of so-called peaceful uses of atomic energy. We are made to believe that nuclear power is cheap, clean and safe. Experts not connected with nuclear power and industries don't agree with it. The health hazards of radiation are of an ecological nature affecting all living organisms. It is already well known that human beings subjected even a little more than the so called safe limits of radiation, tend to develop cancers after few years of exposure. Genetic disease can appear even in subsequent generations.

It is most important to bear in mind that there is no way to destroy radioactivity once it has been set going. For example, Carbon has a half life of 5900 years. This means that it takes 5900 years for its radioactivity to become half. Even if you dump the enormous amounts of radioactive wastes produced by nuclear reactors into the deepest parts of ocean, it does not help. The radioactive substance is absorbed by plankton; algae and sea animals. These radioactive materials enter the biological cycle and soon find their way back to man.

One of the most dangerous radioactive substances is Plutonium which has the half life of 500,000 years. One millionth gram of Plutonium can produce lung cancer in man. Radioactive plutonium is the creation of the nuclear power plants and since there is no absolutely safe technology for handling it, some of it inevitable escapes. This is one additional cause for increase in the various types of cancers throughout the world.

1.4.9 Multinationals and Environment:

Multinationals represent a new form of colonialism. They are the symbols of institutional domination and exploitation. I can't do better than quote Fritj of Capra in this respect. He says- "The assets of thee multinational giants exceed gross production of most nations; their economic and political power surpasses that of many national Governments, threatening national sovereignty and world monetary stability. In most countries of the western world but especially in the U.S., corporate power permeates virtually every aspect of public life. Corporations largely control the legislative process, distort information received by the public through the media and determine to a significant extent, the functioning of our educational system and direction of academic research."

One East India Company had come to India for trade. Fully exploiting both the weakness and generosity of our people, they soon became the masters of the country. Economic submission to multinationals and aid giving agencies is as good as bartering away our freedom. This must not be allowed to happen. Setting aside all political and other differences, we must stand as one man against the exploitation of multinationals in any form. One of the ways the multinationals work is through media particularly T.V. to subvert the national ethos and subjugate the people through consumerism.

According to a recent report T.V. is available to over 50 percent of our population and has exposed they youth to the adverse effects of violence, vulgarity and consumerism.

Unfortunately, mass media are dominated by Government and big business people and they one serves the vested interests. Advertising on T.V. influences the content and the form of culture and progress, use suggestive power, distorts sense of reality and conditions the spectators to buying products.

1.4.10 Integrated Approach for White and Green Revolution:

It may surprise many of us that in spite of our road and rail networks, nearly - ninety percent of all transportation in our vast rural areas is still dependent on bullock carts. What is urgently needed is to evolve better -designs of carts so that bullocks can carry more loads without difficulty.

How many of us realize that without the bullocks this country will come to a grinding halt. In spite of this, we don't treat them properly. It was Rukmini Arundale who was personally responsible for getting the 'Prevention of Cruelty to Animals. 'Act passed in the parliament. Unfortunately, life many other acts, this one is also ineffective. Sick, limping, injured and famished cattle increase in the number of cattle that are sent to slaughter house in this land of Buddha., Mahavir, Adi Shankaracharya, Kabir, Guru nanak and Gandhi. If we conserve our cattle wealth and properly utilize the organic manure, we would be able to reduce by half our dependence on chemical fertilizers. What is needed is the proper integration of dairy and farming which are naturally interdependent. If we also utilize our man power to desilt our rivers and tanks and transfer the rich silt into the adjoining fields during summer, we would not only get bumper crops but minimize the damage caused floods. The bad

effects of pesticides particularly insecticides can be reduced by use of non-toxic chemicals, or least toxic insecticides such as Pyrethrum which can be extracted from the flowers of Chrysanthemum. There is plenty of scope for research in the field of naturally occurring insecticides. Adoption of the age-old method of alternation of crops, use of biological control of pests and pheromones which are a group of hormones secreted by insects to attract their mates, can go a long way in doing away with highly toxic and dangerous pesticides.

1.5 Role of Family Environment:

The family is the most ancient and original human group, its organization may be different from society. The family is the first school and mother is equivalent to hundred teachers. The family environment provides the education and training for conduct and values of life while the school confines to provide knowledge and information to the students. It provides the individual guidance to a child for social qualities.

The family is an informal education institution for developing social relations. It has certain responsibility. It is the prime responsibility of a family to fulfill the primary needs and requirement of a child and create a conducive environment or homely environment for developing social qualities and values among the children.

According W. Burges-"The family as a unity of interacting personalities i.e. parents or other family members." It implies the personality development of a child. The personality is broad concept refers to physical, social, emotional, cultural and intellectual development.

This issue is highly controversial among the educationists. Rousseau is of this view that evils come from family and society. The child should be kept in natural environment rather than family or social

environment. Emil book indicates this regarding role of family and society.

Pesstology and *Frobel* are of different views that family is the first school for a child. It creates most conducive environment to a child for providing learning experiences.

According to Raymond, "The family is the place or school which develops the great qualities in child. The quality of deep love and affection feelings are developed. The family environment provides the learning experiences for selfish-unselfish, justice-injustice, truth-lie, labour-carless etc and to differentiate among these concepts. The following are the main functions of family-

- ✓ Family is first school to develop feeling of security belongingness and emotional stability.
- ✓ To develop the ability of adjustment.
- ✓ To develop social, moral, and spiritual feelings.
- ✓ To indicate the permanent values of life.
- ✓ To develop the high qualities and values.
- ✓ To educate for guidance and counseling.
- ✓ To develop the mental and emotional qualities, and
- ✓ To educate for obedience and discipline.

The family is the place where the old generation or first transmits high qualities and values to second-generation. These high qualities are developed informally from the family environment. The family is the nursing place of culture and character buildings.

Check Your Progress

Q.1 Our environment is classified into two parts. These are:

Q.2 Write any three functions of family for a better environment.

..

1.6 Role of School:

The term school refers to the place where efforts are made for developing a child. A child should have great devotion in his school. Every school has three types of environment which influence the child-(i) Physical environment (ii) Social environment and Psychological and Educational environment.

According to John Dewey, the school has a unique environment where innate qualities of child are developed for life and functioning efficiency in an occupation and in society.

The school is the formal agency where preserved knowledge and experiences are transmitted to new generation and develop the personalities of children.

The following are the main characteristics of a school-

- ✓ The school is the name of specific environment,
- ✓ The school activities are organized to develop the children,
- ✓ The school is the centre of a child development,
- ✓ The school prepares youths for a socialized society and
- ✓ The schools are the creature and creator of society.

1.7 Role of Community:

The group of person of a place has the some objectives which is realized through cooperative life. It is difficult to plane without cooperative life. It is the second place after home for his socialization. It develops the feeling of ours. It has no place for I or me. The members of the community should have the we feeling sympathy and cooperation to each other. It is a well organized aspect of society but it is not a society. The feeling of locality is developed by the community.

The community refers to a general living group which has the common objectives. It maintains all types of relations. It is the result of general life. The members of community do not have the specific goal and selfish motive. It concerns with intensive social life in which human beings are there. They are conscious enough about social objectives and motives. Thus community life generate an environment for the socialization of a child-

- ✓ The community life creates and appropriate social environment which contributes in social and cultural development. It develops emotions, sentiments, characters as per norms of the society. The community process evolves social environment.
- ✓ It also develops cultural environment for the values of life, and ways of expressing his emotions. It develops conduct and values of life.
- ✓ The educative process and activities are controlled and organized by the community to meet the local requirements. The educational at programmes and curriculums are designed in view of the future requirements of the community. The educational process is made more meaningful and purposive.
- ✓ The community organizes informal activities and programmes for facilitating the child for his study by establish library, reading rooms, museums and play grounds etc.

The community education includes the following affective elements:

- The community is a small unit of a society, therefore it contributes in socialization.

- The culture means which we follow in our daily life. The community also provides informal educational situations for developing culture and our values. The culture factor influences the community.
- The community of today is mainly influenced by politics. It also affects our school functioning. Today's education is purely educational politics. The political consciousness is provided by the community.
- The community development is mainly based on the financial conditions and economic factors. The community should provide some training to the children for their vocations so that they are able to earn their livings.

STOP TO CONSIDER

The following are the main characteristics of a school-

- The school is the name of specific environment,
- The school activities are organized to develop the children,
- The school is the centre of a child development,
- The school prepares youths for a socialized society and
- The schools are the creature and creator of society.

1.8 Role of Social Environment:

The ultimate goal of education is to develop an integrated personality of child. The frame-reference of personality is the society; beyond the society the term personality is meaningless. The heredity and environment contributes in the development of personality of a child. The personality includes physical, social, emotional, intellectual and cultural qualities. Some traits are based on heredity and most of the traits are developed by his environment

in which a child lives. The following are main aspects or qualities which are developed by social environment-

- Development social conducts.
- Development of character,
- Social maturity,
- Development of self concept and self actualization.
- Group reputation.
- Feeling of friendship.
- Feeling of co-operation.
- Feeling of nationality.
- Devotion towards parents.
- Development of moral values and
- To develop the feeling of generosity.

1.9 Summing Up:

In the end of the unit we can summarize that there are various types of environmental problems which have been created by human activities. But no problem can be sorted out unless one finds out its root cause. According to Arnold Toynbee the pre-Christian Greeks and Romans believed in man's harmony with nature. However, later on the Semitic religion bestowed entire divinity and spiritual presence on a single, transcendental human like God and propagated the belief that nothing else in the universe is divine. This doctrine divorced man from his natural environment which was divested of its earlier pre-Christian aura of divinity. Man got a license to exploit nature which was no longer considered sacrosanct.

Man must give up the idea of exploitation of nature. He has to recognize the unity of life and sanctity of the planet Earth. There is a way out. The anti-ecological, unhealthy and inhuman technologies can be replacing by what are called 'soft' technologies because their

impact on the environment is greatly reduced by the use of renewable resources and constant recycling of materials. Such soft technologies include solar energy, wind generated electricity and biogas. This will lead us from the petroleum age to 'solar age'. The term 'solar age' is being used beyond its emergence of a human cultural in which ecologically harmonious life styles will predominate.

1.10 Questions and Exercises:

Long Questions:

1. Explain the term 'Man and his Environment. Enumerate types of environments and impact of man-made environments.
2. Compare the ancient and present views on Man and his Environment. Indicate the relevance of ancient views in the present context.
3. Summarize the main features of Rig-Veda for man and his environment. Indicate the importance of animals and plants as emphasized in Rig-Veda.
4. Enumerate the major environmental problems in present period and suggest some ways and means to resolve them.
5. Describe environmental crisis and its conservation.

Short Questions:

1. Explain the term man his environment.
2. Enumerate the type of crisis for man and biosphere.
3. Enumerate environmental crisis.
4. Indicate the need for environmental conservation.
5. Enumerate the main features Rig-Veda environmental conservations.

True/False Questions:

1. Various trees are worshipped by Bharatiya people.
(True/False)
2. Preservation of animals and birds were also advocated in Rig-Veda. (True/False)
3. Human body is composed of earth, water, air fire and ether.
(True/False)
4. Environmental problems are not interdisciplinary in nature.
(True/False)
5. Environmental crisis is due to narrow perception of reality
(True/False)

Key: 1.True, 2.True, 3.True, 4. False, 5. True.

1.11 References and Suggested Readings:

1. Fien, J. 1992. *Education for the Environment: Critical Curriculum Theorizing and Environmental Education*. Melbourne: Deakin University Press.
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UNIT- 2

ENVIRONMENTAL ETHICS

Unit Structure:

- 2.1 Introduction
- 2.2 Objectives
- 2.3 Environmental Ethics
- 2.4 Need of Environmental Ethics
- 2.5 Types of Environmental Ethics
- 2.6 Importance of Environmental Ethics
- 2.7 Principles of Environmental Ethics
- 2.8 Examples of Environmental Ethics
- 2.9 Summing Up
- 2.10 Questions and Exercises
- 2.11 References and Suggested Readings

2.1 Introduction:

Environmental ethics is a branch of ethical thought that focuses on the relationship between humans and their natural environment. It is a holistic approach to understanding and evaluating our moral obligations to protect and preserve the environment. Environmental ethics seeks to bring together the interests of both humans and the environment, recognizing that both are interdependent and have intrinsic values.

A variety of ethical theories, including consequentialism, utilitarianism, and virtue ethics, define environmental ethics. These ethical theories provide a framework for understanding the moral obligations we have to the environment and how we should act to protect it. Environmental ethics also draws upon the fields of

philosophy, economics, ecology, and law, providing a comprehensive approach to understanding and evaluating the moral implications of human actions.

2.2 Objectives:

After going through this unit you will be able to-

- *explain* the meaning of environmental ethics;
- *understand* need of environmental ethics;
- *discuss* different types of environmental ethics with suitable examples;
- *describe* the importance of environmental ethics in the present day context;
- *identify* the basic principles of environmental ethics;
- *give* examples of environmental ethics.

2.3 Environmental Ethics:

Ethics is defined by the concise Oxford English Dictionary as 'the science of morals, treatise on this, moral principles or rules of conduct. The word 'Ethics' comes from the Greek word 'Ethikos' which means 'of or for morals. Morals are described by the same dictionary as being concerned with the distinction between right and 'wrong'. In practice, ethics is a way of studying morality which allows decisions to be made when individuals face specific cases of moral dilemma. Ethics have some objectives, these are given below-

- To studies human behaviour and makes evaluative assessment about them as moral or immoral.
- To establishes moral standards and norms of behaviour.
- To make judgment, upon human behaviour based on these standards and norms.

- To prescribes moral behaviour and makes recommendation about how to, how not behave
- To express an opinion or attitude about human conduct in general.

Environmental ethics is the philosophical discipline that considers the moral and ethical relationship of human being to the environment. In other words, what, if any, moral obligation does man has to the preservation and care of the non-human world?

While ethical issues concerning the environment have been debated for centuries, environmental ethics did not emerge as a philosophical discipline until the 1970s. Its emergence was the result of increased awareness of how the rapidly growing world population was impacting the environment as well as the environmental consequences that come with the growing use of pesticides, technology and industry. Environmental ethics helps define man's moral and ethical obligations toward the environment. But human values become a factor when looking at environmental ethics. Human values are the things that are important to individuals that they then use to evaluate actions or events. In other words, human assign value to certain things and then use this assigned value to make decisions about whether something is right or wrong. Human values are unique to each individual because not everyone places the same importance on each element of life. For example, a person living in poverty in an undeveloped country may find it morally acceptable to cut down the forest to make room for a farm where he can grow food for his family. However, a person in a developed country may find this action morally unacceptable because the destruction of forests increases carbon dioxide emissions into the atmosphere, where can negatively impact the environment.

Environmental ethics, along with human values, make for challenging philosophical debates about man's interaction with the environment. Water and air pollution, the depletion of natural resources, loss of biodiversity, destruction of ecosystems, and global climate change are all part of the environmental ethics debate. And we see that within the discipline of environmental ethics there are tough ethical decisions human must consider. For example, it is acceptable for poor farmers in undeveloped countries to cut down forest to make room for farmland, even if this action harms the environment? It is morally wrong for humans to continue to burn fossil fuels knowing that this action leads to air pollution and global climate changes? Does it ethically permissible for man to build a hydroelectric dam know that this will disrupt the migration pattern of certain fish, leading to their extinction? Does a mining company have a moral obligation to restore the natural environment destroyed by their techniques?

We cannot deny development, but the development and conservation of environment should go side by side which ethical. Any work that causes harm to the environment. We should not think only for the present but for the future. After all human action should be guided by environmental ethics.

STOP TO CONSIDER

The word 'Ethics' comes from the Greek word 'Ethikos' which means 'of or for morals'.

2.4 Need of Environmental Ethics:

Eco-centric world view states that the earth resources are limited and belong to all the species. Though we have right to draw our

requirements from the environment, but certainly not to the extent that degrades the environment and harms other living beings. The success and healthy economy of mankind depend upon the healthy environment.

But most of industrial societies believe in anthropogenic worldview which states that man is the most important species of Nature and earth has an unlimited supply to resources. So the successes and healthy economy of mankind depend upon how nicely man derives benefits from nature resulting its own economic growth which will result healthy environment. So the human beings are over exploiting the natural resources and polluting the environment. It is further compounded by population explosion. These human acts are very dangerous and may lead to environmental crisis which may threaten even the existence of mankind.

So to check the environmental crisis, we must follow certain environmental ethics which would lead to a better environment and better future.

- Love and honour for the earth.
- Celebrate the turning of the senses of the earth.
- No right to drive other living to extinction.
- Be respectful to plants and animals which provided food to human beings.
- Limit the human population.
- Do not waste your resources.
- You should not run after gains at the cost of nature.
- Do not prohibit the right of future generation to live in a clean and safe environment.
- Consume the natural resources in moderate amounts so that all may share this treasure.

2.5 Types of Environmental Ethics:

There are various types of environmental ethics .these are as follows:

- **Libertarian Extension:** Libertarian extension is a type of environmental ethics that focuses on an individual's right to do whatever they want with the environment and its resources. This concept also stresses that an individual should not impose their own values on others and should instead respect the choices of others.
- **Ecological Extension:** Ecological Extension is a type of environmental ethics that focuses on preserving the natural environment and its resources in order to maintain the balance and health of the ecosystem. This concept stresses the importance of humans working with nature in order to sustain it for future generations.
- **Conservation Ethics:** Conservation Ethics is a type of environmental ethics that focuses on preserving natural resources for future generations by ensuring that current resources are not depleted or damaged beyond repair. This concept encourages individuals to use natural resources responsibly and judiciously so there will be enough for future generations.

In short, Libertarian extension promotes an individual's right to use natural resources, Ecological Extension encourages humans to work with nature, and Conservation Ethics emphasizes sustainable use of natural resources. Each of these types of environmental ethics has its own benefits and should be taken into account when considering how to best protect the environment.

Check Your Progress

Q.1. Write any three environmental ethics which would lead to a better environment.

Q.2. Write any two types of environmental ethics.

2.6 Importance of Environmental Ethics:

Environmental ethics are very much important now a day. The importance of environmental ethics is as follows:

- Environmental ethics is essential for protecting the environment, species, and resources.
- It promotes sustainable practices and encourages people to become more aware of the impact their actions have on the environment.
- It emphasizes the interconnectedness of all living things and the need to respect them. It encourages us to think about our place in the world and how we can contribute to preserving the natural environment.
- Environmental ethics helps to build better relationships with nature, recognizing its intrinsic value, not just its instrumental value.
- It encourages us to think beyond our immediate needs and consider the long-term implications of our actions.
- It teaches us responsibility towards our environment, advocating for environmentally friendly practices that help protect natural resources.
- Environmental ethics also promotes better public policies and laws, which help ensure that our environment is properly cared for.

STOP TO CONSIDER

Libertarian extension promotes an individual's right to use natural resources, Ecological Extension encourages humans to work with nature, and Conservation Ethics emphasizes sustainable use of natural resources. Each of these types of environmental ethics has its own benefits and should be taken into account when considering how to best protect the environment.

2.7 Principles of Environmental Ethics:

- 1. Respect for the intrinsic value of nature:** Nature should not be treated as a commodity or resource to be exploited and discarded.
- 2. Interdependence of species and ecosystems:** Humans depend on nature and natural systems. We must recognize our role in preserving and protecting the environment.
- 3. Ecological sustainability:** We must strive to use resources responsibly and with an eye to preserving ecosystems and biodiversity.
- 4. Human responsibility:** We are responsible for our own actions and decisions and their consequences for the environment.
- 5. Human equity:** We must strive for a just world where the rights and needs of humans, animals, and plants are respected and protected.
- 6. Precautionary principle:** We should take precautions against environmental harm, even when scientific evidence is inconclusive.
- 7. Right to know:** Individuals have the right to access information about environmental issues.

- 8. Right to participate:** Citizens have the right to participate in environmental decision-making processes.

Check Your Progress

Q.3. Write the importance of environmental ethics in the present context.

Q.4. Write any three principles of environmental ethics.

2.8 Examples of Environmental Ethics:

One example of environmental ethics in action is using renewable energy sources. Renewable energy sources are sources of energy that are naturally replenished and can be used without depleting natural resources. Examples of renewable energy sources include solar, wind, and hydropower. Renewable energy sources are seen as an ethical choice, as they do not cause pollution or deplete finite resources.

2.9 Summing Up:

- Environmental ethics is a field of study that seeks to understand humans' moral obligations to protect and preserve the environment. It is a branch of ethics that recognizes the intrinsic value of nature, the interconnection of all living things, and the responsibility of humans to act in accordance with ethical principles.
- Environmental ethics is a branch of ethics that studies the moral relationship between humans and the natural environment. It seeks to answer questions such as what duties we owe to animals, how we should treat the

environment, and how we can create an environmentally sustainable society.

- There are three main types of environmental ethics: libertarian extension, ecological extension, and conservation ethics. Libertarian extension is based on the idea that people have a right to use nature for their own ends. The ecological extension considers that nature has value in and of itself beyond any human use or benefit. Finally, conservation ethics focuses on maintaining a balance between human use and the preservation of nature.
- An example of environmental ethics in action is the use of sustainable agriculture methods. Sustainable agriculture methods are those that are designed to ensure that the land and resources used in agriculture remain productive and can continue to be used in the future. Examples of sustainable agriculture methods include crop rotation, integrated pest management, and conservation tillage. Finally, sustainable forestry practices are an example of environmental ethics in action. Sustainable forestry practices are designed to ensure that forests are managed in a way that preserves their biodiversity and ecological integrity. Examples of sustainable forestry practices include selective harvesting, reforestation, and the protection of old-growth forests.
- Environmental ethics is important because it provides a moral framework for how humans interact with the natural environment. It helps us consider the effects our actions have on the planet and guides us in making more ethical and sustainable decisions.

- Ecology is the scientific study of the relationships between organisms and their environment, while environmental ethics focuses on how humans should interact with the natural environment. Ecology looks at how organisms interact with each other and with their environment. In contrast, environmental ethics looks at how humans should interact with the natural environment in order to minimize harm and promote sustainability.

2.10 Questions and Exercises:

1. Explain the meaning of environmental ethics? State the need of environmental ethics.
2. Discuss different types of environmental ethics with suitable examples.
3. State the importance of environmental ethics in the present day context.
4. What are the basic principles of environmental ethics?
5. Give an example of environmental ethics.

2.11 References and Suggested Readings:

1. Fien, J. 1992. *Education for the Environment: Critical Curriculum Theorizing and Environmental Education*. Melbourne: Deakin University Press.
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UNIT- 3

ENVIRONMENTAL VALUES

Unit Structure

- 3.1 Introduction
- 3.2 Objectives
- 3.3 Environmental values
- 3.4 Need of Environmental Values
- 3.5 Importance of Environmental Values
- 3.6 Types of Environmental Values
- 3.7 Philosophical Foundations of Environmental Values
- 3.8 Environmental Values in Action: From Theory to Practice
- 3.9 Decline of Environmental Values: A Growing Concern
- 3.10 Decline of Environmental Values and Its Impact on the Environment
- 3.11 Summing Up
- 3.12 Questions and Exercises
- 3.13 References and Suggested Readings

3.1 Introduction:

As you know that our environment is the foundation upon which our life depends. In a rapidly changing world, the importance of environmental values cannot be over stated. These values refer to the principles and beliefs that guide human interaction with the natural world. They encompass attitudes towards nature, the recognition of ecosystems' intrinsic value, and the belief in the need for responsible stewardship of natural resources. Understanding environmental values is essential for developing policies, practices, and lifestyles that promote sustainability, balance, and a harmonious relationship between humanity and the planet. Moreover, environmental values have evolved over time, shaped by cultural,

philosophical, economic, and scientific perspectives. As human activity increasingly affects the Earth's ecosystems, the necessity of fostering a deep respect for the environment is more urgent than ever. Therefore, this unit explores the nature of environmental values, their importance, the philosophical frameworks that support them, and the role they play in shaping sustainable practices. Also this unit helps you to identify various causes of declining of environmental values and its impact on our environment.

3.2 Objectives:

After end of this unit you will be able to-

- *understand* the concept of environmental values;
- *analyse* the need and importance of environmental values;
- *discuss* various types of environmental values ;
- *explain* the philosophical foundations of environmental values;
- *understand* the causes of declining of environmental values;
- *illustrate* the environmental values and its impact on the environment.

3.3 Environmental Values:

Environmental values are feelings that bring about in us sensitivity for preserving the nature as a whole. Value systems have changed with time. Today we need a strong environmental value system because the environment is degraded to a greater extent. We should develop a value system that supports sustainable development. There are aesthetic values which are related to man's admiration of nature. Importance of preserving ancient structures should also be considered within the framework of environmental sentiment. Valuing nature is the fundamental environmental sentiment. We

should develop a feeling of oneness with all other living forms. We should protect the wildlife by creating effective National Parks and wildlife sanctuaries. We must protect the natural ecosystems along with protecting the rights of local people.

3.4 Need of Environmental Values:

Environmental values are beliefs and attitudes that reflect how individuals or societies view the natural world and their role in its preservation. These values determine how humans use and interact with natural resources and influence decision-making regarding conservation, pollution, land use, and environmental protection. Broadly speaking, environmental values can be categorized into anthropocentric (human-centered) and eco-centric (earth-centered) perspectives.

- ❖ **Anthropocentric Environmental Values:** These values prioritize human well-being over the needs of the natural world. The anthropocentric view sees the environment as a resource to be exploited for human benefits. Under this framework, nature's value is largely instrumental, meaning that it is valuable primarily for the services it provides to humanity. This view has historically dominated industrialized societies, where economic growth and resource extraction were central to development.
- ❖ **Eco-centric Environmental Values:** In contrast, eco-centric values place inherent worth on nature itself, independent of human use or benefits. This perspective suggests that ecosystems, species, and the natural world deserve moral consideration and respect, irrespective of their utility to humans. Eco-centrism advocates for the protection and preservation of ecosystems, recognizing their intrinsic value

and advocating for the rights of non-human entities, including animals, plants, and natural landscapes.

These two perspectives highlight the diversity of environmental values and the complex relationship humans have with the environment. As the world grapples with climate change, resource depletion, and biodiversity loss, there is an increasing call to move toward eco-centric values, which emphasize the interconnectedness of all life and the need to safeguard the planet for future generations.

3.5 Importance of Environmental Values:

Environmental values play a critical role in shaping how societies approach ecological challenges. The increasing degradation of the environment due to over exploitation, pollution, and deforestation calls for a rethinking of values related to nature. The importance of environmental values can be understood in several ways:

- **Sustainable Resource Management:** One of the most pressing environmental challenges today is ensuring that resources are used in a way that meets the needs of the present without compromising the ability of future generations to meet their own needs. Environmental values guide sustainable practices, such as the responsible use of water, energy, and raw materials. They encourage people to consider the long-term impacts of their actions on the planet and to adopt more sustainable lifestyles.
- **Biodiversity Conservation:** The preservation of biodiversity is essential for maintaining ecosystem stability and resilience. Environmental values that emphasize the importance of protecting wildlife and ecosystems help promote policies and actions that prevent species extinction

and habitat destruction. Recognizing the intrinsic value of nature fosters a collective sense of responsibility to safeguard the planet's biodiversity for the benefit of all life forms.

- **Ethical Considerations:** Environmental values are deeply connected to ethical considerations about the treatment of animals, ecosystems, and future generations. The ethical arguments for environmental protection include the duty to prevent harm, the obligation to preserve the natural world for future generations, and the responsibility to minimize suffering among non-human entities. These values are reflected in movements for animal rights, environmental justice, and the rights of indigenous communities to protect their ancestral lands.
- **Climate Change Mitigation:** Climate change is one of the most urgent issues of our time, and addressing it requires a shift in how we value and interact with the environment. Environmental values that prioritize the well-being of the planet and future generations can lead to more aggressive actions to reduce greenhouse gas emissions, promote renewable energy, and transition to a low-carbon economy.

STOP TO CONSIDER

Environmental values are feelings that bring about in us sensitivity for preserving the nature as a whole. Environmental values can be categorized into types. These are anthropocentric (human-centered) and eco-centric (earth-centered). Environmental values play a critical role in shaping how societies approach ecological challenges. The increasing degradation of the environment due to

over exploitation, pollution, and deforestation calls for a rethinking of values related to nature.

3.6 Types of Environmental Values:

Environmental values are the principles and beliefs that guide how humans interact with the natural world. These values shape our attitudes toward nature, the environment's role in human well-being, and the ethical considerations of using natural resources. As the global community faces pressing environmental challenges, understanding different types of environmental values is crucial for fostering sustainable practices. Environmental values can be categorized into several types, each reflecting a distinct approach to the environment.

➤ Anthropocentric Values (Human-Centered)

Anthropocentric environmental values place human interests at the center of moral and ethical considerations. In this view, nature is seen primarily as a resource to serve human needs. The value of the environment is determined by its utility to humanity, and its protection is justified insofar as it benefits people. This perspective has traditionally dominated industrialized societies, where the focus is on economic growth, technological advancement, and the exploitation of natural resources to improve human living standards. Anthropocentrism tends to prioritize short-term human benefits, often overlooking long-term ecological consequences.

➤ Bio-centric Values (Life-Centered)

Bio-centric values extend moral consideration beyond humans to all living beings. This perspective argues that all life forms—animals, plants, and microorganisms—have intrinsic value and deserve

ethical consideration. Biocentrism asserts that humans have a responsibility to respect and protect the rights of other living organisms, irrespective of their utility to human beings. This approach emphasizes the interconnectedness of life and the ethical imperative to avoid harm to other creatures. Biocentrism has gained popularity with the rise of animal rights movements and the growing recognition of the intrinsic worth of nature.

➤ **Eco-centric Values (Ecosystem-Centered)**

Eco-centric values take a broader, more holistic approach by focusing on the entire ecosystem rather than individual species or organisms. This perspective argues that ecosystems—comprising plants, animals, air, water, and soil have intrinsic value and should be preserved and protected in their entirety. According to eco-centrism, the environment is an interconnected web of life, and the health of one part of the ecosystem is dependent on the health of the whole. Eco-centric values advocate for the protection of natural habitats, the restoration of damaged ecosystems, and the preservation of biodiversity to maintain ecological balance and resilience.

➤ **Deep Ecology**

Deep ecology is an environmental philosophy that advocates for a profound shift in human consciousness toward a more ecologically harmonious relationship with the earth. It builds on eco-centrism but goes further by challenging the dominant anthropocentric worldview. Deep ecology emphasizes the inherent value of all life forms and ecosystems and argues for a radical reevaluation of human development and lifestyle. Proponents of deep ecology advocate for reducing human population growth, limiting consumption, and living in a way that respects the earth's natural

limits. The goal is to cultivate a deep, spiritual connection with nature and adopt a lifestyle that minimizes harm to the planet.

➤ **Sustainable Development Values**

Sustainable development values are focused on balancing human development with the long-term health of the planet. This approach emphasizes meeting present needs without compromising the ability of future generations to meet their own. Sustainable development values prioritize resource conservation, renewable energy, and equitable social and economic systems. They aim to create a harmonious balance between economic growth, social well-being, and environmental protection. This value system is increasingly embraced in global development policies, including the United Nations' Sustainable Development Goals (SDGs), which seek to address issues like poverty, inequality, and climate change.

Check Your Progress

Q.1. What do you mean by Environmental values?

Q.2. What is the need of environmental values now a day?

3.7 Philosophical Foundations of Environmental Values:

Environmental values are rooted in various philosophical traditions that seek to understand the ethical, moral, and metaphysical dimensions of human-nature relationships. These frameworks have evolved over time, incorporating both Western and non-Western perspectives on nature.

❖ **Anthropocentrism:** As previously mentioned, anthropocentrism places human beings at the center of moral concern. This view has dominated Western thought for

centuries, particularly since the rise of the scientific revolution and the Enlightenment. Philosophers like René Descartes and Immanuel Kant emphasized the importance of reason and human autonomy, often relegating nature to a subordinate position. In this view, nature exists primarily for the benefit of humans, and its protection is justified only insofar as it serves human interests.

- ❖ **Biocentrism:** Biocentrism extends moral consideration to all living beings, not just humans. It argues that all life forms have inherent value and that humans have a responsibility to protect them. This perspective emerged in the 20th century as environmental concerns gained traction. The bio-centric view challenges the traditional anthropocentric paradigm by advocating for the moral consideration of animals, plants, and ecosystems based on their capacity to experience life and suffering.
- ❖ **Eco-centrism:** Eco-centrism takes the ethical consideration further by recognizing the intrinsic value of entire ecosystems. According to this view, the environment, including landscapes, waters, and air, deserves moral respect and protection, regardless of its utility to humans. Eco-centrism is influenced by the work of philosophers such as Aldo Leopold, whose "Land Ethic" argued for a holistic understanding of the natural world and the ethical obligation to protect it as an interconnected whole.
- ❖ **Deep Ecology:** Deep ecology, a philosophy developed by Arne Naess in the 1970s, takes eco-centrism to a deeper level by advocating for a profound shift in human consciousness toward a more ecologically harmonious way of life. It suggests that the current environmental crisis stems from a worldview that sees humans as separate from nature, and that true environmentalism requires a rethinking of this

worldview. Deep ecology calls for a radical transformation of human values, including recognition of the intrinsic worth of all living beings and ecosystems.

- ❖ **Indigenous Environmental Knowledge:** Many indigenous cultures have long embraced an eco-centric worldview that is deeply rooted in their understanding of the land, animals, and spiritual connections to nature. Indigenous environmental values emphasize the sacredness of nature, the interconnectedness of all life, and the importance of living in harmony with the earth. These values often include practices of sustainability, such as rotational farming, conservation of sacred sites, and the respectful use of resources.

STOP TO CONSIDER

Anthropocentrism, Biocentrism, Eco-centrism, Deep Ecology and Indigenous Environmental Knowledge are some of the important philosophical foundations of environmental values.

3.8 Environmental Values in Action: From Theory to Practice:

The shift toward stronger environmental values has led to significant changes in how societies approach environmental challenges. Here are a few areas where environmental values have made a tangible impact:

- **Environmental Education:** Environmental education plays a vital role in shaping future generations' environmental values. By teaching young people about ecology, sustainability, and the importance of environmental protection, educational systems can foster a culture of

environmental stewardship. This is crucial for cultivating an informed public that is capable of making environmentally responsible decisions.

- **Sustainable Business Practices:** In recent years, there has been a growing trend toward sustainable business practices. Companies are increasingly adopting environmental values in their operations, from reducing carbon footprints to using renewable resources. Corporate social responsibility (CSR) has become a key focus for many organizations, reflecting the growing recognition that business success is intertwined with environmental health.
- **Government Policies and International Agreements:** Environmental values have been translated into policy and legislation at both the national and international levels. Laws protecting endangered species, regulating pollution, and promoting renewable energy are manifestations of these values in action. International agreements, such as the Paris Agreement on climate change, also reflect the global recognition of the need to protect the environment for future generations.
- **Grassroots Movements:** Environmental values have been championed by grassroots movements around the world. Organizations like Greenpeace, Extinction Rebellion, and local environmental advocacy groups have played a crucial role in raising awareness, advocating for policy changes, and organizing collective action to protect the planet.

3.9 Decline of Environmental Values: A Growing Concern:

The decline of environmental values refers to the diminishing importance placed on the protection and preservation of the natural

world. This decline can be observed in various forms, from the increasing exploitation of natural resources to the disregard for sustainability principles and the failure to address environmental degradation. As society becomes more focused on economic growth, technological advancement, and short-term benefits, the foundational principles of environmental ethics, conservation, and sustainability have often been sidelined. The consequences of this decline are far-reaching, with the planet facing environmental crises such as climate change, deforestation, pollution, and biodiversity loss.

❖ **Over exploitation of Resources:**

One of the most significant indicators of the decline in environmental values is the overexploitation of natural resources. Human activity, driven by industrialization, urbanization, and consumerism, has led to the unsustainable extraction of fossil fuels, minerals, water, and timber. The relentless pursuit of economic growth often encourages short-term exploitation without considering the long-term consequences on ecosystems and future generations. The depletion of natural resources compromises the health of ecosystems, leading to soil degradation, water scarcity, and the loss of biodiversity. This reflects a shift away from valuing the environment as a shared, finite resource to one where immediate human benefit is prioritized over sustainability.

❖ **Pollution and Waste Generation:**

The rapid increase in pollution and waste production is another sign of the decline in environmental values. Industrial activities, transportation, and agriculture contribute to the contamination of air, water, and soil. Plastic pollution, chemical waste, and greenhouse gas emissions have led to severe environmental degradation. Despite widespread scientific consensus on the harmful effects of pollution,

many industries continue to engage in practices that harm the environment, often due to weak regulations, profit motives, or lack of awareness. The disregard for the long-term health of the planet in favor of convenience and economic gain reflects a weakening of environmental stewardship.

❖ **Consumerism and Materialism:**

The rise of consumerism and materialism has contributed significantly to the decline in environmental values. As global economies grow, societies often embrace a "throwaway" culture, where products are made for convenience and disposed of quickly. This leads to increased consumption of resources and generation of waste. The desire for constant consumption, fueled by advertising and social pressures, results in an unsustainable demand for natural resources. The shift from valuing sustainability, simplicity, and conservation to a culture of excessive consumption reflects a diminishing connection to the environment and its limits.

❖ **Political and Economic Priorities:**

In many parts of the world, environmental concerns have taken a backseat to political and economic priorities. Governments and industries often prioritize economic growth, job creation, and technological advancements over environmental protection. This has led to insufficient policies and weak enforcement of environmental regulations, especially in developing countries where economic growth is often seen as the primary path to prosperity. Climate change, biodiversity loss, and pollution are sometimes downplayed or ignored in political agendas, as short-term economic benefits are viewed as more urgent. This political and economic negligence further exacerbates the decline in environmental values, as policies do not adequately address the long-term health of the planet.

❖ **Lack of Environmental Education:**

Another contributing factor to the decline of environmental values is the lack of widespread environmental education. While environmental awareness has grown in certain communities, many individuals still lack a deep understanding of ecological principles and the importance of sustainability. Without proper education on the interdependence of life and the finite nature of natural resources, people are less likely to adopt behaviors and values that protect the environment. Schools, media, and governments play a crucial role in shaping attitudes, and when these systems fail to prioritize environmental education, it leads to a broader societal neglect of ecological well-being.

STOP TO CONSIDER

Over exploitation of resources, pollution and waste generation, consumerism and materialism, political and economic priorities and lack of environmental values are some of the important growing concern for decline of environmental values.

Check Your Progress

Q.3. what are the philosophical foundations of environmental values?

Q.4. write down the causes of declining environmental values?

3.10 Decline of Environmental Values and Its Impact on the Environment:

The decline of environmental values refers to the growing disregard for the importance of environmental conservation, sustainability, and responsible resource management. Over the years, human

activities, driven by rapid industrialization, economic growth, and consumerism, have increasingly distanced themselves from respecting and nurturing the natural world. As a result, this shift in values has contributed to significant environmental degradation, with far-reaching consequences for ecosystems, biodiversity, and the health of the planet. This essay will explore the decline of environmental values and discuss its profound impact on the environment.

➤ **Overexploitation of Natural Resources:**

One of the most notable impacts of the decline in environmental values is the overexploitation of natural resources. Human societies have long depended on natural resources like water, forests, minerals, and fossil fuels to support industrial and agricultural activities. However, the decline in environmental consciousness has led to unsustainable extraction and consumption of these resources.

For instance, deforestation driven by the desire to meet the demands for timber, agriculture, and urban expansion has led to massive loss of forests, which are essential for regulating carbon dioxide levels, providing habitat for wildlife, and maintaining the water cycle. Similarly, the overuse of fossil fuels has contributed to the depletion of non-renewable resources and has intensified environmental problems like air pollution and climate change.

The unrestrained consumption of natural resources, often motivated by immediate economic gain, disregards the long-term health of the environment. This overexploitation results in resource scarcity, soil erosion, desertification, and degradation of ecosystems, making it increasingly difficult to restore these resources for future generations.

➤ **Pollution and Environmental Degradation:**

The decline of environmental values has also contributed to rising pollution levels in air, water, and soil. Industries, agricultural practices, and urbanization often prioritize economic growth over environmental health, leading to the unchecked release of pollutants into the environment. For example, factories emit harmful chemicals into the air, leading to poor air quality and contributing to respiratory problems in humans and animals. Similarly, industrial waste and untreated sewage often end up in water bodies, contaminating drinking water sources, harming aquatic life, and affecting human health.

Plastic pollution is another consequence of disregarding environmental values. The mass production and irresponsible disposal of plastic have led to plastic waste accumulating in oceans, rivers, and landscapes, threatening marine life and disrupting ecosystems. Micro plastics, which enter food chains, have now become a pervasive problem for both wildlife and humans.

Inadequate waste management practices, the burning of fossil fuels and harmful agricultural chemicals all contribute to an environment that is increasingly polluted and toxic. This environmental degradation results in the loss of biodiversity, climate instability, and adverse health effects for all living organisms.

➤ **Loss of Biodiversity:**

Biodiversity, the variety of life on Earth, is a key indicator of ecosystem health. The decline of environmental values has contributed significantly to the loss of biodiversity, primarily through habitat destruction, pollution, climate change, and over-exploitation of species.

As human populations grow and expand, natural habitats like forests, wetlands, and grasslands are cleared for urban development, agriculture, and infrastructure projects. This deforestation and habitat fragmentation leave species without the resources they need to survive, leading to a loss of plant and animal species. According to the United Nations, human activity is driving the current rate of extinction, which is estimated to be 1,000 times the natural rate. This loss of biodiversity undermines the resilience of ecosystems, making them more vulnerable to diseases, climate change, and other environmental stresses.

Pollution also contributes to biodiversity loss, as toxins and contaminants poison ecosystems and disrupt food chains. Climate change, driven by the burning of fossil fuels and other human activities, is altering ecosystems worldwide, affecting migration patterns, reproductive cycles, and food availability for many species.

The decline of environmental values has thus led to a situation where species are disappearing at an alarming rate, affecting ecosystem services like pollination, water purification, and soil fertility, which are essential for human survival.

➤ **Climate Change and Global Warming:**

The decline of environmental values has exacerbated the issue of climate change. Human activities such as deforestation, industrial emissions, and the burning of fossil fuels have significantly increased the concentration of greenhouse gases in the atmosphere, leading to global warming. The disregard for environmental stewardship has delayed necessary action to mitigate climate change, resulting in more extreme weather events, rising sea levels, and disruptions to natural ecosystems.

Climate change is causing the polar ice caps to melt, threatening coastal communities and ecosystems. It is also causing more frequent and intense storms, droughts, wildfires, and heat waves, which devastate habitats, agriculture, and human infrastructure. The consequences of climate change are felt most acutely in vulnerable regions, where poor communities often lack the resources to adapt to these environmental changes.

As ecosystems struggle to cope with climate change, species are being forced to adapt or face extinction. Furthermore, the impacts of climate change, such as food and water shortages, affect human populations, creating conflicts over resources and exacerbating social inequalities.

➤ **Erosion of Sustainability Practices:**

Another consequence of the decline in environmental values is the erosion of sustainable practices in agriculture, industry, and urban development. In many regions, intensive farming methods, such as mono cropping and the excessive use of pesticides and fertilizers, have depleted soil health and harmed local ecosystems. These practices are often prioritized because they promise short-term gains, without considering the long-term impact on land fertility and ecosystem balance.

Similarly, urbanization has led to the expansion of cities into previously untouched natural areas, often without adequate consideration for sustainable land use. The construction of buildings, roads, and infrastructure increases impervious surfaces, which prevent the natural absorption of rainwater, contributing to flooding and the destruction of local ecosystems.

The decline of environmental values also leads to a lack of investment in renewable energy and sustainable technologies,

further perpetuating the reliance on fossil fuels. As a result, the transition to cleaner energy sources has been slow, contributing to the continued reliance on polluting industries and delaying necessary action to combat climate change.

3.11 Summing Up:

- Environmental values are feelings that bring about in us sensitivity for preserving the nature as a whole. Environmental values can be categorized into types. These are anthropocentric (human-centered) and eco-centric (earth-centered). Environmental values play a critical role in shaping how societies approach ecological challenges. The increasing degradation of the environment due to over exploitation, pollution, and deforestation calls for a rethinking of values related to nature.
- Environmental values have evolved over time, shaped by cultural, philosophical, economic, and scientific perspectives. As human activity increasingly affects the Earth's ecosystems, the necessity of fostering a deep respect for the environment is more urgent than ever. In this unit we have discussed the nature of environmental values, their importance, the philosophical frameworks that support them, and the role they play in shaping sustainable practices.
- Environmental values play a crucial role in shaping our relationship with the natural world and guiding actions toward sustainability. From anthropocentric to eco-centric perspectives, each type of environmental value brings a unique approach to addressing the ecological challenges we face. By understanding these values, societies can make informed decisions that promote the well-being of both

humans and the planet. Adopting a more eco-centric or bio-centric worldview, for instance, may foster greater respect for biodiversity and help combat the environmental degradation that threatens the future of life on Earth.

- Environmental values are essential to addressing the pressing ecological challenges of our time. They shape the way individuals, communities, businesses, and governments interact with the natural world. Whether through promoting sustainable resource use, advocating for biodiversity conservation, or mitigating climate change, environmental values serve as the moral compass guiding our actions toward a more sustainable future.
- As we face the growing threats of climate change, habitat destruction, and resource depletion, it is clear that a fundamental shift in values is needed. Moving beyond anthropocentric frameworks and embracing eco-centric perspectives can foster a deeper connection to nature and inspire more responsible stewardship of the planet. The preservation of our environment is not only a moral imperative but also a necessity for the survival and well-being of future generations. By integrating environmental values into all aspects of life, we can create a more sustainable, equitable, and harmonious world for all.
- The decline of environmental values has had a devastating impact on the environment, leading to overexploitation of natural resources, pollution, loss of biodiversity, and accelerated climate change. Human activities driven by short-term economic interests and a disregard for the long-term health of the planet have caused widespread environmental degradation. The result is an environment that

is increasingly polluted, depleted of resources, and destabilized by the impacts of climate change.

- The decline of environmental values is a pressing issue that undermines efforts to address the critical environmental challenges of our time. The overexploitation of natural resources, pollution, consumerism, political priorities, and a lack of environmental education all contribute to the erosion of respect and care for the environment. To reverse this decline, there must be a collective effort to reinstate environmental values into societal norms, policies, and daily practices. Promoting sustainability, raising awareness, and fostering a deeper connection to nature are essential steps toward ensuring that future generations inherit a healthy and thriving planet.
- To reverse this decline and mitigate the damage done, it is essential to reinstate environmental values in policy, education, and daily practices. Prioritizing sustainability, responsible resource management, and the preservation of biodiversity will not only improve the health of the planet but also ensure a more equitable and resilient future for generations to come. By shifting towards a more eco-centric worldview and embracing environmental stewardship, society can work towards healing the environment and ensuring its continued well-being.

3.12 Questions and Exercises:

Q.1. Explain the concept of environmental values. State its types.

Q.2. Discuss the need and importance of environmental values in the present day context.

Q.3. Write a brief note on philosophical foundations of environmental values.

Q.4. What are the causes of declining environmental values? How it impact on our environment?

Q.5. Write short notes on:

- (A) Overexploitation of Natural Resources
- (B) Pollution and Environmental Degradation
- (C) Loss of Biodiversity
- (D) Climate Change and Global Warming
- (E) Erosion of Sustainability Practices

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UNIT- 4

ENVIRONMENTAL EDUCATION FOR SUSTAINABLE DEVELOPMENT

Unit Structure

- 4.1 Introduction
- 4.2 Objectives
- 4.3 Concept of Sustainable Development
- 4.4 Basic Aspects of Sustainability
- 4.5 Need of Sustainable Development
- 4.6 Principles and Components of EESD
- 4.7 Environmental Education: The Tool for Sustainable Development
- 4.8 Summing Up
- 4.9 Questions and Exercises
- 4.10 References and Suggested Readings

4.1 Introduction:

The utilization of natural resources is growing at an alarming rate, causing great concern for their conservation. The degradation of the environment due to industrial and other wastes discharged into the atmosphere and hydrosphere has also caused great concern and there is a big question mark - what will happen next? All these environmental problems associated with development have raised several questions regarding the type and nature of development and this has given rise to the concept of 'Sustainable development'.

4.2 Objectives:

After going through this unit you will be able to-

- *understand* the concept of sustainable development;

- *analyze* various aspects of sustainability;
- *explain* the need of sustainable development;
- *discuss* various principles and components of EESD;
- *illustrate* environmental education as a tool for sustainable development.

4.3 Concept of Sustainable Development:

The term 'sustainable development' was used at the time of the Cocoyoc Declaration on environment and development in the early 1970s. Since then it has become the trademark of international organizations, dedicated to achieving environmentally beneficial development.

The concept of sustainability although, has a long historical background. In ancient Indian writings, 'nature' or environmental has been considered as the controller of all human activities, including economic development. They have given the status of God to all the components of environment such as air, water, land, natural vegetation, animals etc. In spite of the fact that there was no need for their conservation, the concept of their protection has been put forward in all the religions of India.

It was only after the industrial revolution, followed by transport-revolution and urbanization that degradation of the environment started which has given rise to the concept sustainable development is, of course, a response to warnings that the world menial catastrophe in the near future unless mankind radically modifies certain practices and perspectives which have created the present crisis. This crisis is characterized, among other things, by the poisoning of our rivers, seas and underground water sources; the thinning of the ozone layen; global warming; the rapid extinction of

species, massive deforestation and soil improvement; rapid population growth; and uncontrolled urbanization, with its attendant social problems.

Our common future, (World Commission on Environment and Development, 1987) defines - "sustainable development is the development that meets the need of the present without compromising the ability of future generations to meet their own needs". The various programmes of the UNO, specially the programmes of UNEP, have emphasized the need for sustainable development also referred to as 'eco-development'

Eco-development is a concept of sustainable development in which all developmental activities are performed on designed in such a way that regional ecological balance can be maintained. UNEP defined 'development at regional and local levels consistent with the potentials of the area involved, with attention given to the adequate and rational use of the natural resources, and to application of technological styles.

4.4 Basic Aspects of Sustainability:

The question of sustainable development has emerged due to overexploitation of resources as well as due to mismanagement of technology. The aspects which require monitoring of sustainability include climatic change, biodiversity, disposal of hazardous and toxic wastes, disposal of pollution generating industries and food and ecological security.

The deterioration in the ecological base in various countries in spatio-temporal terms due to irrational management of the resource and environmental system having damaging repercussions are reflective of unsustainable policy frame and planning strategies followed so far. Their observable sings can be listed as.

- extensive deforestation accounting for loss of flora, fauna and some rare species,
- drying up of drinking water resources and fall in the underground water levels,
- intensifying rate and frequency of flood and droughts,
- land degradation due to densification, wastelands, salinity and water logging
- deterioration in quality of air and water,
- pressure of population resulting in unemployment and mass migrations,
- unplanned urbanization and unprecedented growth of urban slums etc.

The environmental problems are multidimensional and varied in nature in developed and developing countries. There are global problems which have had their impact throughout the world. On the other hand, every country has its own development as well as environmental problems. Apart from this, regional and local problems need immediate attention. The problems created by technology transfer from developed countries to third world countries have become a cause for concern, because in the absence of proper management. It has become a cause of environmental degradation; such alarms are embodied in the sustainable activities which may include

- Intensive cultivation of land without taking adequate care of soil fertility.
- Development of irrigation facilities without proper water management, which leads to water logging, alkaline or saline soil.

- Improper use of pesticides, fungicides, herbicides, etc, cause soil damage and biological imbalance.
- excessive trapping of underground water accounts for sleep full in underground water level,
- replacement of high yielding hybrid varieties lead to spread of diseases capable of wiping out the entire crop,
- excessive use of non-degradable material like plastic creates problems of waste management,
- discharge of industrial and municipal waste in water bodies lead to problems like unmanageable water pollution, and
- Automobiles and industries have become a major cause of air pollution.

In fact development without proper management is a cause of eco-destruction, for which sustainable development is the only solution. In a report for a sustainable world following steps have been suggested.

- A production efficiency era of minimum environmental damage costs through energy transition.
- For a stable world population, a demographic transition.
- from non-renewable to renewable resource transition.
- By a global mutually agreed objectives between south and North-political transition.

While all these initiatives are necessary, the critical shift required, is perception of man. For 'industrial man' has grown accustomed to thinking that (a) the world's resources are infinite b) they exist primarily to be exploited for the benefit of mankind. These assumptions are leading us to disaster. What is required is that we replace this outmoded perspective with one that sees us all as crew

members of spaceship earth and fragile life support system spinning through space.

STOP TO CONSIDER

World Commission on Environment and Development, 1987 defines - "sustainable development is the development that meets the need of the present without compromising the ability of future generations to meet their own needs".

Self Asking Questions

Q.1. When the term 'sustainable development' was used?

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.....
.....

Q.2. What do you understand by the term Eco-development?

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4.5 Need of Sustainable Development:

Sustainable development is the need of the present time not only for the survival of mankind but also for its future protection. Unlike the other great revolutions in human history-the agricultural and Industrial Revolutions- the 'sustainable' revolution will have to take place rapidly, consciously and on many different levels and in many different spheres, simultaneously. On the technical level, for example, it will involve the sustainable technologies based upon the use of non-renewable, fossil fuels for technologies that take advantage of renewable energies like the sun, wind, and biomass,

the wide scale adoption of conservation and recycling practices, the transfer of cleaner and more energy efficient technologies to countries in the developing world.

On the political and economic levels, it will involve, among other things, the overhauling of development and trade practices which tend to destroy the environment, and the improvement of indigenous people, a fairer distribution of wealth and resources within and between nations, the charging of true cost for products which exploit or pollute the environment, and the encouragement of sustainable practices through fiscal and legal controls and incentives. On the Social level, it will involve a renewed trust towards universal primary education and health care, with particular emphasis upon the education and social liberation of women. On the environmental level, we are talking about massive afforestation projects; renewed research into and assistance for organic farming practices and biopest control, and the vigorous protection of biodiversity. On the information level, the need's for data that will allow the development of accurate social and environmental accountancy systems.

The aim of ecologically sustainable development is to maximize human well-being or quality of life without Jeopardizing the life support system. The measures for sustainable development may be different in developed and developing countries according to their level of technological and economic development. But developing countries, like India, can focus attention on the following measures.

- ensure clean and hygienic living and working conditions for the people.
- sensor research on environmental issues pertaining to the region.
- ensure safety against known and proven industrial hazards

- find economical methods for salvaging hazardous industrial wastes.
- encourage afforestation
- find out substitutes for proven hazardous materials based on local resources and needs instead of blindly depending on advanced nations to find solutions.
- ensuring environmental education as a part of school and college curriculum
- encourage use of non-conventional sources of energy, specially solar energy
- as far as a possible production of environmentally friendly products be encouraged.
- use of organic fertilizers and other biotechniques should be popularized.
- environmental management is a key for sustainable development, it should include monitoring and accountability
- need for socialization and also humanization of environmental issues.

The prime need for sustainable development is the conservation of natural resources. For conservation the development policy should follow the following norms.

- i. Make all attempts not to impair the natural regenerative capacity of renewable resources and simultaneously avoid excessive pollution hampering the biospherical capacity of waste assimilation and life support system.

- ii. All technological changes and planning strategy processes, as far as physically possible, must attempt switch from non-renewable to renewable resources uses.
- iii. Formulate a phase out policy of the use of non-renewable resources in general.

Thus, for a worldwide sustainable growth, there is a need for efficient and effective management available resources. In this field the production of 'environmental friendly products' (EFP) is a positive step. With the industrialization and technological development, markets are flooded with products of daily Consumption. They could however be a source of danger to health and damage to our environment. There is a need to distinguish the more environmentally harmful consumer products from those which are less harmful, or have more being impact on the environment than from the stage of manufacture through packaging, distribution, disposal and reusability or recycling.

Throughout the world, now emphasis has been given to the products of EFP. In India, plans are afoot to market environmental friendly products with combined effort of Bureau of Indian standards, Ministry of Environment and forests and central pollution control Board. Since 1990, a scheme a labeling ECOMARK has also been started. In its first phase, the items include in this scheme are soaps, plastics, paper, cosmetics, colours, lubricating oil, pesticides, drugs and various edible times. The scheme was first notified in the gazette on 20 February, 1991. The objectives of the scheme are:--

- i. To provide an incentive for manufactures and to reduce adverse environmental impact of products.
- ii. To reward genuine initiatives by compares to reduce adverse environmental impact of their products.

- iii. To assist consumers to become responsible in their daily lives by providing them information to take account of environmental factors in their purchase decisions.
- iv. To encourage citizens to purchase products which have less harmful environmental impact?
- v. To improve the quality of the environment and to encourage the sustainable management of resources.

Not only in consumer good production but in the field of energy production also environmental friendly techniques of power generation can be used. For example, in power production from coal PFBC (Pressurized Fluidized Bed Combined Cycle) techniques is useful in which coal is burnt efficiently and clearly in combined cycle plants.

Environmental education is important tool for achieving sustainable utilization resources. It can develop values and skills necessary for conservation and wise utilization of natural resources leading towards sustainable development. Environmental education can bring about awareness and develop concern for the long term effects of developmental activities upon the environment. Moreover it can foster love towards the nature that help people to understand the essential harmony between man and nature.

Education in environmental concerns can make people understand the problem of development as an international issue. The trans-boundary nature of environmental problems emerging mainly as consequence of global developmental activities of people makes it important to address the problem of development at international level. Environmentally informed and educated citizens can understand their role in this regard and raise these issues with their governments to make international environmental agreements in order to achieve sustainable development across the globe. Economic and other types of development of human beings have

always been dependent upon the resources of nature. But the supply of these resources is not unlimited and cannot sustain human on earth indefinitely. Therefore conservation of resources for future use and development is a must. The limited supply of natural resources can be utilized for sustainable development only if the 3R approach is adopted.

- **Reduce** excessive use of natural resources like fossil fuels, minerals, water etc.
- **Reuse** of natural resources instead of waste generation and pollution
- **Recycle** the materials to reduce pressure on our existing natural resources.

These are useful strategy that can immensely help the cause of conservation of natural resources and thereby lead the society towards sustainable development.

To cope with increase demand of the basic requirement of life and the limited supply of the natural resources, along with consideration of environmental degradation and ecological balance, need to emphasize on optimal management of land, water, minerals and other natural resources. There is also a need to use the traditional wisdom of those people who live close to nature, close to the earth and have accumulated a store of native wisdom, which can be used for eco-restoration along with development.

STOP TO CONSIDER

Environmental education is important tool for achieving sustainable utilization resources. It can develop values and skills necessary for conservation and wise utilization of natural resources leading towards sustainable development. Environmental education can

bring about awareness and develop concern for the long term effects of developmental activities upon the environment. Moreover it can foster love towards the nature that help people to understand the essential harmony between man and nature.

Check Your Progress

Q.1.What is 3R approach in sustainable development?

Q.2. Why is sustainable development need of the present times?

4.6 Principles and Components of EESD:

Environmental education for sustainable development (EESD) is an approach to education that aims to promote environmental awareness, knowledge, skills, values, and attitudes that contribute to sustainable development. The goal is to empower individuals to make informed decisions and take responsible actions toward environmental conservation, social equity, and economic well-being. Environmental education for sustainable development is an interdisciplinary and holistic approach that addresses the interconnectedness of environmental, social, and economic issues.

Here are key principles and components of EESD:

1. Interdisciplinary Approach: - EESD integrates knowledge and perspectives from various disciplines, including environmental science, social studies, economics, and ethics. It encourages a holistic understanding of the complex relationships between environmental, social, and economic systems.

2. Holistic Perspective: - EESD emphasizes the interconnectedness of environmental, social, and economic dimensions of sustainability.

It encourages learners to consider the broader context and recognize the interdependence of these systems.

3. Experiential Learning: - Experiential learning methods, such as field trips, outdoor activities, and hands-on projects, are integral to EESD. These methods provide direct experiences with nature and real-world problem-solving, enhancing understanding and engagement.

4. Systems Thinking: - EESD promotes systems thinking, encouraging learners to analyze complex environmental issues by considering the interactions and feedback loops within ecosystems and human societies.

5. Critical Thinking and Problem-Solving: - Learners are encouraged to develop critical thinking skills to analyze environmental challenges and generate innovative solutions. Problem-solving skills are essential for addressing sustainability issues at local and global levels.

6. Values and Ethics: - EESD incorporates ethical considerations and values related to environmental responsibility, social justice, and equity. It encourages learners to develop a sense of responsibility and empathy toward the environment and diverse communities.

7. Participatory and Inclusive: - EESD is participatory and inclusive, involving active participation from learners, educators, and communities. It recognizes the importance of diverse perspectives and promotes inclusivity in environmental decision-making.

8. Global Perspective: - EESD fosters a global perspective, helping learners understand the global dimensions of environmental issues and the interconnectedness of actions across borders. It promotes a sense of global citizenship and responsibility.

9. Cultural Relevance: EESD acknowledges the cultural diversity of learners and communities. It integrates local knowledge and cultural perspectives into the learning process, making environmental education relevant to the cultural context.

10. Lifelong Learning: EESD aims to foster a lifelong commitment to sustainable practices. It equips learners with the knowledge and skills needed to continuously engage in environmental stewardship and contribute to sustainable development throughout their lives.

11. Policy and Advocacy: EESD encourages learners to understand environmental policies and advocate for sustainable practices. It empowers individuals to engage with policymakers, contribute to policy discussions, and promote positive environmental change.

12. Collaborative Partnerships: - EESD involves collaboration among educational institutions, government agencies, nongovernmental organizations (NGOs), and communities. Collaborative partnerships enhance the effectiveness and impact of environmental education initiatives. Environmental education for sustainable development is crucial for building a more environmentally literate and socially responsible society. By equipping individuals with the knowledge and skills to address sustainability challenges, EESD contributes to the development of a more sustainable and resilient world.

STOP TO CONSIDER

Environmental education for sustainable development (EESD) is an approach to education that aims to promote environmental awareness, knowledge, skills, values, and attitudes that contribute to sustainable development. The goal is to empower individuals to make informed decisions and take responsible actions toward environmental conservation, social equity, and economic well-

being. Environmental education for sustainable development is an interdisciplinary and holistic approach that addresses the interconnectedness of environmental, social, and economic issues.

Self Asking Question

Q.3. what are the key principles of 'sustainable development'?

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4.7 Environmental Education: The Tool for Sustainable Development:

Environmental education serves society in a variety of ways. The goal of environmental education is to make people wiser, more knowledgeable, better informed, ethical, responsible, critical and capable of continuing to learn, and become more productive and creative in the workplace. It is widely agreed that environmental education is the most effective means that society possesses for confronting the challenges of the present and for shaping the world of tomorrow. Access to environmental education is the sine qua non for effective participation in the life of the modern world at all levels.

Environmental education also serves society by providing a critical reflection on the world, especially its failings and injustices, and by promoting greater consciousness and awareness, exploring new visions and concepts, and inventing new techniques and tools. Environmental education is also the means for disseminating knowledge and developing skills, for bringing about desired changes in behaviour, values and lifestyles, and for promoting public support for the continuing and fundamental changes that will be required if

humanity is to alter its course, leaving the familiar path that is leading towards growing difficulties and possible catastrophe, and starting the uphill climb towards sustainable development. Environmental education, in short, is humanity's best hope and most effective means in the quest to achieve sustainable development.

Environmental education must not be equated with schooling or formal environmental education alone. It includes non-formal and informal modes of instruction and learning as well, including traditional learning acquired in the home and community. By defining environmental education broadly, one also widens the community of teachers to include teachers, lecturers, curriculum developers, administrators, support staff, trainers, forest conservation staff, environmental health and planning officers, staff with non-governmental organizations (NGOs), non-formal environmental education teachers, youth leaders, parent association members, media people, and representatives of learners in all contexts.

This community of teachers can be widened to include all those, whatever their role in society, who perceives a need or duty to inform and educate people regarding the requirements of a sustainable future. This would include international organizations, government departments and institutions, organizations and many others who are deeply involved in environmental education in the broad sense of the term used here. Many firms in the private sector also see the need to play their part in promoting awareness and are doing so in innovative ways for example, through sponsoring the publication of articles in newspapers and journals exploring environmental and social issues.

This vast community of teachers represents an enormously potent, but largely untapped human resource for sustainable development that can be invaluable in a range of contexts as well as

environmental education. It represents, above all, a means for bringing the struggle for sustainable development into communities and local institutions around the world. Such an inclusive process would help in furthering the cause of sustainable development.

4.8 Summing Up:

Now, let us sum up the unit. As we learnt that environmental education is an important tool for achieving sustainable utilization resources. It can also develop values and skills which are necessary for conservation and wise utilization of natural resources leading towards sustainable development. Environmental education can bring about awareness and develop concern for the long term effects of developmental activities upon the environment. Moreover it can foster love towards the nature that help people to understand the essential harmony between man and nature. Education in environmental concerns can make people understand the problem of development as an international issue. The trans-boundary nature of environmental problems emerging mainly as consequence of global developmental activities of people makes it important to address the problem of development at international level. Environmentally informed and educated citizens can understand their role in this regard and raise these issues with their governments to make international environmental agreements in order to achieve sustainable development across the globe. Economic and other types of development of human beings have always been dependent upon the resources of nature. But the supply of these resources is not unlimited and cannot sustain human on earth indefinitely. Therefore conservation of resources for future use and development is a must. The limited supply of natural resources can be utilized for sustainable development only if the 3R approach is adopted. These approaches are:--

- i. Reduce excessive use of natural resources like fossil fuels, minerals, water etc.
- ii. Reuse of natural resources instead of waste generation and pollution and
- iii. Recycle the materials to reduce pressure on our existing natural resources. These are useful strategy that can immensely help the cause of conservation of natural resources and thereby lead the society towards sustainable development.

To cope with increase demand of the basic requirement of life and the limited supply of the natural resources, along with consideration of environmental degradation and ecological balance, need to emphasize on optimal management of land, water, minerals and other natural resources. There is also a need to use the traditional wisdom of those people who live close to nature, close to the earth and have accumulated a store of native wisdom, which can be used for eco-restoration along with development.

4.9 Questions and Exercises:

1. Explain the concept of sustainable development? Discuss various aspects of sustainability.
2. What is the need of sustainable development in the present day context? Discuss.
3. State the principles and components of EESD.
4. Illustrate with examples “Environmental education as a tool for sustainable development”.

4.10 References and Suggested Readings:

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