

UNIT-1: OUR ENVIRONMENT

05 Hours

1.1 Concept, Importance, Components-living (biotic) and non-living (abiotic), Principles.

Environmental Education is the new area of study of the discipline of education with recent development and advances. Environment Education is virtually a new source of concerns for educators, teachers and students.

Environmental education enables learners to develop a structure of knowledge about the world and seek knowledge that they can use and develop throughout their lives. Environmental education empowers learners by enabling them to participate in a sustainable future. Thus the foundation for a lifelong learning is laid by environmental education.

Meaning of Environmental Education

Environment is derived from the French word “Environner”, which means encircle or surrounding. Environment is a complex of many variables, which surrounds man as well as the living organisms. Environmental education describe the interrelationships among organisms, the environment and all the factors, which influence life on earth, including atmospheric conditions, food chains, the water cycle, etc. It is a basic science about our earth and its daily activities, and therefore, this science is important for everyone.

The area of Environment Education has been thoroughly discussed at several National and International Seminars, Workshops and Conferences after the deliberations at Fourx in 1971 and in United Nations Conference on Human Environment at Stockholm in 1972. The outcome Nations Environment Programme (UNEP). There was an International Workshop on Environmental Education – ‘The Belgrade Charter’ at Belgrade (Yugoslavia) in 1975 organized by UNESCO and later an International Conference on Environmental Education (UNESCO, UNEP) at Tbilisi, USSR in 1977. Belgrade workshop formulated the guiding principles to achieve the objectives of Stockholm conference,

“Environmental Education is the process of recognizing values of clarifying concept in order to develop skills and attitude necessary to understand and appreciate the Inter-relatedness among man, his culture and his bio-Physical surroundings. It also

entails picture in decision making and self formulation of code of behavior about problems and issues concerning “Environmental Quality”

“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 lifelong integral education”.

Environmental Education appears to be process that equips human beings with awareness, Knowledge, skills, attitudes and commitments to improve environment. Environmental Education refers to the awareness of Physical and Cultural environment and perceives its relevance for real life situations. The problems and issues are to be identified. The imbalances of environment are to be improved in view of sustainable development.

The terms Environmental Education and Environmental Awareness are used interchangeably for the some meaning but there is a significant difference in these two terms. The study of Physical and Bio-Sciences, Geography and agriculture provides the environmental awareness does not help in developing skills and attitudes for improving environment. Therefore, it is essential to understand the concept of environmental awareness and differentiate it with Environmental Education. Environmental awareness may be defined as to help the social groups and individuals to gain a variety of experience in and acquire a basic understanding of environmental and its associated problems.

Scope of Environmental Education

Environmental education discipline has multiple and multilevel scopes. This study is important and necessary not only for children but also for everyone. The scopes are summarized as follows:

1. The study creates awareness among the people to know about various renewable and non-renewable resources of the region. The endowment or potential, patterns of utilization and the balance of various resources available for future use in the state of a country are analysed in the study.
2. It provides the knowledge about ecological systems and cause and effect relationships.
3. It provides necessary information about biodiversity richness and the potential dangers to the species of plants, animals and microorganisms in the environment.

4. The study enables one to understand the causes and consequences due to natural and induced disasters (flood, earthquake, landslide, cyclones etc.,) and pollutions and measures to minimize the effects.
5. It enables one to evaluate alternative responses to environmental issues before deciding an alternative course of action.
6. The study enables environmentally literate citizens (by knowing the environmental acts, rights, rules, legislations, etc.) to make appropriate judgments and decisions for the protection and improvement of the earth.
7. The study exposes the problems of over population, health, hygiene, etc. and the role of arts, science and technology in eliminating/ minimizing the evils from the society.
8. The study tries to identify and develop appropriate and indigenous eco-friendly skills and technologies to various environmental issues.
9. It teaches the citizens the need for sustainable utilization of resources as these resources are inherited from our ancestors to the younger generation without deteriorating their quality.
10. The study enables theoretical knowledge into practice and the multiple uses of environment.

Importance of Environmental Education

There is a need to study environmental education, because we are born and brought up in an environment, we are out of the living in an environment; and we breathe out our last that too in an environment. Thus, from conception to cremation, we live in one or the other environment, and luxuries. We should, therefore understanding our environment and know how to use it for our individuals well being and for the welfare of the society and the future generations. Thus, environmental education is more functional than the disciplines we have studying so far.

A second aspect of environmental education is education for environment. Environment from last two centuries has undergone a drastic change. So, many environmental problems have evolved like

Environmental study is based upon a comprehensive view of various environmental systems. It aims to make the citizens competent to do scientific work and to find out practical solutions to current environmental problems. The citizens acquire the ability to analyze the environmental parameters like the aquatic, terrestrial and atmospheric systems and their interactions with the biosphere and antrophere.

Importance of environmental Education as follows

1. World population is increasing at an alarming rate especially in developing countries.
2. The natural resources endowment in the earth is limited.
3. The methods and techniques of exploiting natural resources are advanced.
4. The resources are over-exploited and there is no foresight of leaving the resources to the future generations.
5. The unplanned exploitation of natural resources lead to pollution of all types and at all levels.
6. The pollution and degraded environment seriously affect the health of all living things on earth, including man.
7. The people should take a combined responsibility for the deteriorating environment and begin to take appropriate actions to save the earth.
8. Education and training are needed to save the biodiversity and species extinction.
9. The urban area, coupled with industries, is major sources of pollution.
10. The number and area extinct under protected area should be increased so that the wild life is protected at least in these sites.
11. The study enables the people to understand the complexities of the environment and need for the people to adapt appropriate activities and pursue sustainable development, which are harmonious with the environment.
12. The study motivates students to get involved in community action, and to participate in various environment and management projects.
13. It is a high time to reorient educational systems and curricula towards these needs.
14. Environmental education takes a multidisciplinary approach to the study of human interactions with the natural environment.
15. Environmental study is a key instrument for bringing about the changes in the knowledge, values, behaviors and lifestyles required to achieve sustainability and stability within and among countries.

Environmental education deals with every issue that affects an organism. It is essentially a multidisciplinary approach that brings about an appreciation of our natural world and human impacts on its integrity. It is an applied science as it seeks practical answers to making human civilization sustainable on the earth's finite resources.

“If You Plan For One Year, Plant Rice,
If You Plan For Ten Years, Plant Trees,

But If You Plan For One Hundred Years,
Educate The People”.

Components of Environment-living (biotic) and non-living (abiotic)

There are two main components of an ecosystem which are in constant communication with each other. They are the biotic components and the abiotic components.

Biotic Components of Ecosystem

The living components of an ecosystem are called the biotic components. Some of these factors include plants, animals, as well as fungi and bacteria. These biotic components can be further classified, based on the energy requirement source. Producers, consumers, and decomposers are the three broad categories of biotic components.

- **Producers** are the plants in the ecosystem, which can generate their own energy requirement through photosynthesis, in the presence of sunlight and chlorophyll. All other living beings are dependent on plants for their energy requirement of food as well as oxygen.
- **Consumers** include herbivores, carnivores, and omnivores. The herbivores are the living organisms that feed on plants. Carnivores eat other living organisms. Omnivores are animals that can eat both plant and animal tissue.
- **Decomposers** are the fungi and bacteria, which are the saprophytes. They feed on the decaying organic matter and convert this matter into nitrogen and carbon dioxide. The saprophytes play a vital role in recycling the nutrients so that the producers i.e. plants can use them once again.

Abiotic Components of Ecosystem

Abiotic components are the physical and/or the chemical factors that act on the living organisms at any part of their life. These are also called as the ecological factors. The physical and chemical factors are characteristic of the environment. Light, air, soil, and nutrients, etc. form the abiotic components of an ecosystem.

The abiotic factors vary from ecosystem to ecosystem. In an aquatic ecosystem, the abiotic factors may include water pH, sunlight, turbidity, water depth, salinity, available nutrients and dissolved oxygen. Similarly, abiotic factors in terrestrial ecosystems can include soil, soil types, temperature, rain, altitude, wind, nutrients, sunlight etc. Here, the sun is the energy source. Producers/plants use this energy to synthesize food in the presence of carbon dioxide and chlorophyll. The energy from the sun, through several chemical reactions, turns into chemical energy.

Principles of Environment

“Environment” is the surroundings or conditions in which a person, animal, or plant lives or operates. Environment is the sum total of all surroundings of a living organism, including natural forces and other living things, which provide conditions for development and growth. The mobility of the environment governs some principles as follows

1. ***Principle of Dependence and Mutual Influence.*** Every component depends on others. This mutual relationship is known as interaction Eg: Amount of rainfall and growth of trees in an area
2. ***Principle of Balance.*** Due to the interaction among the components, the environment remains more or less stable. The ability of nature to stabilize itself is known as the ecological balance. This balance regulated through food chains and food webs Eg: The excess CO₂ in the atmosphere converted into carbon is by shell bearing organisms of the sea.
3. ***Principle of Unity (Oneness).*** All organisms are made up of same structural and functional units- the ‘cells’ Because of same chemical build up, substance produced by one organism are usually digested and assimilated by others. Substances prepared artificially by man such as plastics, glass etc.. cannot be accepted or recycled by other organisms
4. ***Principle of Diversity.*** Composed of different elements. The inclusion of different types of people.(as people of different cultures) Organisms differ in terms of their morphological, anatomical and physiological characteristics. This diversity gives stability to the environment. Eg: removal of one type of trees may not adversely affect ecological balance

5. **Principle of Active Tendency (Resistive Nature).** Organisms can develop resistance against man made substances, which is termed as active tendency or resistive tendency of organisms Eg: mosquitoes becoming resistant to DDT and other insecticides
6. **Principle of Continuous Production.** We can obtain various useful products from animals and plants. Population of these organisms continually change nature has its own checks and balances to keep most population within rather narrow limits. An understanding of this helps in judicious management of natural resources.
7. **Principle of Adaptation.** Adaptation also called an adaptive trait. It is a trait with a current functional role in the life history of an organism that is maintained and evolved by means of natural selection.
8. **Principle of Energy Flow.** Also called the calorific flow. It refers to the flow of energy through a food chain. In an ecosystem, ecologists seek to quantify the relative importance of different component species and feeding relationships
Primary producers =>Secondary Consumers =>Tertiary Consumers =>Decomposers.
9. **Principle of Growth.** Refers to a positive change in size, often over a period of time. Growth can occur as a stage of maturation or a process toward fullness or fulfillment. It can also perpetuate endlessly.
10. **Principle of Behaviour.** Behavior is the range of actions and mannerisms made by organisms, systems, or artificial entities in conjunction with themselves or their environment

Hence nature knows best that all forms of life are important. Everything is connected to everything else and even everything changes, everything goes somewhere, because ours is a finite earth. Nature is beautiful and we are stewards of God's creation. As a matter of fact we need to understand these principles in our daily life conserve wonderful nature.

1.2 Our earth-a miracle planet.

- Home to 7.2 Billion people planet Earth is a 5 billion year old ball of Iron, Oxygen, Silicon, Magnesium, and other trace elements, hurtling through space at 67,000 mph. Earth is a rather incredible place to be, here's some of the most extreme facts about the planet you live on.
- Earth used to be purple. From space, land on the Earth's surface appears mostly green. But millions of years ago it would have been purple. Today plants use a green pigment called chlorophyll to harness the sun's rays which gives them a green appearance. But research shows that chlorophyll hasn't been around forever, in fact during the days of early life on Earth plants used to use a more primitive molecule to harness the sun's rays. It was called Retinal, and it gave off a violet hue instead of a green one. Meaning all photosynthesizing plants on Earth were, at one point bright purple.
- But the dominant color on Earth's surface definitely isn't green. When the first astronauts that went into space looked back at our planet, they called it the "Blue Planet". That's not surprising when you consider that Earth's surface is 71% water.
- With all that water you would think we would know more about what's down there, but 95% of Earth's underwater world still remains unexplored. That's a remarkable testament to how astonishingly vast the oceans actually are.
- Only 3% of water on Earth is fresh water. The remaining 97% is salted water. And what's more, of the 3% of fresh water, 2% of it is frozen in ice sheets and glaciers. Meaning that less than 1% of water on Earth is fresh water found in lakes, rivers and underground.
- The Earth's core is as hot as the Sun. The Earth is like an Onion, it is made up of three separate layers, the core, the mantle and the crust. The core is made up of mostly molten iron, bubbling away at an incredibly toasty 6,100 degrees celsius, making it as hot as the surface of the Sun. Despite this intense heat, the very centre of the Earth's core remains solid iron, because of the immense amount of pressure put upon the core from the weight of the rest of the Earth.
- There is single mountain range that stretches around the entire globe. Known as the mid-ocean ridge system. It's an impressive range of underwater volcanoes that spans the entirety of Earth's oceans. It was created from volcanic

1.3 Ecosystems-meaning, types, characteristics, ecological balance (Interdependence and interrelationships)

The ecosystem is the structural and functional unit of ecology where the living organisms interact with each other and the surrounding environment. In other words, an ecosystem is a chain of interaction between organisms and their environment. The term “Ecosystem” was first coined by A.G.Tansely, an English botanist, in the year 1953.

An ecosystem consists of an assembly of mutually interacting organisms and their environment in which materials are interchanged in a largely cyclical manner. An ecosystem has physical, chemical, and biological components along with energy sources and pathways of energy and materials interchange. The environment in which a particular organism lives is called its habitat. The role of an organism in a habitat is called its niche.

Types of Ecosystem

An ecosystem can be as small as an oasis in a desert, or as big as an ocean, spanning thousands of miles. There are two types of ecosystem:

- Terrestrial Ecosystem
- Aquatic Ecosystem

Terrestrial Ecosystems

Terrestrial ecosystems are exclusively land-based ecosystems. There are different types of terrestrial ecosystems distributed around various geological zones. They are as follows:

1. Forest Ecosystems
2. Grassland Ecosystems
3. Tundra Ecosystems
4. Desert Ecosystem

Forest Ecosystem

A forest ecosystem consists of several plants, animals and microorganisms that live in coordination with the abiotic factors of the environment. Forests help in maintaining the temperature of the earth and are the major carbon sink.

Grassland Ecosystem

In a grassland ecosystem, the vegetation is dominated by grasses and herbs. Temperate grasslands, savanna grasslands are some of the examples of grassland ecosystems.

Tundra Ecosystem

Tundra ecosystems are devoid of trees and are found in cold climate or where rainfall is scarce. These are covered with snow for most of the year. The ecosystem in the Arctic or mountain tops is tundra type.

Desert Ecosystem

Deserts are the regions with very little rainfall. The days are hot and the nights are cold in deserts.

Aquatic Ecosystem

Aquatic ecosystems are ecosystems present in a body of water. These can be further divided into two types, namely:

1. Freshwater Ecosystem
2. Marine Ecosystem

Freshwater Ecosystem

The freshwater ecosystem is an aquatic ecosystem that includes lakes, ponds, rivers, streams, and wetlands. These have no salt content in contrast with the marine ecosystem.

Marine Ecosystem

The marine ecosystem includes seas and oceans. These have a larger salt content and greater biodiversity in comparison to the freshwater ecosystem.

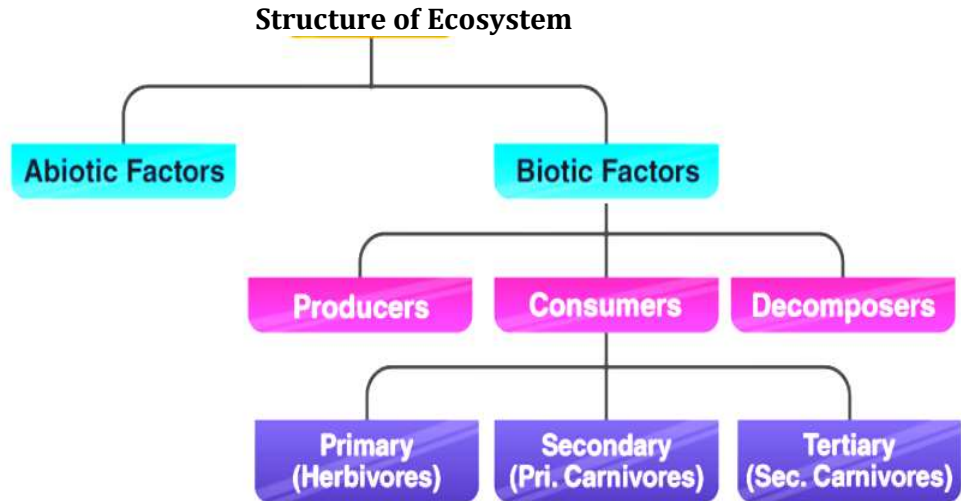
Structure of the Ecosystem

The structure of an ecosystem is characterised by the organisation of both biotic and abiotic components. This includes the distribution of energy in our environment. It also includes the climatic conditions prevailing in that particular environment.

The structure of an ecosystem can be split into two main components, namely:

- Biotic Components
- Abiotic Components

The biotic and abiotic components are interrelated in an ecosystem. It is an open system where the energy and components can flow throughout the boundaries.



Biotic Components

Biotic components refer to all life in an ecosystem. Based on nutrition, biotic components can be categorised into autotrophs, heterotrophs and saprotrophs (or decomposers).

- **Producers** include all autotrophs such as plants. They are called autotrophs as they can produce food through the process of photosynthesis. Consequently, all other organisms higher up on the food chain rely on producers for food.
- **Consumers or heterotrophs** are organisms that depend on other organisms for food. Consumers are further classified into primary consumers, secondary consumers and tertiary consumers.
 - **Primary consumers** are always herbivores that they rely on producers for food.
 - **Secondary consumers** depend on primary consumers for energy. They can either be a carnivore or an omnivore.
 - **Tertiary consumers** are organisms that depend on secondary consumers for food. Tertiary consumers can also be an omnivore.
 - **Quaternary consumers** are present in some food chains. These organisms prey on tertiary consumers for energy. Furthermore, they are usually at the top of a food chain as they have no natural predators.

Decomposers include saprophytes such as fungi and bacteria. They directly thrive on the dead and decaying organic matter. Decomposers are essential for the ecosystem as they help in recycling nutrients to be reused by plants.

Abiotic Components

Abiotic components are the non-living component of an ecosystem. It includes air, water, soil, minerals, sunlight, temperature, nutrients, wind, altitude, turbidity etc.

Functions of Ecosystem

The functions of the ecosystem are as follows:

1. It regulates the essential ecological processes, supports life systems and renders the stability.
2. It is also responsible for the cycling of nutrients between biotic and abiotic components.
3. It maintains a balance among the various trophic levels in the ecosystem.
4. It cycles the minerals through the biosphere.
5. The abiotic components help in the synthesis of organic components that involves the exchange of energy.

Important Characteristics of an Ecosystem

1. It is normally an open system with a continuous, but variable influx and loss of materials and energy.
2. An ecosystem is an overall integration of the whole mosaic of interacting organisms and their environment.
3. It is a basic, functional unit with no limits of boundaries.
It consists of biotic and abiotic components interacting with each other.
5. Its functional unit is capable of energy transformation, circulation and accumulation.
6. An ecosystem is the smallest unit of biosphere.
7. Different types of ecosystem are present in different areas.

Ecological balance and its importance

Ecological balance is a term used to describe the equilibrium between living organisms such as human being, plants, and animals as well as their environment. Photosynthesis that takes place in ecosystem contributes to building a good environment that stabilizes the coexistence of all organisms. Harmonious relationships reflect healthy and desirable ecological balance. Human being plays a key role to maintain ecological balance because they have the highest thinking capacity as compared to other living organisms. Sufficient food availability to all living organisms and their stability reflect the existence of ecological balance. Therefore, this balance is very important because it ensures survival, existence and stability of the environment.

Survival of all organisms is actualized due to ecological balance. Various species survive because favorable ecosystems were created. Favorable ecosystem ensures that each organism thrive and multiply as expected. They get enough food to keep them alive. Ecological balance is also important because it leads to the continuous existence of the organisms. It ensures that no particular species is exploited or overused. For example, human activities such as farming and resources exploitation are checked to prevent excessive destruction of the forests. Deforestation leads to drought. Drought reduces food production resulting to insufficient food. Insufficient food leads to starvation and later death occurs, hence reducing the existence of some species.

In addition, ecological balance ensures the stability of the organisms and environment. It creates a conducive environment for organisms multiplication and thriving. It enhances a stable environment that is free from ecological imbalances such as flood, hunger caused by drought, windstorm that may wipe out everything and over hunting of the predators. This calls for collective efforts to ensure a stable environment is created. Human activities influence the environmental stability. Tree planting and reduced deforestation rate prevent undesirable climate change. Control of excessive wild animals' inhabitant maintains desired population growth. Therefore, a human can contribute positively to create and maintain ecological balance.

In summary, the ecological balance brings the existence of the world. Earth's inhabitants such as human beings, plants, animals and other micro living organisms continue to survive. These species get the conducive environment to multiply and thrive. The world gets to produce sufficient food for all species. Hunger caused by drought becomes history. This is because the drought will never be experienced at any

point. Also, green environment is maintained. This means that the world achieves its equilibrium state that benefits and protects all living organisms in it.

Interdependence and interrelationships among the organisms

All species rely on other species in some way in order to survive. They may rely on other species for food, shelter or to help them reproduce. Like the bee is helping the flower to spread its pollen. Species are not independent, they are interdependent.

Biological interactions are the interactions between different organisms in an environment. In the natural world, no organism is cut off from its surroundings. Organisms are a part of their environment which is rich in living and non-living elements that interact with each other in some way. The interactions of an organism with its environment are vital to its survival, and the functioning of the ecosystem as a whole.

These relationships can be categorized into many different classes. The interactions between two species do not necessarily need to be through direct contact. Due to the connected nature of ecosystems, species may affect each other through such relationships involving shared resources or common enemies.

The term **symbiosis** comes from a Greek word that means “**living together.**” Symbiosis can be used to describe various types of close relationships between organisms of different species, such as **mutualism** and **commensalism**, which are relationships in which neither organism is harmed. Sometimes the term symbiosis is used only for cases where both organisms benefit; sometimes it is used more generally to describe all kinds of close relationships, even when one organism is killed by another. Symbiosis can also be used to describe relationships where one organism lives on or in another, called **parasitism**, or when one organism kills and eats another organism, called **predation**.

There are many different types of symbiotic interactions between organisms. Like *Escherichia coli* bacteria live inside our intestines in a mutualistic relationship: the bacteria produce Vitamin K for us, and they get their food from what we eat. Clownfish that live among the tentacles of sea anemones protect the anemone from anemone-eating fish, and in turn the stinging tentacles of the anemone protect the clownfish from its predators (special mucus on the clownfish protects it from the stinging tentacles).

Similar to the *E. coli*, this bee has a mutualistic relationship with the flower, the bee feeds from the flower, and the flower gets pollinated by the bee.

Competition is as an interaction between organisms or species, for the same resources such as water, food, or hunting grounds in an environment. Eventually, the species that is less able to compete for resources will either adapt or die out. According to evolutionary theory, competition for resources plays an important role in natural selection.

Animals that eat decomposing organic material also have an important interaction with the environment. They help to decompose dead matter and assist with the recycling of nutrients. By burying and eating dung, dung beetles improve the nutrient cycling and soil structure. They make the dead organic matter available to bacteria that break it down even further.

Organisms are not independent, they are **interdependent**. They cannot live alone; they need other organisms to survive. The same is true for species. All species need other species to survive.

1.4 Natural resource-renewable and non-renewable resources (distribution and consumption)

Nature has been very kind to Man. Ever since his appearance on the earth's surface, he has been dependent on nature for his subsistence, through everything that comes from nature has some utility for man, but its utilization is possible only when an appropriate technology is available in the initial stages of the history of economic development, man identified plants and animals around him as natural gifts and used them. With time he learned to cultivate land, run the wind and water mills by using wind and water energy, developed technologies to utilize coal and mineral oil and so on, and turned the natural materials into resources giving rise to an industrial society.

The consumption of resources in the industrial society has increased exponentially during the last fifty years. Since, 1960 as much fossil fuel, metals and fertilizers have been used as during all times before. Today the consumer life style of rich countries that accounts for only 24% of the global population consumes at least 80% of the most important resources. An urbanization process is clear in the industrial countries, with about 70% of the population in urban areas composed with 35% in developing countries. The concept of sustainability applied to urban areas is a paradox as

cities are consuming and destructive in an ecological sense. The urban/industrial society has created a consumer culture which lacks a necessary respect for other cultures of today and tomorrow. It is feared that future generations may have to bear the costs for the unsustainable use of natural resources by present generations. E.g. depleted and contaminated water resources, destroyed forests, decreased biodiversity, climate change etc. A way out of this dilemma is the development of a fundamentally new life style which suits the pre-requisites of sustainability.

While working with the term “Sustainability” in connection with life style, there are three ingredients as follows,

- i) Rates of use of renewable resources do not exceed regeneration rates.
- ii) Rates of use of non-renewable resources do not exceed rates of development of renewable substitutes; and
- iii) Rates of pollution emission do not exceed assimilative capacities of the environment.

The renewable natural resources can be considered as assets or stocks that could provide a flow of resources (or services). The management of these resources should be based on the concepts of maximum sustainable yield (MSY). According to this concept /Principle, biological resource should not be exploited above it, otherwise its reproduction rate without management, otherwise its exploitation, exceeding a certain level, can lead to ultimate loss of productivity if a renewable natural resource is left alone, its surplus production will not extend infinitely but the growth will slowly decline the stock or asset will reach its carrying capacity, where surplus production will reduce to zero. It is, therefore suggested that under certain circumstances a renewable resource can be exploited at a sustainable rate.

Non-renewable natural resources, unlike natural renewable resources are finite in quantity and quality. The obvious question then arises about how to use these resources over time, should they be extracted now or left until later. There are various kinds of uncertainties involved in the use of depletable resources e.g., uncertainty about the quantity of existing reserves, future demand and backstop technologies. Uncertainty about substitutes will generally shift the depletion towards the present as the owner would like to reap the benefits sooner than economically optimal under certainty; whereas uncertainty about the available stock may shift depletion towards the future due to the possibility of running out unexpectedly. The concept of a stock of a depletable

resource is rather elastic. New discoveries are possible and there is always controversy as to whether the detected or expected stock is fully recoverable or not.

The increasing global concerns of man's mismanagement of natural resources has led to the united nations conference on Environment and development in Rio-de-Jainerio in 1992 established a new UN body, the commission on sustainable development (CSD), which meets annually to review and promote the follow up of the main action plan from Norway, the CSD meeting in January 1994 focused on sustainable consumption by arranging a symposium in Oslo. With reference to a Dutch study, the summary of the symposium identifies the following four goals to attain a society based on sustainable consumption:

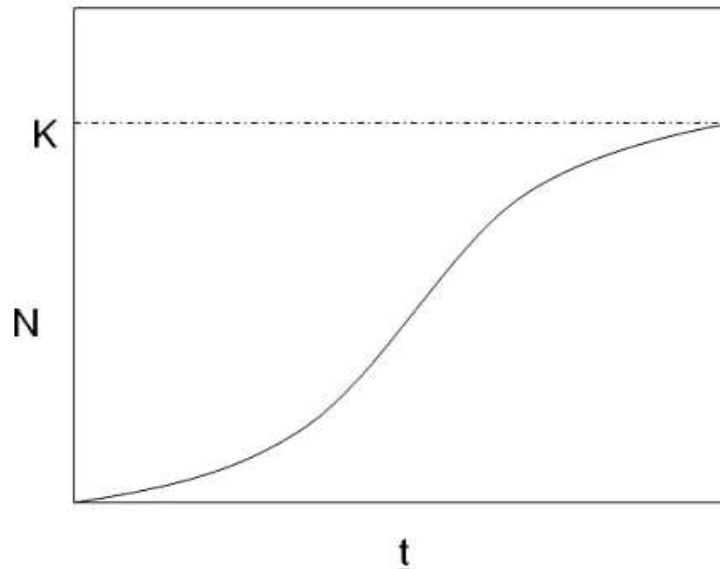
- Close process cycles (aiming at achieving complete reuse, recycle and repair.
- Halving fossil fuel use (by maximizing the use of energy conservation measures, shrinking energy intensive sectors and introducing energy taxes).
- Improving the quality of materials (using a cradle-to-grave approach to get products which are more durable, repairable and recyclable and avoiding the use of source and hazardous material).
- Reducing transportation (providing goods and services as close as possible to the consumers in accordance with the proximity principle).

1.5 Carrying capacity of environment.

Definition:

Carrying capacity is the number of organisms that an ecosystem can sustainably support. An ecosystem's carrying capacity for a particular species may be influenced by many factors, such as the ability to regenerate the food, water, atmosphere, or other necessities that populations need to survive.

The concept of carrying capacity relates the number of organisms which can survive to the resources within an ecosystem. Ecosystems cannot exceed their carrying capacity for a long period of time. In situations where the population density of a given species exceeds the ecosystem's carrying capacity, the species will deplete its source of food, water, or other necessities. Soon, the population will begin dying off. A population can only grow until it reaches the carrying capacity of the environment. At that point, resources will not be sufficient to allow it to continue to grow over the long-term.



The graph above shows the population (N) of a certain species over time (t). At the carrying capacity (K), the population stops growing as resources are maxed out.

The maximum population size that an ecosystem can support under particular environmental conditions is known as the carrying capacity. In natural ecosystem with unlimited resources and ideal environment, species can multiply at a maximum rate. However, in actual practice, the population of a species remains in check due to interaction of the inhabiting species as also finite nature of resources. It is an established fact that while food grain production can under optimum conditions increase arithmetically (1, 2, 3, 4...), population increases geometrically ($2^2, 3^2, 4^2\dots$).

Rate of population growth, $dN/dt = r N$

Where N = population size and r = specific growth rate. With doubling of population, resources do not double and hence set in a critical situation. If the population size far exceeds the carrying capacity by a wide margin, it leads to population crash or explosion when environmental conditions get degraded lower the carrying capacity. The earth weighs about 5.97×10^{24} kg. If the present population growth continues for the next 5000 years, then the weight of human population itself will match the earth's weight. In other words, another earth will have to be accommodated within this earth, which is totally absurd. This implies man will run out of space and resources. Thus the present population growth will get more and more unfavorable for human survival as it will destroy the carrying capacity in the long run. The concept of carrying capacity, as stated above, implies that only a limited number of people can be supported by the resource base of a country. The population growth must

be linked to the resource base in order to have sustainable development. The developed countries follow the policy of Population Stabilization i.e. keep the population growth level below 0.5 per cent and thereby hold the key to economic development and resource management. This is the success story of all developed countries. For India, population explosion is a time bomb, which must be diffused sooner the better. It is the major crisis facing the country.

UNIT-2: POLLUTION AND ENVIRONMENTAL EDUCATION

08 Hours

2.1 Meaning and definition of Environmental hazards and pollution.

Meaning and definition of Environmental hazards

Environmental hazards may be stated as those extreme events caused by natural process or man's activities which exceed the tolerable magnitude within or beyond certain time limits, make adjustment difficult, result in losses of property and lives.

The events are caused by natural processes or human activities are called extreme events which aggravate natural environmental processes to cause disaster for human society such as earth quake, floods, volcanic eruptions, etc.

The terms environmental hazards, environmental stresses and environmental disasters are used for extreme events which are caused by natural process or human activities.

The environment hazards are the abnormal processes which cause environmental disasters or the results or environmental hazards or extreme events, The intensive of environmental disasters are assessed in terms of damages done to the human society. The environmental quality is lowered and deteriorated by these extreme events which are termed hazards and disasters.

The environmental or ecological balance is disturbed; the resultant state of the highly disturbed natural environment is called 'Environmental Stress'. The natural sudden physical processes and events become hazards and disasters when humans live near a danger.

Meaning and definition of Environmental and pollution

Environmental pollution and degradation are used interchangeably by most of the people because both are, concerned with the lowering of the 'quality of environment.' There are two aspects-(i) lowering the quality of environment and (ii) deterioration of the quality of environment. The deterioration of environmental quality refer the magnitude or intensity of the area covered.

Environmental pollution means lowering of the quality of environment local caused by human activities for exploitation of resources. Environmental degradation means deteriorating the environmental quality at global, regional and local levels by both natural processes and human activities.

Definition of Pollution

The adverse changes by human activities in the environmental quality at local level is generally called pollution, but sometimes the effects of human activities are so wide that the environment is degraded at global and regional level as well.

Pollution is an undesirable change in the physical, chemical and biological characteristics of air, water and soil that may harmfully affect the life or create a potential health hazard of any living organization. Pollution is thus direct or indirect change in any component of the biosphere that is harmful to living organisms and man, affecting adversely the industrial progress, cultural and natural resources or general environment.

2.1.1 Types of environmental hazards and disaster.

The extreme events are divided into two categories on the basis of causative factors:

- (1) Natural hazards and disasters and
- (2) Man-induced hazards and disasters.

The brief description and sub-types of natural and man induced hazards and disasters have been given in the following paragraphs:

1. Natural Hazards and Disasters. It involves rare high-intensity processes and extreme events caused by Terrestrial or Endogenous hazards and atmospheric or exogenous hazards. Thus, natural hazards and disasters are of two types:

- (a) Terrestrial or endogenous hazards and disasters.
- (b) Atmospheric or exogenous hazards and disasters.

(a) Terrestrial or Endogenous Hazards and Disasters. Normally, include those extreme events which are caused by endogenetic forces evolve from within the earth. The causative factors of such extreme events and hazards are hidden deep within earths which are not observable, only their effects are observed and experienced. These can be further classified into three categories-

- (i) Volcanic eruptions, (ii) Earthquakes and (iii) Landslides.

These extreme events are caused by endogenetic thermal conditions of the interior of the earth. It is the result of disequilibrium in any part of the earth crust. In India earthquakes are along the Himalayas and foothill zones and Bihar. The three types of hazards and events are interrelated to each other. These extreme events are also causative factors to one another. The land slides are in hilly regions due to earthquakes.

These hazards and disasters have resulted in great damages to human constructions-buildings, roads, rails, factories, dams, heavy loss to human property. On the other hand there is great disaster for human lives and other organisms. The quality of environment is deteriorated and great damage to human structures, towns and cities, dams and human settlement as a whole.

These extreme events cannot be prevented or checked, because these are beyond human control and management.

(b) Atmospheric or Exogenetic hazards and Disasters. These are normally related to weather and climatic extreme conditions. These nature hazards are caused by atmospheric processes or forces which generate from within the atmosphere so these are known as “exogenetic natural hazards”. The causative factors are not observable, but are recorded by meteorologists to forecast about the weather conditions.

2.1.2-Types of pollution, land, air, water, noise and radiation – green house effect, ozone layer depletion.

There are various types of pollution which have been classified in different ways and on different criterion on the basis of the type of environment being polluted, may be classified in the following categories. Pollution is generally caused by human activities which can be divided into two broad categories:

1. Physical Pollution. It is caused by human activities due to lowering of the quality of physical components of the environment and this is further divided into three sub-types

- (a) Air Pollution.
- (b) Water Pollution.
- (c) Land Pollution.

2. Social Pollution. It is caused in different aspects of the society due to cumulative effects of extreme events/hazards and pollution. It may be further subdivided into several categories:

- (a) Population Explosion.
- (b) Sociological Pollution-Educational and social backwardness, etc..
- (c) Economic Pollution-Poverty, devolution of currency, lower per-capita income.

Another way to classify the pollution is the nature of pollutants. The pollutants are broadly classified into two categories.

1. Non-Degradable Pollutants. These are the materials and poisonous substances like aluminium, Mercuric salts, long-chain phenolics, etc., which do not degrade or degrade very slowly in nature. They are not cycled in ecosystem naturally.

2. Biodegradable Pollutants. These are the domestic wastes that can be rapidly decomposed under natural conditions. They may create problems which they accumulate.

Basis for cost of pollution.

The following are the main basis for evaluating cost of pollution :

- (i) Damages to crop production.
- (ii) Loss of resources by unnecessary wasteful exploitation.
- (iii) Medical care of health due to disease.
- (iv) Soiling of buildings and textiles.
- (v) Corrosion of metals as iron, steel, copper, brass, zinc, lead, etc.
- (vi) Pollution control involving money, funds, manpower etc., for disposal of pollutants and for control devices developed.

Land Pollution or Soil Pollution

Soil is very important environmental component for human, animals and plants. It is the basic medium for food, vegetation and natural resources. It is also the base for the development of human culture and civilization. There are various aspects and components of soils-texture, structure, moisture, profiles and horizons.

"The contamination of soil with excess of chemicals, fertilizers, insecticides, herbicides is known as soil pollution." The decrease in the quality of soils either due to human activities or natural sources or by both is known as soil pollution or soil degradation. The soil pollution is caused due to soil erosion, decrease in plant nutrients, decrease in soil micro-organisms, excess or deficit of moisture content, high fluctuation of temperature and lack of human content.

The Sources of Soil Pollution

The minor sources of soil pollution are accelerated rate of soil erosion, soil eruption, deforestation, excessive use of chemical fertilizers, pesticides, insecticides, polluted waste water from industries, urban areas, forest fires, a few micro-organisms,

dumpling of urban and industrial wastes, water-logging and related capillary process treating processes drought, etc.

The air and water pollutants are also responsible for the soil degradation.

The sources are divided into five categories.

- 1. Physical sources**, e.g. soils erosion, volcanic eruption.
- 2. Biological sources**, e.g. the micro-organisms, bacteria and protozoa.
- 3. Air-born sources**, e.g., thermal power plants, industry and factory waste products.
- 4. Urban and industrial sources.** Urban wastes degrade the soil properties, urban sewage pollute the soil.

The Effects of Soil Pollution

The soil pollution affects the human beings, animals, and plants adversely and degrades the quality of soils, soil pollution results in decrease in agricultural production. Soil erosion converts the fertile soil into waste land. The use of chemical fertilizers, pesticide and herbicides cause various diseases and several deaths.

Control of Soil Pollution

It is very essential to control and prevent soil pollution, because the existence of man, animals and vegetation depend upon the quality of soil' It is necessary to maintain and also increase the quality of soils' The essential commodities required for man, animals and plants come from soils' The following are 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 DDT.
- (iv) To dispose properly urban and industrial wastes.
- (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'

AIR POLLUTION

The air pollution is generally accomplished through the pollutants of gases and solid and liquid particles of both organic and inorganic chemical. It is true that air is never pure because some gases such Sulphur dioxide, carbon monoxide, hydrogen sulphide emissions from volcanoes, swamps, dusts, salt spray, pollens from plants, etc. are continuously added to the air by these natural processes. Thus, the air becomes

polluted when its natural composition is disturbed either by natural or man-made sources or activities or by-both.

The contamination of air with dust, smoke and harmful gases is called air pollution.

The atmosphere is a gaseous envelope which surrounds the earth from all sides and the air is a composition of several gases mainly nitrogen, oxygen, argon and carbon dioxide. Air is very important for all types of life in the biosphere. Even human life is not possible without air because man can survive for a few days without water and for a few weeks without food, but cannot live even for a few minutes without air or oxygen.

Sources of Air Pollution

There are two major sources of air pollution as follows:

1. Natural Sources. Such as volcanic eruptions, deflation of sand and dust, forest, or wild fires of natural vegetation, etc.
2. Manmade Sources or Human Activities. Such as industries, factories, urban centers, aircraft, nuclear experiments, automobiles, agriculture, power plants, etc.

From the different sources of air pollution, a variety of pollutants are released into atmosphere. The principle air pollutants emitted from these different sources are as follows:

- (i) Carbon Compounds. These are mainly carbon dioxide and carbon monoxide, the former released by complete combustion of fossil fuels and the latter by automobile exhausts.
- (ii) Sulphur Compounds. These include SO_2 , H_2S and sulphuric acid mostly released by fossil fuel (coal, etc.) based power generating plants (Thermal plants) and industrial units as refineries.
- (iii) Nitrogen oxides. These include chiefly nitrogen monoxide, nitrogen oxide, Nitric acid mostly released by automobiles' power plants and industries.
- (iv) Ozone. (O_3).Its level may rise in atmosphere due to human activities.
- (v) Fluorochloro carbon. These come from industries, insecticides spray, etc'
- (vi) Hydrocarbons. These are chiefly benzene' benzene' etc which is mostly discharged by automobiles and industries.
- (vii)Metals. These include chiefly lead, Nickel, arsenic, beryllium, vanadium, titanium, cadmium, etc. Present in air as solid particles or liquid droplets or gases. They are produced mostly by metallurgical processes, automobiles etc.

Types of Air Pollution

Air pollution is classified on two bases as follows:

- (1) On the basis of types of pollutants and**
- (2) On the basis of types of sources of pollutants**

(1) On the basis of types of pollutants are further divided into two categories (a) Gaseous pollution and (b) Particulate air pollution.

2. On the basis of sources of air pollution is sub-divided into six categories-

- (a) Automobile Pollution, (b) Industrial Pollution, (c) Thermal pollution,
- (e) Rural Pollution and (e) Nuclear Pollution.

Generally, these pollution approaches are used to describe the air pollution. There is overlapping among the various ways used for this purpose

1. Automobiles Air Pollution. During this period of technological development, there is very rapid increase of cars, trucks, buses and two wheelers. It has raised the traffic density in our cities and towns. The vehicles create tones of gaseous pollutants into the air daily.

2. Industrial Air Pollution. India is the agricultural country but there is rapid development in the agricultural technology and engineering. The economic development is based on both agricultural and industrial development of a nation. There is also rapid industrial development in our country. There are industrial towns and complexes in our big cities. There are number of industries which are sources of air pollution. Kanpur city of Uttar Pradesh is the biggest industrial city of the state which has the heaviest air pollution due to dust and smoke of the factories.

3. Thermal Pollution. There are a number of thermal power stations and super thermal power stations in the country. The National Thermal Power Corporation (NTPC) is setting up four mammoth coal-powered power stations to augment to energy generation. The coal consumption of thermal power plants is millions of tons. The main pollutants are fly ash, sulphur dioxide and other gasses and hydrocarbons.

The different sources of air pollution release a variety of pollutants into the atmosphere as follows (1) carbon compounds, (2) Sulphur oxides and compounds, (3) Nitrogen Oxides, (4) ozone gas, (5) Fluorocarbons, (6) Hydrocarbons (7) Metals. (8) Photochemical products, (9) particulate matter and (10) Toxicants other than heavy metals.

Types of Air pollutants

1. Carbon compounds. The carbon monoxide is significant gaseous air pollution which is harmful to human health. It is mainly released from gasoline engines and burning coal and power thermal plants of factories. It combines with hemoglobin in human blood and affects nervous system. An increase of carbon compound in atmosphere may result in Green house Effect, and damaging effect quality of the environment.

2. Sulphur compounds. One of the common gaseous air pollutants which is known to be harmful to human heart is sulphur dioxide. It is originated primarily from the combustion of coal and petroleum. It irritates the respiratory epithelium and impairs normal breathing. Sulphur dioxide also causes an increase in cough, eyes irritation and headache in human beings. The increase in sulphur compounds in atmosphere is also harmful to the plants and animals.

3. Nitrogen Oxides. Even in unpolluted atmosphere, these are present in measurable amounts of nitrous oxide, nitric oxide and nitrogen dioxide. Of these nitric oxide (NO) is the pivot compound. It is produced by the combustion of O_2 and N_2 during lightning discharges and by bacterial oxidation of NH_3 in soil.

The main nitrogen compounds are Nitrous oxide, Nitric oxide, Nitrogen oxide. The nitrogen oxides are most important gaseous air pollutants which arise due to burning of fossil fuels in automobiles and power plants. The most common type of nitrogenous air pollutant is nitrogen oxide. It reduces ultra-violet light in the atmosphere.

4. Dust Pollution. Dust is found to travel several thousands of kilometers across deserts and seas. Air-borne particles of the Sahara desert sand cross the Arabian Sea and reaches India. Thar Desert sand gradually reaching to the other states of the country. The dust air pollution is harmful to human health and it may lead to disease like allergic asthma bronchitis and fibrosis of the lungs. The dust air pollution can be controlled by certain evergreen plants, grasses and epiphytes like orchids. Certain plants are better dust collectors.

5. Benzene. A liquid pollutant is emitted from gasoline, It cause lung cancer. Benzpyrene is most potent cancer inducing hydrocarbon pollutant. It is also present in small amounts in smoke, tobacco, charcoal boiled stakes and gasoline exhaust. Methane (marsh gas) is a gaseous pollutant, in minute quantity in air about 0.00027% by volume. In nature this is produced during decay of garbage, aquatic vegetation, etc" This is also

released due to burning of natural gas and from factories. Higher concentrations may cause explosions. In air the common metals present are mercury lead zinc and cadmium. They are released from industries and human activities in the atmosphere.

6. Mercury. A liquid volatile metal (found in rocks and soils) is present in air as a result of human activities as the use of mercury compounds in production of fungicides, paints, cosmetics, paper pulp etc.

7. Zinc. It is not a natural component of air, copper, lead and steel refineries also release some zinc in air. Zinc in air occurs as white zinc oxide fumes and is toxic to man.

8. Cadmium. It occurs in air due to industries and human activities. Cadmium - containing materials and those in refining, of copper, lead and zinc are the major sources of cadmium in to air.

9. Toxicants. There is a wide variety of toxic substances besides air pollutants which have the harmful effect on human health. Nickel is used in chemicals. Petroleum and metal products, electrical goods.

WATER POLLUTION

Water is most important natural resource. It is vital for the maintenance of all forms of lives and vegetation. 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.

"The contamination of water with soluble sewage and industrial waste is 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." -World Health Organization (1966)

"Water pollution may be defined as alteration in physical, chemical and, Biological properties of water may cause harmful effects on human and aquatic life".

Source of Water Pollution

There are two main sources of water pollution as follows:

1. Natural Sources of water pollutants include soil erosion, volcanic

Eruption, landslides, coastal and cliff erosion, floods, decomposition of plants and animals.

2. Man-induced Sources of water pollutants include industrial development, urbanization, and agricultural sources, cultural sources (religious fair and pilgrimage) Kumbha fair at Allahabad is an example of cultural source of water pollution.

The main sources of water pollution are:

- (i) Sewage and other waste in cities.
- (ii) Industrial effluents and waste products.
- (iii) Agricultural discharge, chemical fertilizers used.
- (iv) Thermal power plants and nuclear plants waste.

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.

Water pollution is also classified on the basis of sources of water pollution as follows.

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

Each type of water pollution affects the physical and biological components of various aquatic systems in different degrees and its ultimate effect on man remains quite drastic in medical, aesthetic and economical sense. The well known ecological effects of water pollution area as follows:

1. Sewage Pollution. The primary source of sewage pollution is the discharge of untreated sewage in water bodies, sometimes due to improper sewage-handling processes of municipal bodies. This is very common in major cities of the country. Sewage is the waterborne waste derived from home (domestic waste) and animal or food processing plants. It includes human excreta, paper, cloth, soap, detergents, etc. These are a major proportion of the pollutants entering our water. There is uncontrolled dumping of wastes of rural areas towns and cities into ponds, lakes, stream or rivers.

The following methods are to be used to check the water pollution through sewage waste.

(i) The waste water must be treated before its discharge into lake or river. This would limit its nutrient input.

(ii) To stimulate bacterial multiplication in order to reduce the amount of nutrients solubilised in water. This would help disruption of algal food-web.

(iii) To check recycle of nutrients into the water through harvest and removal of algal bloom upon their death and decomposition.

(iv) To remove dissolved nutrients from water by physical or chemical methods. For instance, phosphorous can be removed by precipitation. Nitrogen by biological nitrification and denitrification or by air stripping.

2. Industrial Effluents. A wide variety of both, inorganic and, organic pollutants are present in effluent from breweries, tanneries, dyeing textiles, paper and pulp mills, steel industries, mining operations, etc. The pollutants include oils, greases, plastics, plasticizers, metallic wastes, suspended solids, phenols, toxins, acids, salts, dyes, cyanides, DDT etc". Many of which are not readily susceptible to degradation and thus cause serious pollution problems. Sulphuric acid waste from coal mines is a serious pollutant that increases the hardness of water, has disastrous effect on live organisms and corrodes concrete.

3. Thermal Pollution. The two chief pollutants are heat and radioactive substance. These are the wastes chiefly from power plants-Thermal and Nuclear, which use large quantities of water. Some other industries also give out waste water after use. Nuclear power plants are the source of radionuclides. The quantity of waste water is highest in the thermal power plants in the country. This waste water is returned after use at very high temperatures to the streams-a river, lake. This affects the aquatic life in these water bodies. This is also called thermal pollution.

4. Agricultural Discharges. It is another kind of water pollution. These include chiefly the chemicals used as fertilizers and the pesticides (biocides) used in disease control. Their discharges reach into the water bodies. As compared to developed nations, India has relatively a low use of these chemicals, thus discharges into water are still low. India

uses about 16 kg/h. of fertilizers. Modern agriculture rely heavily on a wide range of synthetic chemicals which include various types of fertilizers and biocides. They are dangerous, harmful and disturb the natural ecosystem. These chemicals affect the quality of the food stuffs. The chemical make water unfit for drinking and also cause diseases.

Pesticides are the chemicals used for killing the plant and animal pests. There is a wide scope of chemicals used as biocides, but these are most harmful to man by entering into our food chain. Pesticides create various types of diseases related to kidney, blood, urine and brain tissues.

Prevention and control of water pollution

Control of water pollution requires several remedial measures. The following measures are suggested to control water pollution:

1. Maintaining stability of the ecosystem
2. Reutilization and recycling of waste
3. Removal of pollutants
4. Management of water pollution.

1. Maintaining Stability of the Ecosystem. It is most scientific method to control and prevent water-pollution. The basic principles are the reduction in waste input, thus water pollution is controlled at source. Several methods like biological as well as physical can be used to restore species diversity and to maintain ecological balance in the water bodies.

2. Reutilization and Recycling of Waste. The various types of waste include industrial effluents and thermal pollutants which may be reutilized. The urban waste is reused to generate, cheaper fuel gas and electricity. The efforts are being made in the development of suitable technology for waste water. so that it can be utilized in agriculture and prepare some useful products.

3. Removal of Water Pollutants. There are various types of pollutants present in water bodies which can be removed by suitable methods, e.g. absorption, electro dialysis, ions exchange, reverse osmosis, etc. This process is used for purifying water from sewage.

Soil or Land Pollution

Soil is very important environmental component for human, animals and plants. It is the basic medium for food, vegetation and natural resources. It is also the base for the development of human culture and civilization. There are various aspects and components of soils-texture, structure, moisture, profiles and horizons.

"The contamination of soil with excess of chemicals, fertilizers, insecticides, herbicides is known as soil pollution."

The decrease in the quality of soils either due to human activities or natural sources or by both is known as soil pollution or soil degradation. The soil pollution is caused due to soil erosion, decrease in plant nutrients, and decrease in soil micro-organisms, excess or deficit of moisture content, high fluctuation of temperature and lack of human content.

The Sources of Soil pollution

The major sources of soil pollution are accelerated rate of soil erosion, soil eruption, deforestation, and excessive use of chemical fertilizers, pesticides, insecticides, polluted waste water from industries, urban areas, forest fires, a few micro-organisms, and dumping of urban and industrial wastes, water-logging and related capillary process treating processes drought, etc.

The air and water pollutants are also responsible for the soil degradation. The sources are divided into five categories.

1. Physical sources, e.g. soils erosion, volcanic eruption.
2. Biological sources, e.g. the micro-organisms, bacteria and protozoa.
3. Air-born sources. e.g. Thermal power plants, industry and factory waste products.
4. Urban and industrial sources. Urban wastes degrade the soil properties, urban sewage pollute the soil.

The Effects of soil pollution

The soil pollution affects the human beings, animals, and plants adversely and degrades the quality of soils; soil pollution results in decrease in agricultural production. Soil erosion converts the fertile soil into waste land. The use of chemical fertilizers, pesticide and herbicides cause various diseases and several deaths.

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also increase the quality of soils. The essential commodities required for man, animals and plants come from soils" The following are 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 wastes.
- (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.

NOISE POLLUTION

If may be defined as the state of discomfort and restlessness caused to man by unwanted high intensity sound known as noise. The nose pollution is both from natural sources and human activities.

1. Natural Sources. Cloud thunder, high intensity rainfall, storm and hail storm and heavy rainfall.

2. Human Activities Sources. Urban areas are automobiles, factories, industries, trains. aero planes, loud speakers, radio. Television, band baja, religious functions, pressure cookers, cooler, election convincing, family celebrations, etc. such activities are very frequent in urban areas. The production of unbearable high pitched sound is called noise pollution.

Effects of Noise Pollution

There are two basic properties of sound-loudness and frequency. Loudness is the strength of sensation of sound by the individual. The effects of noise pollution are of two types-Auditory effects and Non-auditory effects.

1. Auditory Effects include auditory fatigue and deafness. Deafness is caused by continuous noise exposure. There is risk of deafness in the biggest cities like Mumbai, Delhi, Kolkata and Chennai, etc.

2. Non-Auditory Effects are the interference with speech communication, irritation/annoyance and loss of working efficiency and physiological disorders, etc. We are a noisy people and every sentiment, be religious, social, family activity, is manifested in a noise way. Loudspeakers and amplifiers are used without regard to inconvenience or annoyance it may cause to a neighbor. "Dussehrara" festival as it is approaching and

many neighborhoods will suffer ten days of restless and disturbed nights. The "Ramlilas" are staged with loudspeakers at the highest pitch and the show goes on late into the night. In temples there may be heard bells and recordings of devotional songs over the loudspeakers. One wonders if God listens only through loudspeakers. This is at the cost of health and peace of many. There is lot of noise nuisance during a marriage. The processions stop from place to place for dancing and drinking and what not.

The noise pollution has psychological effects, it causes many behavioral changes among human as well as animals. Disco music produces temporary deafness in the listeners.

Control of Noise Pollution

Noise is measured in the unit of decibel (dB) which is a tenth of the largest unit, the Bel. One decibel is equal to the finest sound that can be heard by the human ear. The following are the methods to control and reduce noise pollution

1. At Source Control. The gadgets are to be developed to control noise at source.
2. Transmission Control. The room walls can be covered with absorbers.
3. To Protect Exposed Persons or workers. The devices as ear plugs and ear muffs can be provided to workers of industries.
4. Plantation or Vegetation. Trees should be planned along highways, streets and other noisy place, the big trees are good for this purpose.
5. Through Acts or Law. The noise pollution has now been included under Air Pollution Control Act.
6. The Education. By educating students and public about noise nuisance through news media.

RADIO ACTIVE POLLUTION

Radioactive substances are most toxic, as compared to organic poisons which have the harmful and injurious effects. Nuclear war materials, test explosions, great rush for power plants and radio isotope use in medicines, industry and research are the main sources of radioactive pollution that could threaten or degrade the quality of environment. There are two sources of radioactive pollution:

- 1. Natural Processes in Rocks and Soil Sources.** Such as radium, uranium, thorium, potassium, carbon, etc.

2. Human Activities. Sources from atomic bomb, nuclear reactors are other radiation sources-radio isotopes such as iodine, strontium, plutonium, cobalt, cesium, etc. A few radioisotopes are concerned with environmental pollution such as argon, cobalt, cesium, iodine, krypton, strontium, plutonium.

With biotic communities and ecosystem, these radioactive elements may become accumulated or dispersed, depending upon the biological activity of the Element and period of radio-activity of the isotope. These are absorbed by plant, ingested by animals which are deposited in bone tissues close to blood forming tissue and it can then be passed on to humans through milk and non-vegetarian food.

The isotopes are accumulated in human tissues as well as those of plant and animals. The isotopes in human tissues cause serious health hazards to man. Man's radiation exposure from artificial source is already sufficient to produce serious disease problems such as bone tumors, genetic damage and infant mortality.

Prevention and control of Radioactive Pollution

There is race in the world over to develop atomic power, so experiments are being conducted by nations either in deserts or in sea or oceans. Such experiments Pollute atmosphere at regional and global level. The World Health Organization" and, "United Nations Organization" can play a significant role to check such experiments. The atomic energy may be used in industry and domestic purposes. The education of medical science must include such environmental studies, so that proper medical aids may be provided to the suffers. Researches are to be designed for preparing effective medicine to cure such patents. Radioactive Protection Rules have been formulated in 1962.It is known as the Atomic Energy Act, 1962.

GREEN HOUSE EFFECT

Green House means a building made mainly of glass, with heat and humidity regulated for growing plants. The atmosphere acts like a glass in green house. In a green house, visible light passes through the glass and heats up the soil warming the plants. The warm soil emits radiation in longer wave-length opaque to longer wave length of infra-red radiation; it partly reflects and partly absorbs infra-red radiations. This mechanism keeps the green house warmer than the outer atmosphere.

Thus a green house is that body which allows the short wave length incoming solar radiations to come in, but does not allow the long wave outgoing terrestrial infra-red radiation to escape.

In a similar way, the earth's atmosphere battles up the energy of the sun, and is said to act like a green house, where CO₂ acts like glass windows. CO₂ and water vapors in the atmosphere transmit short wavelength solar radiations but reflect the longer wavelength heat radiation from warmed surface of the earth. CO₂ molecules are transparent to sunlight but not to the heat radiation. So they trap and re-enforce the solar heat stimulating an effect which is known as green house effect. The Green House effect may therefore be defined as the progressive warming up of the earth's surface due to blanketing effect of manmade CO₂ in the atmosphere.

The gasses such as CO₂, CH₄, N₂O, O₃ etc and Chloro fluoro carbons (CFCS) present in the atmosphere are also capable of absorbing long wave radiation and radiate energy back to the earth. When these gases and CFCS increase in the atmosphere as a result of air pollution or human activities. More energy is radiated back and consequently temperature of the earth increases. This phenomenon is known as green house effect or global warming.

The four major green house gases, which cause adverse effects are CO₂- contributes about 50% to global warming. CFCS - believed to be responsible for 24% of the human contribution of green house gases and generally trap 1500-7000 items as much heat per molecule as CO₂ while they are in the troposphere.

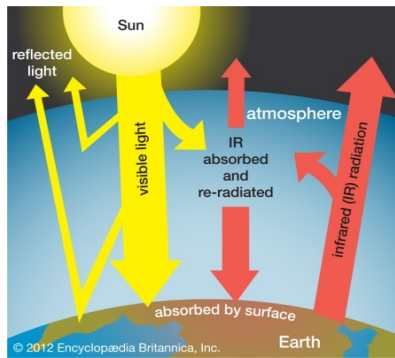
CH₄ - 18% of the human input of GHG's and it traps 25 items as much heat per molecule as CO₂, N₂O - 6% of the Human input of GHG's and it traps 230 items as much heat per molecule as CO₂. The USA is the largest emitter of all GHG's (18.4%) of global emissions, followed by soviet union - 13.5%, China - 9.1%, Japan - 4.7%, India - 4.1%, Brazil - 3.9% and Germany - 3.4% .

POSSIBLE EFFECTS: - The green house effect at its natural level is very essential for life to exist on this planet. It is due to the natural occurrence of green house effect (i.e presence of Water vapor and Co2) that there is a higher atmosphere equilibrium temperature, otherwise the earth's mean surface temperature would have been 18^oc instead of the present 17^oc.

However, its increase (i.e enhanced green house effect) as is actually taking place is feared to cause global climatic changes of irreversible and highly destructive type.

The concentrations of CO_2 and other green house gases in the atmosphere are rising alarming and making it clear that we are going to experience a general warming up of the atmosphere. Infact some warming up from 0.3°C – 7°C has already taken during the last one century.

Greenhouse effect, a warming of Earth's surface and troposphere (the lowest layer of the atmosphere) caused by the presence of water vapour, carbon dioxide, methane, and certain other gases in the air. Of those gases, known as greenhouse gases, water vapour has the largest effect.



The greenhouse effect on Earth. Some incoming sunlight is reflected by Earth's atmosphere and surface, but most is absorbed by the surface, which is warmed. Infrared (IR) radiation is then emitted from the surface. Some IR radiation escapes to space, but some is absorbed by the atmosphere's greenhouse gases (especially water vapour, carbon dioxide, and methane) and reradiated in all directions, some to space and some back toward the surface, where it further warms the surface and the lower atmosphere. The greenhouse effect is caused by the atmospheric accumulation of gases such as carbon dioxide and methane, which contain some of the heat emitted from Earth's surface.

1. TEMPERATURE INCREASE: - The earth's surface temperature is predicted to increase by about 2°C by the year 2100, by emission continue to increase at current rate.

2. RISE IN SEA LEVEL: - Water expands slightly when heated. This explains why global sea levels would rise if the oceans warmed, just as the fluid in a thermometer rises when heated.

Since 1900 the world's average sea level has raised 10-20 cms (4-8 inches) and appears to be rising about 2.5 cms (inch) per decade. About 1/3 of the World's population and more than a 3rd of the world's economic infrastructure are

concentrated in coastal regions. Current models indicate than an increase in the average atmospheric temperature of 3⁰ c would raise the average global sea level by 0.2 – 1.5 meters over the next 50-100 years.

One meter rise would flood low lying areas of major cities such as Shanghai, Cairo, Bangkok, Sydney, Mumbai etc as well as agriculture lowlands and deltas on Egypt, Bangladesh, India and China where much of the World's rice is grown.

3. FOOD PRODUCTION: - Water is a limiting factor in the growth of many crops, especially in drier areas. Two climate models project that, with warming from a doubling of CO₂ over 1988 levels, droughts would occur every other year across much of the world thus having the potential to lower crop yields.

4. HUMAN HEALTH: - A warmer world affects human health by disrupting suppliers of food and fresh water, displacing millions of people. Sea level rise could spread infections disease by flooding sewage and sanitation systems. The dislocation and possible extinction of certain biological species and ecosystems cannot be ruled out.

Other effects include more evaporation and transpiration in tropic, alternation in existing precipitation patterns, effect on hydrological cycle etc.

PREVENTION: -

- Shift over the next 30 years to perpetual and renewable energy resources that don't emit CO₂.
- Ban all production and uses of CFCs and other Ozone depleting chemicals.
- Use energy more efficiently.
- Transfer energy efficiency, renewable energy, pollution prevention and waste reduction technologies to LDCs.
- Increase the use of nuclear power to produce electricity. This is an option only if safer and cheaper reaction can be developed and if the problem of how to store nuclear waste safely for thousands of years can be solved.

2.2 Factors of degradation of environment. Socio economic and cultural impact of degradation of environment.

Environmental degradation is the deterioration of the environment through depletion of resources such as air, water and soil; the destruction of ecosystems; habitat destruction; the extinction of wildlife; and pollution. It is defined as any change or disturbance to the environment perceived to be deleterious or undesirable.

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 comes in 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.

Socio cultural environment consists of all those things that are developed by man. It comprises complicated societal and individual actions originating from culture. In other words all aspects of culture are part of the man made environment. Today poorly planned socio-cultural activities in different bio physical environments can have detrimental and irreversible consequences on the environment and many variables affecting the carrying capacity of the biosphere. Addition of unwanted substances means pollutants adversely affecting our environment. Pollutants which are changing physical, chemical, biological, characteristics of air, water, soil, that may harmfully affect the life or create a potential health hazards of living organisms.

CAUSES OF ENVIRONMENTAL DEGRADATION

The major causes of the environmental degradation are modern urbanization, industrialization, over-population growth, deforestation etc. Environmental pollution refers to the degradation of quality and quantity of natural resources. Various types of the human exercises are the fundamental reasons of environmental degradation. These have prompted condition changes that have turned out to be hurtful to every single living being. The smoke radiated by the vehicles and processing plants expands the measure of toxic gases noticeable all around. The waste items, smoke radiated by

vehicles and ventures are the fundamental driver of contamination. Spontaneous urbanization and industrialization have caused water, air and sound contamination. Urbanization and industrialization help to expand contamination of the wellsprings of water. So also, the smoke discharged by vehicles and ventures like Chlorofluorocarbon, nitrogen oxide, carbon monoxide and other clean particles dirty air. Neediness still remains an issue at the base of a few ecological issues.

SOCIAL FACTORS

Population

The rapid population growth and economic development in country are degrading the environment through the uncontrolled growth of urbanization and industrialization, expansion and intensification of agriculture and the destruction of natural habitats. One of the significant reasons for environmental degradation in India could be ascribed to quick development of population which is antagonistically influencing the natural resources and condition. The developing population and the ecological weakening face the test of maintained improvement without natural harm.

The presence or the nonattendance of ideal characteristic assets can encourage or hinder the procedure of economical development. Population is an important source of development, yet it is a major source of environmental degradation when it exceeds the thresh hold limits of the support systems. Unless the connection between the multiplying population and the existence emotionally supportive network can be settled, improvement programs, howsoever, imaginative are not prone to yield wanted outcomes. Population impacts on the environment primarily through the use of natural resources and production of wastes and is associated with environmental stresses like loss of biodiversity, air and water pollution and increased pressure on arable land.

Poverty

Poverty is said to be both cause and effect of environmental degradation. The round connection amongst poverty and environment is a to a great degree complex marvel. Imbalance may cultivate un sustainability in light of the fact that poor people, who depend on normal assets more than the rich, drain characteristic assets quicker as they have no genuine prospects of accessing different kinds of assets. As the 21st century starts, developing number of individuals and rising levels of utilization per capita are draining regular assets and corrupting the earth. The poverty-environmental

damage nexus in India must be seen in the context of population growth as well. The pressures on the environment intensify every day as the population grows. The fast increment of human numbers joins with urgent poverty and rising levels of utilization are draining natural resources on which the vocation of present and future ages depends. Poverty is amongst the consequences of population growth and its life style play major role in depleting the environment either its fuel demands for cooking or for earning livelihood for their survival. The unequal dispersion of assets and constrained open doors cause push and force factor for individuals living underneath poverty line that results in overburdened the population thickness in urban zones and condition get controlled by manifolds, subsequently, urban ghettos are produced in urban zones.

Urbanization

Urbanization in India started to quicken after freedom because of the nation's reception of a blended economy which offered ascend to the advancement of the private area. Urbanization is occurring at a quicker rate in India. Population living in urban territories in India, as per 1901 statistics, was 11.4%. This tally expanded to 28.53% as indicated by 2001 enumeration, and intersection 30% according to 2011 evaluation, remaining at 31.16%. As indicated by a review by UN State of the World Population report in 2007, by 2030, 40.76% of nation's population is required to dwell in urban zones. According to World Bank, India, alongside China, Indonesia, Nigeria, and the United States, will lead the world's urban population surge by 2050.

Economic Factors

Environmental degradation, to a large scale, is the result of market failure, namely the non-existent or poorly functioning markets for environmental goods and services. In this unique situation, environmental degradation is a specific instance of utilization or generation externalities reflected by uniqueness amongst private and social costs/benefits. Absence of very much characterized property rights might be one reason for such market disappointment.

The level and pattern of economic development also affected the nature of environmental problems. India's development objectives have consistently emphasized the promotion of policies and programmes for economic growth and social welfare. The production innovation received by the vast majority of the ventures has set an overwhelming burden on condition particularly through concentrated asset and vitality use, as is clear in common asset consumption (petroleum derivative, minerals,

timber), water, air and land sully, well being risks and debasement of characteristic eco-frameworks. With high extent petroleum derivative as the fundamental wellspring of modern vitality and real air contaminating enterprises, for example, iron and steel, composites and bond developing, mechanical sources have added to a generally high offer in air pollution.

CULTURAL FACTORS

Festivals, Fairs, Religious places and other celebrations are also held responsible for maximum amount of environmental degradation.

- A Diwali festival of India etc. is the events when huge accumulation of heavy metals is recorded in the atmosphere. The Diwali is one of the major festivals of India which is traditionally a festival of light when people light the lamps and distribute sweets. But unfortunately, due to the dominance of cracker burning, this festival is turned to the festival of fireworks. The emissions of fireworks consist of gases and respirable particles which can damage the respiratory system.
- Idol immersion during some rituals and cultural event is another source of environmental degradation. Water pollution and food contamination are the major consequences of idol immersion. Paints and decoration materials used in the idols contain heavy metals which contaminate water when we immerse idols.
- Throwing flowers and fruits into the river water during festivals becomes a source of contamination of water and sediments. On some occasions, the animal sacrifice is also a source of river water pollution and also a source of foul odor due to the decay of tissues in the open air.

CONCLUSION

The primary causes of environmental degradation in India are attributed to the rapid growth of population in combination with economic development and overuse of natural resources. Major environmental calamities in India include land degradation, deforestation, soil erosion, habitat destruction and loss of biodiversity. Economic growth and changing consumption patterns have led to a rising demand for energy and increasing transport activities. Air, water and noise pollution together with water scarcity dominate the environmental issues in India.

2.3 Meaning, definition and characteristics of Environmental Education.

Meaning of Environmental Education

Environment is derived from the French word “Environner”, which means encircle or surrounding. Environment is a complex of many variables, which surrounds man as well as the living organisms. Environmental education describe the interrelationships among organisms, the environment and all the factors, which influence life on earth, including atmospheric conditions, food chains, the water cycle, etc. It is a basic science about our earth and its daily activities, and therefore, this science is important for everyone.

E. E. is an integral process which deals with man’s interrelationship with his natural and man-made surrounding’s including the relation of population growth, pollution resources allocation and deflection, conservation, technology and urban and rural planning to total human environment.

E. E. is a study of the factors influencing ecosystems, mental and physical health, leaving and working condition, decaying cities and population pressures.

E. E. is the process of recognizing values and clarifying concepts related to environment and its problems in order to develop skills and attitudes necessary to understand the environment.

E. E. also entails practice in decision making and self – formulating a code of behavior about issues concerning environmental quality.

Definition and characteristics of Environmental Education

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 have been provided here to understand the concept.

“Environmental education is the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the inter-relatedness among man, his culture and his bio-physical surroundings. It also entails practice in decision making and self formulation of a code of behaviour 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 himself to solve the problems for improving his life.

"Environmental education is problem-centered, inter-disciplinary, value oriented, community-oriented, and concerns with man's survival as species, based on student-initiated activities and involvements 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 for environmental education."

Characteristics of Environmental Education

The review of the definitions of E.E. indicates the following main characteristics as follows. It is a process of recognizing the interrelatedness among man, his physical, cultural and biological surroundings.

1. It appears to be a process that equips human beings with awareness, skills, attitudes, values and commitments to improve environment.
2. It refers to the knowledge and understanding of physical, biological, cultural and psychological environment and to perceive its relevance for real life situation.
3. It identifies the imbalances of environment and tries to improve it in view of substance development.
4. It entails practice in decision making and self formulations of a code of behaviour about problems and issues concerning environmental quality.
5. It develops skills, attitudes, feelings and values needed to play and productive role in improving life and values.
6. It involves child's investigation and systematic exploration of his natural own and social environment and prepares himself to solve problems for improving his life.
7. It is problem-centered, interdisciplinary, value and community oriented and concerns with man's survival and development. It the concerns with present and the future.
8. It provides the basis for construction and creative skills for the practice of healthy living and improvement.
9. It involves both theoretical and practical aspects of environment to improve the imbalances and prevent the deterioration or pollution
10. It utilizes educational approaches, methods and techniques of teaching to identify the real causes of environmental problems and practice problem solving skills in formal and non-formal situations.

2.3.1 Importance, Objectives, Scope and Principles of Environmental Education.

Importance of Environmental Education.

The term why we should study environmental education is that we are born and brought up in an environment, we are out of the living in an environment; and we breathe out our last that too in an environment. Thus, from conception to cremation, we

live in one or the other environment, and luxuries. We should, therefore understanding our environment and know how to use it for our individuals well being and for the welfare of the society and the future generations. Thus, environmental education is more functional than the disciplines we have studying so far.

A second aspect of environmental education is education for environment. Environment from last two centuries has undergone a drastic change. So, many environmental problems have evolved like:

1. World population is increasingly swiftly
2. Stock of many vital resources are diminishing
3. Deforestation has become an epidemic
4. Climatic systems have changed due to increase in concentration of GHS's.
5. O₃ layer is depleting at a faster rate
6. Bio-diversity is declining rapidly
7. Deserts are expanding
8. Wildlife habitats are disappearing
9. Soils are denigrating at a fast rate
10. Toxic poisons circulate from air, water, soil to food and are bio- accumulated up the food chain

To sum-up, the natural systems which sustain mankind are degenerating at a fast rate while human population is rising rapidly. This is a sad state of affairs. Much of these changes are due to mankind's own activities. Something has to be done to reverse aging trends. So, there is an immediate need to educate peoples about the environment and its associated problems, so that they can take steps for its betterment.

Therefore, environment education is indeed very important of child and adult for self-fulfillment and social development. It helps in the maintenance of life and health in self preservation and in the preservation of human race. It helps to understand different food-chains and the ecological balance in nature and society. It stimulates concern for changing environment in a systematic manner for the maximum long run as well as the immediate welfare of mankind. It directs attention towards the problem of population explosion, exhaustion of natural resources and the pollution of environment and sheds light on the methods of solving these problems.

Objectives of Environmental Education.

The objectives of environmental education can be submitted in three domains discussed by Bloom on his book "Taxonomy of Educational Objectives" Cognitive, affective and Psychomotor.

The objectives in the cognitive domain are:

- 1) To help acquire knowledge of the immediate environment.
- 2) To help acquire knowledge of the environment beyond the immediate environment including distant environment.
- 3) To help understand the biotic and a-biotic environment.
- 4) To help understand the effects of unchecked population growth or unplanned resources utilization on the world of tomorrow.
- 5) To help diagnose the different causes of environmental pollution and to suggest remedial measures.
- 6) To examine trends in the growth of population and interpret them for the socio-economic development of the country.
- 7) To evaluate the utilization of Physical and human resources and suggest remedial measures.

Besides the foregoing objectives, the following skills and ability also fall in the Cognitive domain:

- 1) To help develop observational skills and notice details usually not seen by an untrained eye.
- 2) To help develop ability to draw unbraided inferences and conclusions.
- 3) To help develop ability to make meaningful suggestions. The affective objectives of environmental Education are:
- 4) To help acquire interest in the flora and fauna of the near and also distant environment.
- 5) To show tolerance towards different casts, races, religions and cultures.
- 6) To appreciate the gifts of nature.
- 7) To love he neighbors and value mankind as a whole.
- 8) To value equality. Liberty, fraternity, truth and Justice.
- 9) To respect the National and purity of our environment.

Environmental Education also fulfills some objectives of the psychomotor domain as are achieved through participation in environmental activities, excursions and camping Programmes. Some of these objectives are listed below:

- 1) To participate in afforestation Programmes
- 2) To participate in Programmes aimed at minimizing air, water and noise pollution.
- 3) To participate in Programmes aimed at preventing soil erosion.
- 4) To participate in Programmes aimed at eliminating food contamination and adulteration.
- 5) To participate in Programmes such as installation of Global Gas Plants, Solar heaters.
- 6) To participate in cleaning neighborhood. The aforesaid objectives have been more or less delineated by the UNESCO's conference also, through in a nutshell are quoted below:

1. AWARENESS. i.e. acquire awareness of and sensitivity to the total environment and its allied problems.
2. KNOWLEDGE. i.e. gain a variety of experiences and acquire a basic understanding of the environment and its associated problems.
3. ATTITUDE. i.e. to help social groups and individuals acquire a set of values and feelings of concern for the environment and the motivation of actively participating in environmental improvement and protection.
4. SKILL i.e. acquires 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. provide an opportunity to be actively at all levels in working towards the resolution of environmental problems

Scope of Environmental Education

Environmental education discipline has multiple and multilevel scopes. This study is important and necessary not only for children but also for everyone. The scopes are summarized as follows:

1. The study creates awareness among the people to know about various renewable and nonrenewable resources of the region. The endowment or potential, patterns of utilization and the balance of various resources available for future use in the state of a country are analysed in the study.

2. It provides the knowledge about ecological systems and cause and effect relationships.
3. It provides necessary information about biodiversity richness and the potential dangers to the species of plants, animals and microorganisms in the environment.
4. The study enables one to understand the causes and consequences due to natural and induced disasters (flood, earthquake, landslide, cyclones etc.,) and pollutions and measures to minimize the effects.
5. It enables one to evaluate alternative responses to environmental issues before deciding an alternative course of action.
6. The study enables environmentally literate citizens (by knowing the environmental acts, rights, rules, legislations, etc.) to make appropriate judgments and decisions for the protection and improvement of the earth.
7. The study exposes the problems of over population, health, hygiene, etc. and the role of arts, science and technology in eliminating/ minimizing the evils from the society.
8. The study tries to identify and develop appropriate and indigenous eco-friendly skills and technologies to various environmental issues.
9. It teaches the citizens the need for sustainable utilization of resources as these resources are inherited from our ancestors to the younger generation without deteriorating their quality.
10. The study enables theoretical knowledge into practice and the multiple uses of environment.

Principles of Environmental Education

One of the methods of developing observational skill is encouraging children to explore, experience and assess their own environment and to modify it as far as possible to suit their own needs and the needs of their community and of the society at large keeping these objectives in view, emphasis is being increasingly laid on environmental education as an integral part of the school curriculum. The educational principles that buttress support to the inclusion of environmental education in school curriculum given by Ambast are as below:

(1) Environmental education helps in programming learning experiences from 'simple to complex'. For illustration, children look at a bird, observe its colourful plumage, see it

eating figs or insects or watch it flying, etc. All this gives them same awareness of the eating and flying habits of birds.

(2) Environmental education helps children to proceed from 'indefinite ideas to definite' ones. In this connection, it may be said that the first perceptions and thoughts of children are as vague as their first movement and the first attempt at speech. Environmental education helps in sharpening the development of these observational skills and hastens the transition of ideas in children's mind from indefiniteness to definitions.

(3) Environmental education helps children to proceed from concrete to the 'abstract. This is a very simple educational maxim and does not need any elaboration. Still it may be said that environment is full of concrete things which children may examine and classify and interpret, and then draw their own conclusions and inferences about them. For example, children may observe different types of plants and animals and classify them according to their species genus family and order.

(4) Environmental education helps the ordering of learning experiences from 'empirical to the rational'. Needless to say, empirical to rational is a very important educational maxim and like other educational maxims described above, was given the pride of place by no less on educational than Herbert Spencer. This maxim is satisfied very well in environmental studies as children can observe phenomena and conclusions and rational explanations. Having argued so, they' may verify their hypotheses experimentally. Rational explanations. Having argued so, they' may verify their hypotheses experimentally.

(5) A corollary of the foregoing principle which is so dear to the hearts of educationists is that education should help the child in 'process of self-development'. This means that children should be encouraged to conduct their own investigations and draw their own conclusions. They should be told as little as possible and made to discover as much as possible. This principle is very much consistent with what, thinking man always do in life, namely, self instruction which has been the warp and woof of human progress and discovering things for themselves is possible maximally in programmes of environmental education.

(6) Education of the child must follow 'the same sequence as existed in the education of mankind,' considered historically. This means that the genesis of knowledge in the individual should follow nearly the same course as the genesis of knowledge in the race.

This principle can be followed both in letter and spirit in programmes of environmental education. Children when taken out to a forest and made to camp there, can very well acquire, interpret and appreciate the sequence in which knowledge was developed by man.

(7) The next important educational principle of environmental education is the pleasurable excitement. This principle can be appreciated by one who has seen the children's becoming faces and the intense delight on them when they are picking up flowers and insects or hoarding pebbles and shells.

(8) The eighth principle of environmental education is that it makes child's education 'Problem-based', for understanding environment and the hazards of its pollution, the pollution of air and water, the destruction of wild life the dereliction of land, etc. are problems that all of us should solve in order to save mankind from extinction.

(9) The last but not the least important principles of environmental education is its 'social relevance', its relevance to man's interaction with his physical and social environment, its relevance to changing human attitudes which curve man to hate man and beget hatred on one.

2.3.2 Approaches, methods and techniques of teaching Environmental Education.

Approaches: Infusion and problem-solving, Innovative approach.

Approaches of Teaching Environmental Education.

It is a mechanism for transferring information and skills to students to bring out a change in their behavior.

Two Types of Approaches 1. Infusion 2. Problem Solving

INFUSION -To infuse means to focus instill to integrate a new dimension without changing the innate nature of the subject or the discipline.

-Infusion approach may be defined as a process of integrating content and skills into existing courses without jeopardizing the integrity of the courses themselves.

- In the present context, infusion means to focus on EE concepts in the already existing content in the school curriculum.

PROCESS OF INFUSION analyzing the contents of the school curriculum into specific concept and integrating them with the concepts emerging from an analysis of the environmental problems or issues could achieve infusion.

Two General Approaches Used To Infuse Environmental Perspectives:

1. Inter Disciplinary Approach

2. Multi Disciplinary Approach

Interdisciplinary Approach. It is an approach where in concepts from various disciplines or subjects will be utilized to highlight the environmental perspective or analyze an environmental problem or issue.

Multi Disciplinary Approach. In the multidisciplinary approach, environment topics are dispersed or infused into various single disciplinary courses. In the other words, the environmental perspective is integrated into the other disciplines.

Steps of Infusion Approach.

1. Identifying the plug points. In this step we need to identify the suitable situations in the contents disseminations of various subjects.
2. Selecting the suitable environmental concepts for the plug points. When once the plug points are identified, there is a need to select the suitable environmental concepts for the specifically identified plug points.
3. Selecting the method of Teaching. Once the plug point and the content to be *infused is selected, next it is very important to identify the suitable method for instructions.*
4. Preparing the Lesson plan in Infusion approach and instruction. After all the above three steps are followed, it is the final step to prepare the lesson plan and to disseminate the environmental concepts along with the other subjects.

Conclusion

Infusion Approach is a mechanism for transferring information and skills to students to bring out a change in their behavior. Different strategies are adopted for enhancing the effectiveness of the approach. Infusion and problem solving are the two approaches used in environmental education.

Problem-solving Method

Problem Method is of comparatively recent origin. It has emerged as a reaction against theoretical and away from life type of education. The aim of Population education is to prepare the individuals for life or to equip them in such a way that they can deal with the life situations effectively, competently and successfully. Life is full of problems with which we have to deal in our day to day life. Problem Method prepares the individuals for this purpose.

Problem Method differs from the Project Method, whereas Project Method leads to physical accomplishment of a task, in the Problem Method, only a mental solution is to be found. In the words of Bining and Bining, "In the Project, the activity both mental and physical, leads to the accomplishment of a task, in the problem, the activity involved leads to a mental solution."

The Problem Solving Procedure

There are two procedures of problem-solving

1. Deductive Procedure. In this very little effort and reasoning is required on the part of the students. The students mostly depend on their teachers, text books etc. which provide ready-made solutions of the problems.

2. Inductive Procedure. Inductive procedure is the problem-solving procedure in the true sense of the term. It requires reflective thinking on the part of the students as a result of which they reach a mental solution.

Steps in the Problem Solving Procedure

As recommended by John Dewey in his book 'How We Think' the steps are as follows:

- (i) Selecting and defining the problem in definite terms.
- (ii) Formulating various hypotheses or tentative solutions of the problem.
- (iii) Gathering all relevant facts in connection with all the tentative solutions.
- (iv) Judging and evaluating the tentative solution one by one in the light of the material collected.
- (v) Rejecting wrong and impracticable solutions and finally arriving at the best possible solution.

Characteristics of Good Problems

- (i) It must be the product of the student's environment and it must challenge the minds of the students.
- (ii) It must be according to the mental level of the students, so that they may be able to take interest in them.
- (iii) It must have educational value and must provide the maximum of activity and practical knowledge to the pupils.
- (iv) It must be accepted and undertaken by the pupils on co-operative basis.

Principles of Problem Solving method

- (i) The pupils must feel the problem as their own.
- (ii) The problem must be stated definitely.
- (iii) The means of solving the problem must not be vague to the pupils.
- (iv) Solution must be definite and clear.

Advantages of the Problem Method

- 1. Fulfilling the Objective of Population Education.** The aim of population education is to prepare the individuals for life, so that they may be able to solve their problems. This method provides them a good training towards and power evaluate
- 2. Developing reasoning power of reasoning and judgments.** The students power of reasoning and judgment is developed because they discuss investigate and evaluate themselves in order to reach a definite conclusion.
- 3. Correct way of acquiring knowledge.** As knowledge comes to the pupils as a byproduct while trying to solve problem, knowledge is required with the express purpose of finding a solution to a problem.
- 4. Ensuring Active pupil participation.** As the students actively participate in the problem-solving procedure, the emphasis is on pupil activity rather than on teacher activity.
- 5. Developing Initiative and Responsibility.** Taking the initiative by selecting a problem for solution, the students bear the entire responsibility of solving a problem. This develops initiative and a sense of responsibility in them.

Limitations of Problem Method

- 1. Difficult to Follow in Actual Practice.** Though in theory this method seems to be very easy to follow, yet in practice, both the teachers and students, habituated to the traditional methods of teaching will find it difficult to follow.
- 2. No Practical Activity Involved.** Children are interested in practical activities and not in reflective thinking. This method cannot be used with small children due to lack of practical activity.
- 3. Time Consuming.** A lot of time will be consumed even in solving one problem. Much of the time will simply be wasted.

4. Difficulty in Selecting Right Type of Problems. The success of the problem-method depends upon the selection of right type of problem. It is not always possible select problem to full of educational possibilities.

5. Cannot be the Only Method. This method cannot be depended upon to achieve all the aims and objectives of teaching population education. It must be used along with other methods of teaching.

2.3.4 Methods: Discussion, Demonstration, Project Method.

Discussion Method

Teaching-learning process should be a co-operative process between the teacher and the pupils. In the discussion method the students participate actively in the learning process. Discussion involves study and preparation, selection and organization of subject matter, exchanging ideas and learning procedures. It is a systematic procedure of collective decision-making. It seeks agreement but, it is not reached. It has the value of clarifying the nature of disagreement. It may be informal or it may assume some such form as a debate, a symposium, a panel or a round table conference. Any one of these forms may be adopted.

Merits of the Discussion Method

1. Helping Self-Expression. Discussion helps to improve verbal self expression. It provides equal opportunities to everybody to express his views on the topic under discussion.

2. Collective Decision-making. Discussion method is a process of collective decision-making.

3. Developing Logical and Critical Thinking. The participants in discussion have arguments and develop their points of view logically viewing the argument of others critically. This develops their critical faculty and logical way of thinking

4. Providing Right Way of Acquiring Knowledge. Knowledge is not acquired through memorization and cramming. It requires listening to various points of view. It also leads to better understanding as the facts are to be twisted according to the needs of the discussion.

Limitations of Discussion Method

1. Absence of Direct Experiences. It does not provide first hand information and direct experiences to the educands who keep themselves busy merely with the academic type of discussion.

2. Neglect of Reading and Writing. There is very little scope for reading and writing which are very essential for learning.

3. Time-consuming. As much time is consumed in discussion, it is doubtful that much learning takes place by this method.

4. All Students do not Participate Equally. Certain students feel shy or do not have the confidence to participate in the discussion. The bright students may dominate and do not allow others to speak.

Demonstration Method

The word demonstration means to give demos or to perform the particular activity or concept. In demonstration method, the teaching-learning process is carried in a systematic way. Demonstration often occurs when students have a hard time connecting theories to actual practice or when students are unable to understand applications of theories. In order to make a success of demonstration method, three things are necessary.

(a) The object being displayed during demonstration should not be so small.

(b) During the demonstration, the clear language should be used so that pupils may understand concept easily.

(c) The pupils should be able to question teachers in order to remove their difficulties.

Characteristic of demonstration method

(1) The demonstration should be done in a simple way.

(2) In this strategy, attention is paid to all students.

(3) Goals and objections of demonstration are very clear.

(4) It is a well-planned strategy.

(5) Time is given for rehearsal before the demonstration.

Steps of Demonstration method

There are six steps of demonstration process.

(1) Planning and preparation

Proper planning is required for good demonstration. For this following points should be kept in mind. Through the preparation of subject matter. Lesson planning, collection of material related to the demonstration, rehearsal of demonstration.

In order to ensure the success of demonstration, the teacher should prepare lesson minutely and very seriously.

(2) Introducing the lesson

The teacher should motivate students and prepare them mentally for the demonstration. The teacher should introduce the lesson to students keeping in mind the following things.

- individual differences
- Environment
- Experiences

The lesson can also be started with some simple and interesting experiments. Very common event or some internal story.

The experiment should be able to hold the attention of students.

(3) Presentation of subject matter

- In demonstration presentation of subject matter is very important.
- The principle of reflecting thinking should be kept in mind.
- The teacher should teach the student in such a way that their previous knowledge can be attached to their new knowledge.

(4) Demonstration

- The performance in the demonstration table should be ideal for the student.
- The demonstration should be neat and clean.

(5) Teaching Aids

- The teacher can use various teaching aids like models, blackboard, and graphs etc.during demonstration.

(6) Evaluation

-In this last step, evaluation of the whole demonstration should be done, so that it can be made more effective.

Merits of demonstration method

- (1) It helps a student in having a deeper understanding of the topic.
- (2) It helps students remain active in teaching -learning process.
- (3) It leads to permanent learning.
- (4) It accounts for the principles of reflective thinking.
- (5) It helps to create interest for topics among students.
- (6) It helps in arousing the spirit of discovery among students.
- (7) It imparts maximum learning to students.

Demerits of demonstration method

- (1) Students cannot benefit with direct and personal experiences as teacher carry out the demonstration.
- (2) It can be costly as it requires costly materials.
- (3) It can be a time-consuming method.
- (4) It is not based on learning by doing.
- (5) This method does not provide training for the scientific method.
- (6) There is a lack of experienced teachers to carry out the demonstration.

Conclusion

It is the most suitable method for teaching the secondary classes. If a teacher feels that the demonstration is taking much time than he would have to take the help of students. Similarly, a small group of students can be invited to the demonstration table. Students can also demonstrate the experiment. This might help in removing objection regarding non-availability of learning by doing approach.

II. PROJECT METHOD

This method was devised by Kilpatrick and was given a project shape by Stevenson. This is based on the philosophy of pragmatism. John Dewey wanted that education should be for life and through life. School should be a miniature society. In this method connected facts are developed round a central theme which may be any matter of scientific interest, a scientific principal or a topic of immediate interest to the students.

Definitions

The term project has been defined by a number of educationists in their own way. According to Kilpatrick, "A project is a wholehearted purposeful activity proceeding in a social environment."

According to Stevenson "A project is a problematic act carried to completion in its natural setting."

According to Ballard "A project is a bit of real life that has been imparted into the school." This method is based on the following principals:

1. Students learn better through association, co-operation and activity.
2. Learning by doing
3. Learning by living.

A project is a kind of life experience which is the outcome of a desire of the students and teaching by this method is therefore, based upon the use of this desire. "Learning by living" is the better meaning of project method, because life is actually full of projects and we try to carry out these projects every day.

Projects work out best with small groups or classes. Biology can be best taught through projects. Students can gain interesting information if they are made to investigate the same locality at different seasons of the year for flora and fauna. They may note down the ways in which living things may adopt themselves to dry and wet seasons, the differ times of flowering and fruiting of plants, and of breeding of birds and the presence or absence of various species of animal life.

Suitable planning and organization is essential for any investigation. Students should be classified into groups with a leader for each group. Every student should be assigned a definite task the leader being responsible for collecting all the information together at the end. Students should take down notes as and when observations are made

Steps in a project

1. Providing a situation

The teacher should always be on the look out to find out situations that arise and discuss them with their students to discover their interest s. situations may be provided by different methods. The teacher can talk to the students on the topics of common interests, for example about their hobby, how do they spend the leisure time and

holidays. By talk and discussion with the students the teacher should provide situations for the students to tell about a project, which can be completed by project method.

2. Choosing and Proposing

The project should be chosen and proposed by the students. The teacher should not choose the project himself and compel the students directly or indirectly to accept the proposal. The teacher should tempt the students and the proposal should finally come from the students. The teacher should continue his discussion till the students propose the project. When a project has been proposed the teacher should see that the propose of the teacher is clearly defined and understood. In case the students make an unwise choice the teacher should carefully guide them for a better project by providing some other situation.

3. Planning

The success of a project depends on the planning. This planning is to be done by the students. All the details of the project are to be planned well in advance. The teacher should guide the students in planning by giving some suggestions. The teacher should not impose his plan on the students. Everything should be told by the students.

4. Executing

It is the most important and longest step in the project method and therefore needs a great deal of patience on the part of the teacher and the students. The project must be executed by the students because they have chosen and planned parts among the students. The work of the project is to be assigned to the students according to their tasks, interests, aptitudes and capabilities. All the work of the project cannot be done by every member of the group. Every student should get a chance to do something. Those who are backward in one subject, may be excellent in others, and therefore can contribute their might towards the execution of the project. The teacher is simply to keep a close watch, and encourage and guide the students wherever necessary.

5. Evaluating

It is very valuable to review the whole project, after the project has been completed and find out the mistakes, if any. Students should evaluate their own work and they should be able to look their own failures and findings.

6. Recording

The students should keep a complete record of the project. They should record the discussion, the proposal, and the plan, allotment of duties, books referred, places visited, maps drawn, places surveyed, specimens collected and lessons learnt.

Criteria of a Good Project

1. The project selected should be purposeful it should be useful and practicable to the students in their daily life.
2. The experience gained should be fruitful. The students should learnt to co-operate and share their interests and should develop into a democratic individual.
3. The project should cater for the activities of the students.
4. Students should be given full freedom to work on their own accord.
5. The project should be selected by the active participation of both students and teacher.
6. The project should be economical and the purpose of the project should be achieved without any waste of time or money.
7. It should be timely and drawn in relationship with seasons of the year and the interest and needs of the community.
8. It should be challenging.
9. It should be feasible.
10. It should help individuals to see and understand life in its unity.

Role of the Teacher in Project Method

1. The teacher is a friend, guide, and a working partner.
2. He should provide opportunities for shy students to contribute something for the success of the project.
3. He should try to learn more along with the students.
4. He should help the students in developing character and personality by allowing them to accept the responsibilities and discharge them efficiently.
5. He should move freely with the students so that democratic atmosphere prevails in the class.
6. He should be alert and active all the time to see that the project runs in the right line.
7. He should have a thorough knowledge of the students so as to allot them work according to their interest and ability.
8. He should be well experienced and should have initiative, tactics and taste for learning.

Merits

This method is based upon the laws of learning. They are as follows:

- a) Law of readiness -The students are made ready to learn by creating interest, purpose and life situations.
- b) Law of exercise -The student's carry out activities in the real life situations, the experiences gained thus are very useful in the later life of the students.
- c) Law of effect -The sense of success and satisfaction should follow the learning process. This law makes it essential for the teacher to make the student satisfy and feel happy in what he is learning.
- d) It promotes co-operation and group interaction.
- e) It is a democratic way of learning. The students choose, plan and execute the project themselves.
- f) It teaches dignity of labour.
- g) The correlation of subject is best sought. There is no division of subjects into watertight compartments.
- h) It gives opportunity to develop keenness and accuracy of observation and to experience the joy of discovery.
- i) It calls for wholehearted purposeful activity.
- j) It sets up a challenge to solve a problem and this stimulates constructive and creative thinking.
- k) It helps to widen the mental horizons of students.
- l) Students learn the matter very easily because the subject is associated with activities.

Demerits

- a) The project method absorbs a lot of time.
- b) It gives the students superficial knowledge of so many things but leaves an insufficient basis of sound fundamental principles.
- c) It requires much work on the part of teacher for planning and carrying out projects.
- d) It presumes that the teacher is the master of all subjects and has an all-round knowledge of everything to impart correction.
- e) The books written on these lines are not available.

- f) It is more expensive because the students have to bear the expenses of excursions, outdoor activities, purchase of material and do experiments.
- g) In this method, the teaching is not well organized, regularized and continuous. The timetable is almost upset.

2.4 Techniques: Observation, Nature game, Role-play, Brain-storming, Survey, Dramatization.

Observation

Observation is a method of collecting evaluating information in which the evaluator watches the subject in his or her usual environment without altering that environment.

Observation mainly classified in to:

- Controlled and uncontrolled
- Structured and unstructured
- Participant and non participant

Importance of observation

- Improves concentration about environmental issues.
- Encourages pupils to explore and learn local environment.
- Imagination and enthusiasms are heightened.
- Biophobia and nature deficit disorder decline.
- Responsible action is taken to better the environment.

- It helps to identify major environmental problems

Nature game

A nature game develops favourable attitudes towards environment. As games involve elements of recreation and enjoyment, students play them with great interest and enthusiasm. Nature games are nothing but activities where in students participation is predominant.

Some of the natural games are; Solo walk, star therapy, hug a tree, leaf rainbow natural orchestra, secret smells.

Importance of nature games

- Playing in our natural play scape which makes use of our land resources to provide entertainment and physical activity.
- Creating and maintaining community gardens.
- A heightened interest and excitement in environment.
- Takes away classroom drudgery.
- Play in diverse natural environment reduces or eliminates anti-social behavior such as violence, bullying, vandalism.
- Games provide new and interesting way to convey information which is easy to learn.

Role-play

- Role playing is dealing with problems through actions.
- Role playing methodologies to a range of curriculum areas focusing on human issues and would like to share insights in to its specific applications to environmental education.
- In a role play usually a problem is delineated, enacted, and discussed.

Forms of role play include:

- simple role play •multiple role play •socio drama

Importance of role play

- Role play is a simple and low cost method.
- Focuses right on the problem and helps learners deal with it.
- It throws considerable light on crucial environmental issues within a short period of time.
- It does not require much material or much advance preparation.
- Explore subject matter in varied ways.
- Role playing process provides a live sample of human behaviour that serves as a vehicle for students to gain insight in to their attitudes, values and perceptions.
- Develop the problem solving skills.

Brain-storming

The meaning of Brainstorming

In context to teaching, brainstorming is a strategy or tool of teaching used by the teacher in which maximum or all the students participate by responding or presenting views on one topic. This technique encourages new ideas among students which would never have happened under normal circumstances.

Brainstorming can be explained in following ways:-

- It is a process designed to obtain the maximum number of ideas relating to a specific area of interest.
- It is a technique where a group of pupils put social inhibitions and rules aside with the aim of generating new ideas and solutions.
- It is a technique that maximizes the ability to generate new ideas.

Brainstorming can either be traditional or advanced.

(a) Traditional brainstorming

Traditionally for brainstorming pupils gather in a room and forward their ideas as they occur to them. They are told to lose their inhibitions and no ideas shall be judged. Here pupils should build on ideas called out by other people.

(b) Advanced Brainstorming

It is an extension of the traditional brainstorming and makes the whole process easier and effective. Advanced brainstorming uses new processes and new techniques to reduce inhibitions, for example, creative and lateral thinking techniques.

Brainstorming in Environmental Education

In the field of education brainstorming is a large or small group of activities that encourage the student to focus on a topic and contribute to the free flow of ideas. In this process

- Teacher begins the session by posing a question, problem or by introducing a topic.
- The student then expresses possible answers, relevant words, and ideas.
- The contribution is accepted without criticism or judgment and is then summarized on a white board by the teacher.
- These ideas are examined, usually in an open class discussion format.

Purpose of Brainstorming

- To focus student attention on a particular topic.
- To generate particular ideas.

- To teach acceptance and respect for individual differences.
- To encourage the learner to take a risk in sharing their ideas and opinions.
- To demonstrate to the student that their knowledge and abilities are valued and accepted.
- To provide an opportunity for students to share ideas and expand their knowledge by building on each other's

Characteristic of Brainstorming

- It is an intellectual activity.
- Maximum or all students can participate.
- Each student gives their personal view/ideas.
- Each idea is neither right nor wrong.
- It involves divergent thinking.

Brainstorming as teaching strategy

- First, a small group of students is formed. They are asked to sit in a group and are provided with a particular issue or topic.
- Teacher, as the group leader, then ask group members to think about the problem and give their ideas. They are advised to find as many solutions to the problem as they can find. They are instructed not to criticize others ideas but they are free to make attentions to others ideas. Students are encouraged to put forward suggestions without hesitation even if they seem to come up with unusual and unorthodox ideas.
- Student's ideas are to be listened and accepted patiently, without passing any judgment or comment of any sort until the session is over.

Advantages of Brainstorming

- It stimulated and provides varied instructional approach.
- Highly motivating.
- Increase task focus.
- Promotes spontaneity and creativity.
- Efficient and procedure.
- Involves participants in ownership of ideas.
- Encourages creativity.

Survey

A survey technique helps to involve learners in carrying out simple data collection exercises, which provide basic information for planning related activities. Based on the survey record and project work, experimental investigations can be carried out to learn more about the environmental problems of the areas and understand the totality of the environment. A survey is generally carried out to gather information through questionnaires, opinion sheets or personal interviews and to elicit opinions, feelings, and attitudes of individuals on various environmental issues or problems.

A few sample topics for surveys could be

- Survey of problems faced by the people living in flats.
- Survey of the solid waste disposal techniques in a locality.

Importance of survey

- Surveys help to elicit opinions, feelings, and attitudes of individuals on various environmental issues or problems.
- Learn more about the environmental problems.
- Numerous questions can be asked about a subject, giving extensive flexibility in data analysis.
- A broad range of data can be collected.
- Precise results are obtained.
- Low costs. .

Dramatization

Dramatization gives reality and concreteness to learning situations. Environmental education can be dramatized as part of the activities of a science club. Active involvement of pupils' dramatization helps easy memorization of learning materials.

Kinds of dramatization

- Full-length play
- Class dramatization
- Tableau
- Shadow play, etc of Environmental issues are also included in dramatization.

Importance of dramatization

- The use of drama can greatly enhance and reinforce learning in environmental education.
- Drama can thus consolidate and extend students direct experience of the natural world and foster the empathy that is essential if students are to appreciate and ultimately protect it.
- Promoting environmental awareness through drama.
- Dramatization helps for environmental protection.
- Power of observation also develops through this method.
- It also helps to develop the power of sympathy and imaginations.

2.5 Use of appropriate tools and techniques of evaluation-tests, questionnaire, rating scale, observation, anecdotal records and case-study.

Assessment is a systematic process of gathering information about what a student knows, is able to do, and is learning to do. Assessment information provides the foundation for decision-making and planning for instruction and learning. Assessment is an integral part of instruction that enhances, empowers, and celebrates student learning. Using a variety of assessment techniques, teachers gather information about what students know and are able to do, and provide positive, supportive feedback to students. They also use this information to diagnose individual needs and to improve their instructional programs, which in turn helps students learn more effectively.

Evaluation refers to the decision making which follows assessment. Evaluation is a judgment regarding the quality, value, or worth of a response, product, or performance based on established criteria and curriculum standards. Evaluation should reflect the intended learning outcomes of the curriculum and be consistent with the approach used to teach the language in the classroom. But it should also be sensitive to differences in culture, gender, and socioeconomic background. Students should be given opportunities to demonstrate the full extent of their knowledge, skills, and abilities. Evaluation is also used for reporting progress to parents or guardians, and for making decisions related to such things as student promotion and awards.

OBSERVATION

Observation is recognized as the most direct means of studying people when one is interested in their overt behavior. Observation is defined as “a planned methodological watching that involves constraints to improve accuracy.” According to Gardner (1975), observation is the selection, provocation, recording and encoding of that set of behaviors and settings concerning organism “insitu’ which are consistent with empirical aims.”

Characteristics of observation

1. Observation is at once a physical as well as mental activity.
2. Observation is selective and purposeful.
3. Scientific observation is systematic
4. Observation is specific
5. Scientific observation is objective.
6. Scientific observation is quantitative.
6. The record of observation is immediately.
7. Observation is verifiable
8. Behavior is observed in natural surroundings
9. It enables understanding significant events affecting social

TYPES OF OBSERVATION

1) Casual & Scientific observation

An observation may be either casual or scientific. Casual observation occurs without any previous preparations. Scientific observation is carried out with the help of tools of measurement.

2) Simple and systematic observation

Observation is found in almost all research studies, at least in the exploratory stage. Such data collection is often called simple observation. Its practice is not very standardized. Systematic observation it employs standardized procedures, training of observers, schedules for recording.

3. Subjective and Objective Observation

One may have to observe one’s own immediate experience, it is called subjective observation. In any investigations, the observer is an entity apart from the thing observed, that type of observation is called objective observation.

4. Intra – subjective and inter subjective observation

If repeated observation of a data the observation is said to be intra subjective. If repeated observations of a constant phenomenon by different observers yield constant data the observation is said to be inter subjective.

5. Direct and indirect observation

The direct observation describes the situation in which the observer is physically present and personally monitors what take place. Indirect observation is used to describe studies in which the recording is done by mechanical, photographic or electronic means.

6. Structured and un structured observation

Structured observation is organized, planned which employs formal procedures has asset of well defined observation categories, and is subject to high levels of control and differentiation. Unstructured observations are loosely organized and the process is largely left to the observer to define.

7. Natural and Artificial Observation

Natural observation is one in which observation is made in natural settings while artificial observation is one in which observations made in a laboratory conditions.

8) Participant and Non-participant observation

When the observer participates with the activities of these under study is called participant observation

Merits:- Acquiring wide information, Easy in exchange of clear observation of neutral and real behavior.

Limitations: - larger time required, greater resources required lack of objectivity. When the observer does not actually participate in the activities of the group to be studied but simply present in the group it is common as non participant observation. The observer in this method makes no effort to his influence or to create a relationship between him and the group.

ANECDOTAL RECORDS

Anecdotal Records are collections of narratives involving first-hand Observations of interesting, illuminating incidents in children's literacy development. Anecdotal records are reports about the teacher informal observations about students. It will help the teacher to collect details regarding student's behaviors at different

situations. It will be a good tool to bring positive behavioral patterns through daily observation and correction. It involves the following information;

Social interactions and literacy exchanges that teacher have observed Children's everyday routines, such as what they choose to do in center workshops; a particular writing topic in a journal or on a sheet of paper during independent writing time; the book they choose during independent reading time; and when they spend time with blocks, sand, painting, or other forms of creative expression.

- Children's learning styles
- Recurring patterns in children's ways of understanding
- Changes in children's behaviors
- Milestones in children's development

Steps Involved In Preparation of Anecdotal Records

Teachers basically use the following steps for the preparation of Anecdotal records;

1. Observing children in instructional settings:

Formal and information is the starting point in the preparation of anecdotal records.

2. Maintaining a standards-based focus:

Follow some criteria's as standards at the time of observation.

3. Making anecdotal records:

Writing quality anecdotal records are facilitated by keeping in mind the following considerations: Write observable data, use significant abbreviations, write records in the past tense.

4. Managing anecdotal records:

Once the records are coded for strengths, needs, or information, simply list an abbreviated summary of the strengths and the needs in the space provided below the records. Separating the records into strengths and needs allows the teacher to summarize what patterns are being exhibited by the student. The summary also helps clarify and generate appropriate instructional recommendations.

5. Analysis of anecdotal records:

Anecdotal records assessment is informed by comparing the standards to the child's performance. The standards also inform the selection of strategies and activities for instructional recommendations. Periodically, analyze the compiled records for each student. The time between analyses may vary according to your own academic calendar.

RATING SCALE

Rating scale is one of the scaling techniques applied to the procedures for attempting to determine quantitative measures of subjective abstract concepts. It gives an idea of the personality of an individual as the observer judge the behavior of a person includes a limited number of aspects of a thing or of traits. Rating means the judgment of one person by another. "Rating is in essence directed observation". Writes Ruth Strang. A .S. Barr and other defines, "Rating is a term applied to expression of opinion or judgment regarding some situation, objects or character. Opinions are usually expressed on a scale or values. Rating techniques are devised by which such judgments may be qualified."

A rating scale is a method by which we systematize the expression of opinion concerning trait. The ratings are done by parents, teachers, a board of interviewers and judges and by the self aswell. Rating is a term applied to expression of opinion or judgment regarding some situation, object or character. Opinions are usually expressed on a scale of values. Rating scale refers to a set of points which describe varying degrees of the dimension of an attribute being observed.

Characteristics

There are two characteristics of a rating scale.

1. Description of the characteristics to be related,
2. Some methods by which the quality, frequency or importance of each item to berated may be given.

Types of rating scale

A number of rating techniques have been developed which enable the observers to assign numerical values or ratings to their judgments of behavior. According to Guilford (1954, P. 263) these techniques have given rise to five board categories of rating scale.

1. Numerical scale (Itemized rating scale)
2. Graphic scale
3. Standard scale
4. Rating by cumulative points
5. Forced choice ratings.

Use and advantages of rating scales

1. Helpful in measuring specified outcomes or objectives of education

2. Helpful in supplementing other sources of understanding about the child.
3. Helpful in their simulating effect upon the individuals who are rated.
4. Helpful in writing reports to parents
5. Helpful in filling out admission
6. Helpful in finding out student's needs
7. Helpful in making recommendations to the employers.
8. Helpful to the students to rate himself

Limitations

1. Some characteristics are more different to rate.
2. Subjective element is present.
3. Lack of opportunities to rate students.
4. Rates tend to be generally generous.

QUESTIONNAIRE

Questionnaire is the structured set of questions. It is described as a "A document that contains a set of questions, the answers to which are to be provided personally by the respondents."

It is a device for securing answer to questions by using from which the respondent fills by himself. It is the most flexible tool in collecting both quantitative and qualitative information. A questionnaire cannot be judged as good or bad, efficient or inefficient unless the job it was intended to accomplish is known. Developing questionnaire requires a certain amount of technical knowledge. The researcher must decide the points like method of data collection, procedure to be followed in approaching the respondent order of sequence of questions structured vs unstructured questions while framing questionnaire.

Scope of Questionnaire

1. When very large samples are desired.
2. Cost have to be kept low.
3. The target groups who are likely to have high response rates are specialized.
4. Ease of administration is necessary.
5. Moderate response rate is considered satisfactory.

Characteristics of a Good Questionnaire.

1. It deals with an important or significant topic so that it enthruses respondent to give response. Its significance is carefully stated on the questionnaire itself.
2. It seeks only that data which cannot be obtained from the resources like books reports and records.
3. It is as short as possible because long questionnaire are frequently thrown away into the waste paper basket.
4. It is at the same time as much comprehensive as necessary so that it does not leave out any relevant and crucial information.
5. It is attractive in appearance; neatly arranged and clearly duplicated or printed.
6. Directions are clear and complete, important terms are clarified each question deals with single idea and is worded in simple and clear manner as possible and provide an opportunity for easy accurate unambiguous response.
7. The questions are objective with no clues, hints or suggestions as to the responses desired. Leading questions are carefully avoided.
8. Questions are presented in good psychological order proceeding from general to more specific responses.
9. The offending annoying or embarrassing questions have to be avoided as far as possible.
10. Items are arranged in categories to ensure easy and accurate responses.
11. Descriptive adjectives and adverbs that have no agreed up on meaning are avoided.
12. Double negatives are also avoided.
13. The questions carry adequate number of alternatives.
14. Double barreled questions or putting two questions in one questions or putting two questions in one question are also avoided.
15. It is easy to tabulate summarize and interpret.

Various Forms of questionnaire

Questions in the questionnaire may vary with respect to a number of criteria.

1. Primary, Secondary and Tertiary Questions. on the basis of the nature of information elicited questions may be classified as primary, secondary, and tertiary. Primary questions elicit information directly related to the research topic. Secondary questions elicit information which do not relate directly to the topic, ie, the information is of secondary importance. Tertiary questions only establish a framework

that allows convenient data collection and sufficient information without exhausting or biasing the respondent.

2. Closed- ended and open -ended questions. The closed- ended are the fixed choice questions. They require the respondent to choose response from those provided by the researcher. It is easy to fill out, takes less time keeps the respondent on the subject is relatively more objective, more acceptable and convenient to respondent and is fairly easy to tabulate and analyse.

The open-ended type questions which respondents to answer in their own words. The subject reveals his mind gives his responses .This type of item is sometimes difficult to interpret, tabulate and summarize in the research report.

3. Structured and non- structured questions. The structured questions contains definite concrete and direct questions where as non- structured may consist of partially completed questions or statements.

A non- structured questionnaire is often used as the interview guide which is non - directive. The interviewer poses only a blue print of the enquires and he is largely free to arrange the form or statements of the questions.

Advantages of Questionnaire

1. It has greater potentialities when it is properly used otherwise progress in many areas of education would be greatly handicapped.
2. It is economical way of collecting information to educators.
3. It permits a nationwide or even international coverage. It can cover a large group at the same time.
4. It is easy to plan construct and administer.
5. Once it has been constructed skillfully the investigator may ask anybody to administer it on his behalf. Confidential information often may be obtained more readily by means of questionnaire.
6. It places less pressure on the subject for immediate response.
7. It helps in focusing the respondent's attention on all the significant items.
8. It may be used as a preliminary tool for conducting a depth study later on by any other method.

Limitations of Questionnaire

1. The mailed questionnaires can be used only for educated people also restricts the number of respondents.

2. The return rate of questionnaire is low.
3. The mailing address may not correct which may omit some eligible respondents.
4. Sometimes different respondents interpret questions differently.
5. The researcher is not present to explain the meaning of certain concepts the respondent may leave the question blank.
6. It does not provide an opportunity for collecting additional information.
7. The respondent can consult others before filling in the questionnaire this response cannot be considered as his own views.
8. There is a lack of depth or probing for a more specific answer.

TESTS

Test is an instrument or systematic procedure for measuring a sample of behavior by posing a set of questions on a uniform manner. A test is a form of assessment. It answers the question how well did the individual performed. It can be either in comparison with others or in comparison with a domain of performance tasks. So we can say – a list is a type of assessment consisting of a set of questions administered during a fixed period of time under reasonably comparable conditions for all students.

Purpose of Testing

The use of psychological testing is to evaluate behavior, cognitive behavior personality traits and other individual and group characteristics in order to assist in making judgments, predictions and decisions about people. To say it specifically list are used for screening applicants for jobs, educational programs etc and to classify and place people in the right contexts. It helps to council and guide individuals and also to prescribe psychological treatment and many more. To get an apt result for the test there is a need to follow same steps.

Steps in the listing program

1. Determining the purpose of testing

The first step in the listing program is to define specifically the purpose of listing and the type of information being sought through testing. As is emphasized by the firsts standard for list users in the code of fair testing practices in education, is critical that the purpose must be clearly defined and that the list matches the purpose.

2. Selecting the appropriate test

To make a proper selection, we must first identify the objectives and specific learning outcome of the instructional program. This is necessary in choosing relevant test irrespective of the size of the group to the tested single

3. Administering the test

The main requirement to administer a test is that the testing procedures prescribed in the test manual be generously followed. When we alter the procedures for administering a published test we lose the basis for a meaningful interpretation of the scores. The administration of the group test is relatively simple.

- a) Motivates the students to do their best
- b) Follow the directions closely
- c) Keep time accurately
- d) Record any significant events that might influence test scores
- e) Collects the materials promptly. Motivates the students

4. Scoring the test

Essay tests may be scored holistically or analytically. For both the examinee should be informed of the methods used. Numerical scores added with written comments and explanations are often helpful in providing feedback on essay test performance.

5. Analyzing and interpreting the scores

Test result can be interpreted in terms of the types of task that can be performed or the relative position held in reference to group. Once refers to what a person can do and the other how the performance is compared with that of others.

6. Applying the results

The object of test is to bring in some change in instruction, educational support or inform some other aspect for which the test was conducted. This cannot be achieved unless the results are interpreted correctly but reported accurately and appropriately to those who have a need the outcomes too must be informed. The feedback that the test administration provides to the test taker and the other relevant authorities are of great importance. These achievement and learning ability test can serve many different purposes in the school educational program.

- They help to identify the level and range of ability among students
- helps to identify areas of instruction needing greater emphasis
- helps to identify learning errors and plan remedial instruction. Helps to identify individual difference and helps to provide individualized instruction

- Exceptional students can be identified and necessary steps can be taken to promote their education through enabling them opt for right course

CASE-STUDY

Case studies is an instructional method that refers to assigned scenarios based on situations in which students observe, analyze, record, implement, conclude, summarize, or recommend. Case studies are created and used as a tool for analysis and discussion. They have a long tradition of use in higher education particularly in business law and as well as in environmental studies.

Cases are often based on actual events which add a sense of urgency or reality. Case studies have elements of simulations but the students are observers rather than participants. A good case has sufficient detail to necessitate research and to stimulate analysis from a variety of viewpoints or perspectives. They place the learner in the position of problem solver. Students become actively engaged in the materials discovering underlying issues, dilemmas and conflict issues of various environmental issues.

Case studies can be either single or multiple-case designs. Single cases are used to confirm or challenge a theory, or to represent a unique or extreme case. Single-case studies are also ideal for revelatory cases where an observer may have access to a phenomenon that was previously inaccessible. Single-case designs require careful investigation to avoid misrepresentation and to maximize the investigator's access to the evidence. These studies can be holistic or embedded the latter occurring when the same case study involves more than one unit of analysis.

Multiple-case studies follow replication logic. This is not to be confused with sampling logic where a selection is made out of a population, for inclusion in the study. This type of sample selection is improper in a case study. Each individual case study consists of a "whole" study, in which facts are gathered from various sources and conclusions drawn on those facts.

Steps in case study

The following steps are followed in conducting a case study.

1. Identification and defining a problem.
2. Collection of information or data from different sources.
3. Descriptive analysis of data.

4. Identifying the causes for the problem/deviation.
5. Suggesting and planning remedial measures.
6. Implementing remedial programme
7. Evaluation of remedial programme and follow up work.

Merits

1. It provides comprehensive and complete information about an individual's behavior in relation to his environment.
2. It is a best method for diagnostic study of the cases.
3. It provides information regarding the behavioral problem of the individual and possible remedial measures to overcome the problem.
4. This method is useful in solving problems of backwardness in learning, reading disability, emotional disturbances, isolation and delinquent behaviors.

Limitations

1. The data or information collected by the individual and his friends may or may not be the true. The information is not verifiable and is highly subjective.
2. Case study is time consuming and a costly method.
3. It needs technically trained person to collect the data and study.
4. The results cannot be generalized and have limited in scope.

UNIT-3: MANAGEMENT AND CONSERVATION OF ENVIRONMENTAL **04 Hours**

3.1 Environment Management – Need, Function and Characteristics.

It is difficult to define the term “environmental management”, because it is understood differently by different experts of different disciplines, the objectives of environmental management are varied, complex and even conflicting in nature.

According to T.O. Riordan (1971), "Management refers to conscious preference from the variety of alternative plans and proposals and further more that such choices involve purposeful commitment to recognize and desired objectives. Managements employ strategies to realize the objectives”.

The theme of environmental management is *"the reduction or minimization of the impact of human activities on the environment, thus efforts to protect the overuse, misuse or environmental resources."*

The environmental strategies are devised for

1. Environmental planning.
2. Environmental status evaluation.
3. Environmental impact assessment.
4. Environmental legislation and administration.

According to Dennis Meadows (1977), "The term environmental management' is generally related to environmental models which assures that food supply will grow with increased capital, annual agricultural inputs and land development; but on the other hand it also includes important limits to all these factors, challenges to be faced and the policies to overcome the problems”.

Environmental management involves socio-economic development of the society on the one hand maintenance of environmental quality' on the other hand. Environmental management is mainly concerned with environmental quality. It is also difficult to define the term environmental quality, because it is a subjective term and it is interpreted in various ways by different experts of various disciplines, because the term environmental management and quality are inter-disciplinary in nature. Environment not only sustains life but enriches life, harmonizing the work of man and nature for the larger good of all.

Need of Environmental Management

It is true that ecological balance and ecosystem stability are duly maintained by nature itself but the modern scientific, technological and industrial developments have

disturbed the ecological balance and ecosystem stability through heavy industrialization, technological revolution faster growth of means of transportation and communication, rapid exploitation of nature resources, large scale land use change, unplanned expansion of urban population and industrial complexes.

Thus, human activities of modern man have disturbed the natural and harmonious relationship between man and environment. Therefore, it is the need of day to employ the concept of environmental management to maintain the ecological balance and stability of ecosystem.

Environmental management is the process to improve the relationship between the environment and man so that 'environment quality' and human society may be improved. This objective can be achieved through check on destructive activities of man, conservation, protection, regulation and regeneration of nature. It is related to the rational adjustment of man with nature involving judicious exploitation and utilization of natural resources without disturbing the ecological balances and ecosystem equilibrium. Environmental management is, therefore, a compromise between ecology balance, ecosystem stability and human socio-economic progress and thus, it need must take into consideration the ecological principles and socio-economic of the society.

Characteristics and functions of environmental management:

The following are the main characteristics and functions of environmental management:

- i) The main function is to maintain ecological balance and stability ecosystem for the welfare of man.
- (ii) It is related to the rational adjustment of man with nature.
- (iii) It involves socio-economic development of society and maintenance of environmental quality.
- (iv) It compromises between ecological balance, ecosystem stability and socio-economic development of man.
- (v) It has two major aspects
 - (a) Socio-economic development and
 - (b) Stability of ecological balances and stability of individual ecosystem in particular.

(vi) There essential prerequisites of environmental management are the conservation of resources and control of pollution.

(vii) Environmental management has three main functions:

(a) Protection of environment and lowering down the level of pollution,

(b) Enhancement of socio-economic values of the environment and its resources

(viii) It evaluates the policies, plans, priorities implemented for the maintenance of the ecological balance and stability of ecosystem in view of the human development.

Dimension of Environmental Management

There are various approaches which are employed for five basic aspects of environmental management

1. Environmental Awareness. Sources, levels and role of the environmental awareness.

2. Environmental Education. At different levels and environmental training.

3. Resources Management. Survey, and classification natural resources preservation of ecological resources and conservation of energy resources.

4. Environmental Impact Assessment or Evaluation. Methods, procedures, production, development, realization of objectives.

5. Control of Environmental Pollution. Regeneration, control and reduction of natural disasters.

3.2 Sustainable Development concept and Need for Sustainable Development.

Sustainable development has been defined in many ways, but the most frequently quoted definition is from *Our Common Future*, also known as the Brundtland Report: "*Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*"

Sustainability can be also defined as "*the practice of maintaining world processes of productivity indefinitely—natural or human-made—by replacing resources used with resources of equal or greater value without degrading or endangering natural biotic systems*". Sustainable development ties together concern for the carrying capacity of natural systems with the social, political, and economic challenges faced by humanity. Sustainability Science is the study of the concepts of sustainable development and environmental science. There is an additional focus on the present generations'

responsibility to regenerate, maintain and improve planetary resources for use by future generations.

The concept of education for sustainable development (ESD) was born from the need for education to address the growing and changing environmental challenges facing the planet. To do this, education must change to provide the knowledge, skills, values and attitudes that empower learners to contribute to sustainable development. At the same time, education must be strengthened in all agendas, programmes, and activities that promote sustainable development. Sustainable development must be integrated into education and education must be integrated into sustainable development. ESD promotes the integration of these critical sustainability issues in local and global contexts into the curriculum to prepare learners to understand and respond to the changing world.

ESD aims to produce learning outcomes that include core competencies such as critical and systematic thinking, collaborative decision-making, and taking responsibility for the present and future generations. Since traditional single-directional delivery of knowledge is not sufficient to inspire learners to take action as responsible citizens, ESD entails rethinking the learning environment, physical and virtual. The learning environment itself must adapt and apply a whole-institution approach to embed the philosophy of sustainable development. Building the capacity of educators and policy support at international, regional, national and local levels helps drive changes in learning institutions. Empowered youth and local communities interacting with education institutions become key actors in advancing sustainable development. It is a great gift of god.

Need for Sustainable Development.

1) Satisfaction of basic human needs and right to economic efficiency and growth. Agenda 21 (of the Earth Summit at Rio in 1992) in its 900 page report –proposal for international funds to eradicate poverty, provide sanitation and clean water to everyone, reduce indoor pollution, meet basic health care needs for all, resources for family planning and education for women.

2) Survival of all life forms. Preservation of Biodiversity at all costs. Different species form part of the food web on which humans rely. For example, if unsustainable

agricultural practices are used in regard to pesticides, bees and other pollinators could be negatively impacted. Without bees, at least 19 major food crops would suffer and nearly 50% of the food in most grocery stores would be non-existent.

3) Preservation of the quality of environment and ecosystem for one's own sake and passing it on to the next generation.(Preventing soil erosion, degradation of forests, preserving mangroves, wetlands etc.)

4) Social Justice --Fairness in sharing the benefits of development between the developed and developing world, the privileged and deprived classes of society. Eg. While the developing countries are struggling to meet their basic necessities the affluent countries are practicing waste consumerism.

5) Sharing a responsibility in terms of emissions. The developed countries are the ones that have fouled up the atmosphere the most they have to cut down the emissions or provide cleaner alternative technologies.

6) People's participation and initiative of the locals. The affected, those at the grass root level to take initiatives or firm stands.

7) Policy making, legislation and a political will to implement.

8) Change of values and ethics. A change in attitudes and lifestyles on part of the developed world is very imperative.

3.3 Agenda 21

Agenda 21 is a non-binding action plan of the United Nations with regard to sustainable development. It is a product of the Earth Summit (UN Conference on Environment and Development) held in Rio de Janeiro, Brazil, in 1992. It is an action agenda for the UN, other multilateral organizations, and individual governments around the world that can be executed at local, national, and global levels.

The "21" in Agenda 21 refers to the original target of the 21st century where they were hoping to achieve their development goals by then. It has been affirmed and had a few modifications at subsequent UN conferences. Since it found 2000 was an overly optimistic date, its new timeline is targeting 2030. Its aim is to achieve global sustainable development. One major objective of the Agenda 21 initiative is that every local government should draw its own local Agenda 21. Since 2015, Sustainable Development Goals are included in the newer Agenda 2030.

Agenda 21 is a declaration accepted by the heads of the states in the Earth summit held at Rio De janeiro (1992) ,Brazil.

The two principles of agenda 21 are:

1. To combat environmental damage, poverty disease through global cooperation an common interests mutual needs and shared responsibilities.
2. Every local government should have there own local agenda 21.

Structure

Agenda 21 is a 351-page document divided into 40 chapters that have been grouped into 4 sections:

- **Section I:** Social and Economic Dimensions is directed toward combating poverty, especially in developing countries, changing consumption patterns, promoting health, achieving a more sustainable population, and sustainable settlement in decision making.
- **Section II:** Conservation and Management of Resources for Development includes atmospheric protection, combating deforestation, protecting fragile environments, conservation of biological diversity (biodiversity), control of pollution and the management of biotechnology, and radioactive wastes.
- **Section III:** Strengthening the Role of Major Groups includes the roles of children and youth, women, NGOs, local authorities, business and industry, and workers; and strengthening the role of indigenous peoples, their communities, and farmers.
- **Section IV:** Means of Implementation includes science, technology transfer, education, international institutions, and financial mechanisms.

The full text of Agenda 21 was made public at the UN Conference on Environment and Development (Earth Summit), held in Rio de Janeiro on 13 June 1992, where 178 governments voted to adopt the program. The final text was the result of drafting, consultation, and negotiation, beginning in 1989 and culminating at the two-week conference.

Implementation

The Commission on Sustainable Development acts as a high-level forum on sustainable development and has acted as preparatory committee for summits and sessions on the implementation of Agenda 21. The UN Division for Sustainable Development acts as the secretariat to the Commission and works "within the context of Agenda 21. Implementation by member states remains voluntary. The implementation

of Agenda 21 was intended to involve action at international, national, regional and local levels. Some national and state governments have legislated or advised that local authorities take steps to implement the plan locally, as recommended in Chapter 28 of the document.

3.4 Conservation of Natural Resources, Reduce, Recycle, Refuse and Reuse.

3.5 Relevant legislative measures.

UNIT-4: INTERNATIONAL EFFORTS ON ENVIRONMENT.

03 Hours

4.1 The Stockholm Declaration, 1972

The United Nations Conference on the Human Environment (also known as the Stockholm Conference) was an international conference convened under United Nations auspices held in Stockholm, Sweden from June 5-16, 1972. It was the UN's first major conference on international environmental issues, and marked a turning point in the development of international environmental politics.

The Conference in Stockholm was the first time that attention was drawn to the need to preserve natural habitats to produce a sustained improvement in living conditions for all, and the need for international cooperation to achieve this. The emphasis was on solving environmental problems, but without ignoring social, economic and developmental policy factors. United Nations Environmental agency organized a World Conference on Environment at Stockholm, the capital of Sweden from 5th to 16th June 1972. It was attended by high level representatives of 114 nations and many environmentalists and nature lovers and was presided by Maurice Strong. It was called the "International Conference on Human Environment, 1972". The Indian delegation led by Prime Minister Indira Gandhi while addressing this conference, drew the attention of the world community to our environmental problems. India, along with other developing countries felt that the environmental problems are more

due to lack of development rather than excessive development. In that conference 150 action plans, 109 other suggestions and 26 principles were approved for promoting the improvement of environment and protection of the delicate environmental balance.

The meeting agreed upon a Declaration containing 26 principles concerning the environment and development; an Action Plan with 109 recommendations, and a Resolution.

Principles of the Stockholm Declaration:

1. Human rights must be asserted, apartheid and colonialism condemned
2. Natural resources must be safeguarded
3. The Earth's capacity to produce renewable resources must be maintained
4. Wildlife must be safeguarded
5. Non-renewable resources must be shared and not exhausted
6. Pollution must not exceed the environment's capacity to clean itself
7. Damaging oceanic pollution must be prevented
8. Development is needed to improve the environment
9. Developing countries therefore need assistance
10. Developing countries need reasonable prices for exports to carry out environmental management
11. Environment policy must not hamper development
12. Developing countries need money to develop environmental safeguards
13. Integrated development planning is needed
14. Rational planning should resolve conflicts between environment and development
15. Human settlements must be planned to eliminate environmental problems
16. Governments should plan their own appropriate population policies
17. National institutions must plan development of states' natural resources
18. Science and technology must be used to improve the environment
19. Environmental education is essential
20. Environmental research must be promoted, particularly in developing countries
21. States may exploit their resources as they wish but must not endanger others
22. Compensation is due to states thus endangered
23. Each nation must establish its own standards
24. There must be cooperation on international issues

25. International organizations should help to improve the environment

26. Weapons of mass destruction must be eliminated

Salient Recommendations of the Stockholm Conference

- i. All possible steps should be taken by States to prevent pollution of the seas by substances that are causing hazards to human health, living resources and marine life.
- ii. Introduction of the concept of Sustainable Development, which was given a definite shape in 1987 by the World Commission on Environment and Development in its report, entitled "Our Common Future".
- iii. Man can transform his environment in countless ways on an unprecedented scale. The protection and improvement of the human environment promotes the well being of people and economic development throughout the world; it is the urgent desire of the people of the whole world the duty of all governments.
- iv. Resources should be made available to preserve and improve the environment.
- v. The task of planning, managing or controlling the environmental resources for improving the quality of environment must be entrusted to appropriate national institutions.
- vi. Scientific research and development in the context of environmental problems, must be promoted in all countries, especially in developing countries.
- vii. In accordance with the provisions of the United Nations Charter and Principles of International Law, States have sovereign rights to exploit their own resources pursuant to their environmental problems.
- viii. International matters concerning the protection and improvement of the environment should be handled in a cooperative spirit by all countries through multinational or bilateral agreements or treaties.

The conference helped to evoke environmental consciousness all over the world. Many nations started enacting laws to protect environment. In fact, the rising environmental awareness resulting in the formation of many environmental organizations and groups all over the world and all the environmental protection laws, protocols and covenants are the aftermath of the Stockholm Conference. The conference declared that June 5 to be observed as the World Environment Day every year.

4.2 Brandt land Commission, 1983

Formerly known as the **World Commission on Environment and Development** (WCED), the mission of the **Brundtland Commission** is to unite countries to pursue sustainable development together. The Chairperson of the Commission, Gro Harlem Brundtland, was appointed by United Nations Secretary-General Javier Pérez de Cuéllar in December 1983. At the time, the UN General Assembly realized that there was a heavy deterioration of the human environment and natural resources. To rally countries to work and pursue sustainable development together, the UN decided to establish the **Brundtland Commission**. Gro Harlem Brundtland was the former Prime Minister of Norway and was chosen due to her strong background in the sciences and public health. The Brundtland Commission officially dissolved in December 1987 after releasing *Our Common Future*, also known as the *Brundtland Report*, in October 1987. The document popularized (and defined) the term "Sustainable Development". ***Our Common Future*** won the University of Louisville Grawemeyer Award in 1991.

In 1983, the World Commission on Environment and Development (WCED) convened by the United Nations was created to address growing concern about the consequences of the accelerating deterioration of the human environment and the natural resources. The outcome of the work by the WCED was the report 'Our Common Future'.

The report was quickly named the Brundtland Report in recognition of the chairman of the WCED, Gro Harlem Brundtland. The report was published in 1987 and was the first to focus on global sustainability. It addressed governments, businesses and, above all, people whose welfare should be a key element for environmental and development policies. It provided a comprehensive overview of the major global environmental crisis and suggestions on how to solve these problems. The Brundtland report placed environmental issues firmly on the political agenda with the aim to discuss environment and development as a single and identical issue.

The report gathered different issues related to environmental problems and launched a comprehensive gateway to sustainability, which included social, economic, political-institutional and environmental criteria. The concept of sustainability created by the WCED has since been used and also redeveloped in the ongoing work with sustainability within different spheres. The Brundtland Report, however, has been criticised for toning down the social dimension of sustainability by organizations who

have worked to maintain the original holistic idea. Among these are The Wuppertal Institute who further processed the Brundtland report.

The Brundtland Report and the concept of sustainability can be seen as an attempt to create awareness of the disturbing relations between human society and the natural environment, focusing on institutional, economic, ecological and social aspects. Sustainability is, however, not a clear cut homogeneous concept. It is a complex concept, which there is in praxis no consensus about, apart from the overall and quite broad principles. Today, the term is very commonly used but in effect the concept of sustainability is actively re-designed for the specific purpose at any given time and context. Nevertheless, the birth of the Brundtland report sustainability concept has influenced environmental laws and planning in a wide range of countries.

The publication of Our Common Future and the work of the World Commission on Environment and Development laid the groundwork for the convening of the Rio Declaration created at the 1992 Earth Summit, the adaptation of Agenda 21 and the establishment of the UN Commission on Sustainable Development.

4.3 Rio-Summit 1992 (Earth Summit)

The United Nations Conference on Environment and Development (UNCED), also known as the Earth Summit, took place in Rio de Janeiro, Brazil, from June 2-14, 1992. It was held twenty years after the United Nations Conference on the Human Environment took place in Stockholm, Sweden. Government officials from 178 countries and between 20,000 and 30,000 individuals from governments, non-governmental organizations, and the media participated in this event to discuss solutions for global problems such as poverty, war, and the growing gap between industrialized and developing countries. The central focus was the question of how to relieve the global environmental system through the introduction to the paradigm of sustainable development. This concept emphasizes that economic and social progress depends critically on the preservation of the natural resource base with effective measures to prevent environmental degradation.

The Rio Declaration on Environment and Development is a set of 27 legally non

binding principles designed to commit governments to ensure environmental protection and responsible development and intended to be an Environmental Bill of Rights, defining the rights of people to development, and their responsibilities to safeguard the common environment. It established the "Precautionary principle" and the principle of "common but differentiated responsibilities". The Declaration recognizes that the only way to have long-term social and economic progress is to link it with environmental protection and to establish equitable global partnerships between governments and key actors of civil society and the business sector.

Principles of Rio Conference

The Rio Declaration is a framework document which is made up of 27 principles; not legally binding similar to the Stockholm declaration adopted 20 years ago. These

Principles are as follows:

Principle 1: Human beings, being at the centre of concerns for sustainable development,

are entitled to a healthy and productive life in harmony with nature.

Principle 2: States have the sovereign right to exploit their own resources with their own environmental and developmental policies. They have the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other states or of areas beyond the limits of national jurisdiction.

Principle 3: The right to development must be fulfilled so as to equitably meet development and environmental needs of present and future generations.

Principle 4: In order to achieve sustainable development, environmental protection should constitute an integral part of the development process and cannot be considered in isolation from it.

Principle 5: All states and all people should get involved in eradicating poverty as an indispensable requirement for sustainable development, in order to decrease the disparities in standards of living and betterment the needs of the majority of the people of the world.

Principle 6: The special situation and needs of developing countries, particularly the least developed and those most environmentally vulnerable, should be given special priority. International actions on environment and development should address the interests and needs of all countries.

Principle 7: States should co-operate to conserve, protect and restore the health and

integrity of the earth's eco system. The developed countries acknowledge the responsibility that they bear in the pursuit of sustainable development in view of the pressures their societies place on the environment and of the technologies and financial resources they command.

Principle 8: To achieve sustainable development and a higher quality of life for all people, states should reduce and eliminate unsustainable patterns of production and consumption and promote appropriate demographic policies.

Principle 9: States should co-operate to strengthen endogenous capacity-building for sustainable development by improving scientific understanding through exchange of scientific and technological knowledge, and by enhancing the development, adoption, diffusion and transfer of technologies, including new and innovative technologies.

Principle 10: Environmental issues are best handled with the participation of all concerned citizens, at the relevant level. At the national level, each individual should have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes. States should facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, should be provided.

Principle 11: States should enact effective environmental legislation. Environmental standards, management objectives and priorities should reflect the environmental and developmental context to which they apply. Standards applied by some countries may be inappropriate and of unwarranted economic and social cost to other countries, in particular, developing countries.

Principle 12: States should co-operate to promote a supportive and open international economic system that would lead to economic growth and sustainable development in all countries, to better address the problems of environmental degradation. Trade policy measures for environmental purposes should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade. Unilateral actions to deal with environmental challenges outside the jurisdiction of the importing country should be avoided. Environmental measures addressing trans boundary or global environmental problems should, as far as possible, be based on an international consensus.

Principle 13: States should develop national laws regarding liability and compensation operate in an expeditious and more determined manner to develop further international law regarding liability and compensation for adverse effects of environmental damage caused by activities within their jurisdiction or control to areas beyond their jurisdiction.

Principle 14: States should effectively co-operate to discourage or prevent the relocation and transfer to other states of any activities and substances that cause severe environmental degradation or are found to be harmful to human health.

Principle 15: In order to protect the environment, the precautionary approach should be widely applied by states. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing cost effective measures to prevent environmental degradation.

Principle 16: National authorities should endeavour to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter-should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment.

Principle 17: Environmental impact assessment, as a national instrument, should be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to decision of a competent national authority.

Principle 18: States should immediately notify other states of any natural disasters or other emergencies that are likely to produce sudden harmful effects on the environment of those states. Every effort should be made by the international community to help states so afflicted.

Principle 19: States should provide prior and timely notification and relevant information to potentially affected states on activities that may have a significant adverse trans boundary environmental effect and should consult with those states at an early stage and in good faith.

Principle 20: Women have a vital role in environmental management and development.

Their full participation is, therefore essential to achieve sustainable development.

Principle 21: The creativity, ideals and courage of the youth should be mobilized to forge a global partnership in order to achieve sustainable development and ensure a better future for all.

Principle 22: Indigenous people and their communities, and other local communities, have a vital role in environmental management and development because of their knowledge and traditional practices. States should recognize and duly support their identity, culture and interest and enable their effective participation in the achievement of sustainable development.

Principle 23: The environment and natural resources of people under oppression, and domination and occupation should be protected.

Principle 24: Warfare is inherently destructive of sustainable development. States should, therefore, respect international law providing protection for the environment in times of armed conflict and co-operate in its further development, as necessary.

Principle 25: Peace, development and environmental protection are interdependent and indivisible.

Principle 26: States should resolve all their environmental disputes peacefully and by appropriate means in accordance with the Charter of the United Nations.

Principle 27: States and people should co-operate in good faith and in a spirit of partnership in the fulfillment of the principles embodied in this Declaration and in the further development of international law in the field of sustainable development.

Main features of the Rio Declaration

The 1992 Rio Declaration on Environment and Development defines the rights of the people to be involved in the development of their economies, and the responsibilities of human beings to safeguard the common environment. The declaration builds upon the basic ideas concerning the attitudes of individuals and nations towards the environment and development, first identified at the United Nations Conference on the Human Environment (1972).

The Rio Declaration states that long term economic progress is only ensured if it is linked with the protection of the environment. If this is to be achieved, then nations must establish a new global partnership involving governments, their people and the key sectors of society. Together human society must assemble international agreements that protect the global environment with responsible development.

4.4 Kyoto Conference and pact on Global warming 1997

Kyoto Protocol, in full Kyoto Protocol to the United Nations Framework Convention on Climate Change, international treaty, named for the Japanese city in

which it was adopted in December 1997 that aimed to reduce the emission of gases that contribute to global warming. In force since 2005, the protocol called for reducing the emission of six greenhouse gases in 41 countries plus the European union to 5.2 percent below 1990 levels during the “commitment period” 2008–12. It was widely hailed as the most significant environmental treaty ever negotiated, though some critics questioned its effectiveness.

The Kyoto Protocol is an international treaty, which extends the 1992 United Nations Framework Convention on Climate Change (UNFCCC) that commits State Parties to reduce greenhouse gases emissions, based on the premise that

(a) Global warming exists and

(b) Man-made CO₂ emissions have caused it. The Kyoto Protocol was adopted in Kyoto, Japan, on 11 December 1997 and entered into force on 16th February 2005. There are currently 192 Parties to the Protocol.

The Kyoto Protocol implemented the objective of the UNFCCC to fight global warming by reducing greenhouse gas concentrations in the atmosphere to "a level that would prevent dangerous anthropogenic interference with the climate system". The Protocol is based on the principle of common but differentiated responsibilities: it puts the obligation to reduce current emissions on developed countries on the basis that they are historically responsible for the current levels of greenhouse gases in the atmosphere.