ENVIRONMENTAL SCIENCE

UNIT-I

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL SCIENCE

Introduction:

We are the same as plants, as trees, as flowers, as birds, as dew drops, as mountains, as oceans, as other people, as the rain that falls. We consist of that which is around us; we are the same as everything. We are part of nature (Environment).

Environment:

The word, 'environment' is derived from the French word 'environ' which means to surrounding.

Each and everything around us is called environment. ***Thus the environment is also defined as "the sum of total, of all living and non- living components around us influencing one another".*** The environment provides resources which support life on the earth and which also help in the growth of a relationship of interchange between living organisms and the environment in which they live.

Environmental science:

Environmental science is the systematic and scientific study of the environment, its biotic (living) and abiotic (non- living) components and their interrelation ship.

Scope of environmental studies:

The scope of environmental studies is vast and wide. Scope means coverage. Environmental study is an important tool to educate the people for protecting the quality of environment. The scope of environmental studies can be discussed as follows:

1. To get an awareness and sensitivity to the total environment and its related problems.
2. To motivate the active participation in environmental protection and improvement.
3. To develop skills for identifying and solving environmental problems.
4. To know the necessity of conservation of natural resources.
5. To evaluate environmental programmes interms of social, economic, ecological factors.

Importance of environmental studies:

The importance of environmental studies can be explained with the following Points.

1. By environmental studies, people will understand the concept of "Need of development with out destruction of Environment"
2. Through environmental studies, people can gain the knowledge of different types of environment and the effects of different environmental hazards.
3. Environmental studies inform the people about their effective role in protecting the environment by changes in laws and enforcement systems.
4. Environmental studies have a direct relation to the quality of life we live.
5. Environmental studies develop a concern and respect for the environment.
6. Man is exploiting resources on a large-scale and with irresponsible manner for his comfort. It results in the destruction of valuable resources. This has disturbed the smooth functioning of an environment and has created many problems.

The Multidisciplinary Nature of Environmental Studies:

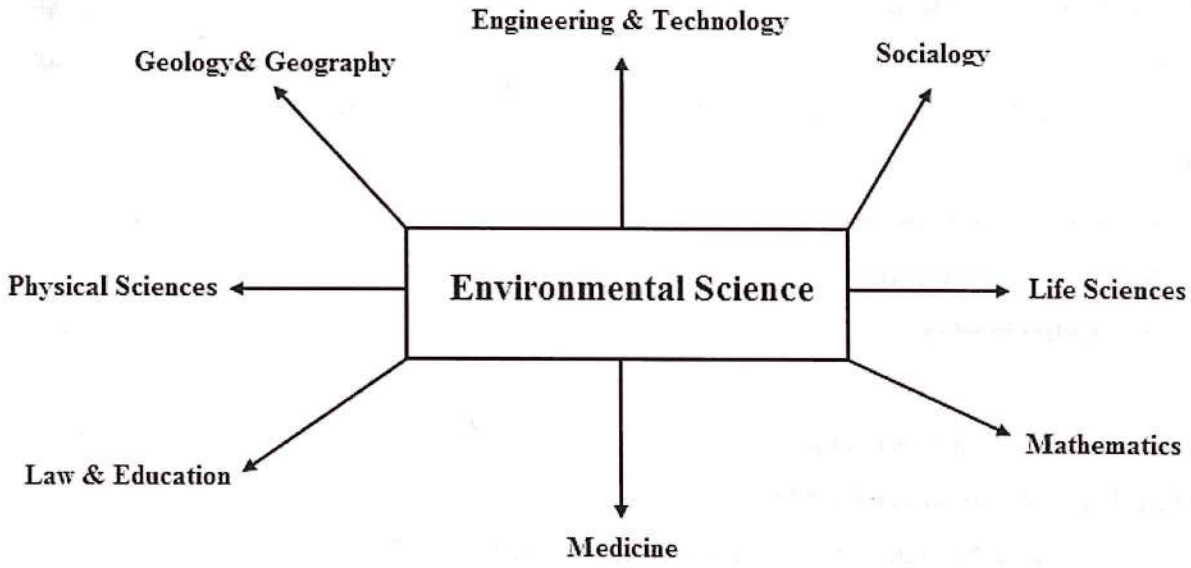

Fig: Multidisciplinary nature of Environmental Science

Fig: Multidisciplinary or interdisciplinary nature of Environmental Science.

1. Environmental studies deal with the interactions between humans and their natural environment.
2. Environment is not a single subject. It is an integration of several subjects that include both Science and Social studies.
3. Basic Physical sciences, management studies, life sciences, technical studies, Economics, law, ethics, social sciences, psychology, philosophy, and even politics are also integrated into environmental studies.
4. We must learn about these fields to understand how and why humans use the environment, and to examine the nature of the relationship between people and nature.
5. It is essential to have some background of the social sciences like Psychology, Sociology, Economics, etc. to examine the behavior of the people.

Need for public awareness:

It is essential to make the public awareness of the environment due to the selfish and irresponsible manner of human beings; they have to face many serious problems. The natural cycles are disturbed. Indifference and ignorance of people towards an environment and loss of values are the main causes that give birth to many environmental problems.

1. Growing Population

2. Poverty

India has often been described a rich land with poor people.

3. Agricultural Growth

4. Need to Ground water:

5. Degradation of Land:

6. Urbanization

Institutions of our Environment:

Wild life Institute of India(WII):

1. It is located in at Dehradun and was established in 1982
2. It is an autonomous Institution of the Ministry of environment and forests.
3. It is considered as an important regional centre for training and education in Wild life management and conservation.
4. Its prime concern is to carryout researchrelavent to conservation and management of wild life resources.

Zoological Survey of India (ZSI):

1. It was established in 1916 at Kolkata.
2. It is in the premier government organization under the ministry of Environment and Forests involved in the field of survey and laboratory investigation on faunal resource of India.
3. It houses more than a million identified specimens from all animal groups.

Botanical survey of India (BSI):

1. BSI was established on 13th February 1890.
2. It is an important research organization under the Ministry of environment and forests.
3. This organization focuses on collection,identification and distribution of botanical materials for use in educational and research Institutions.
4. It will take care of the precious collection in herbaria.
5. Identification of endangered species.

NATURAL RESOURCES

Introduction:

Natural resources are classified into two types are

1. Renewable resources
2. Non renewable resources

Renewable resources: The energy resources which are replenished, which are present naturally and are in continuous supply.

Non renewable resources: The energy resources which are not replenished, which are present in limited quantity.

Natural resources and associated problems:

1. Forest resources
2. Water resources
3. Food resources
4. Energy resources
5. Land resources

Forest resources: One third of the world's land surface is covered with forests. The forests are classified into the following types.

1. Evergreen forests
2. Deciduous forests
3. Conferrous forests

Functions of forests:

1. Forests perform very important functions both to humans and to nature
2. They are habitats to millions of plants, animals, and wild life
3. They recycle rain water and remove pollutants from air
4. They control water quality and quantity
5. They moderate temperature and weather and help to maintain humidity
6. They influence soil conditions and prevent soil erosion and perform water shed function
7. They promote tourism and beauty

Uses of forests:

1. Forests used as fuel.
2. Raw materials as paper, board, timber industries.
3. Like gums, resins, dyes, etc.
4. Are utilized in preparing medicines and drugs.
5. Honey, ivory, etc
6. Mining, grazing, recreation and for dams.
7. Produces O_2 and reduces CO_2.

Over exploitation of forests:

1. Due to over population
2. Increasing agricultural production
3. Increasing industrial activities
4. Increase of demand of wood resources

Deforestation:

It is the process of removal of or elimination of tree resources due to many natural or man made activities in general deforestation means destruction of forests.

Causes of deforestation:

1. Developmental projects
2. Mining operations – mica, coal, manganese, lime stone
3. Raw materials for industries — for making match boxes, furniture
4. Fuel requirements
5. Shifting cultivation
6. Forest fire

Case studies:

1. Deforestation in Himalaya region
2. Disappearing tea gardens in chotanagpur.

Timber extraction:

Due to population growth and lack of alternative fuels, people living near by forest area mostly using wood as fuel. Hence, wood (timber) extraction is increasing day by day.

Uses of timber:

1. Timber is used as raw materials for various wood based industries like pulp and paper, composite wood, furniture, etc.
2. Timber is also used for various developmental activities like railways, boats, and road constructions, etc.

Dams and their effects on forests and tribal people:

Dams are the massive artificial structures built across the river to create a reservoir in order to store water for many beneficial purposes. Dams are built across the river in order to store the water for irrigation hydro electric power generation and flood control most of the dams are built to serve for the more than one purpose called multipurpose dams. **Our country first prime minister Jawaharlal Nehru was said that dams are the golden temples of modern India.**

State	No.of dams
Mahararastra	More than 600 dams
Gujarat	250 dams
Madhya Pradesh	130 dams
Andhra Pradesh	Morethan 30 dams

Tehri dam is the highest dam built across the river Bhagirathi in the state of Uttaranchal

Benefits of dams:

1. Dams are built to control flood and store flood water
2. Some times dams are used for diverting part of water from the river into a channel
3. These are built for generating electricity
4. These are used mainly for drinking and agriculture purposes
5. Navigation and fishery can be developed in the dam areas

Problems of dams:

1. Displacements of tribal people
2. Loss of non forests land and flora and fauna
3. Landslides sedimentation and siltation occurs
4. Stagnation and water logging around reservoirs retards plant growth
5. Reservoir induced seismicity causes earthquakes
6. Sometimes due to structural defects the dam may collapse suddenly and destroy many living organisms.

Water resources:

Water is an important component of all the living beings, nearly 80% of the earth's surface is covered with water all living organisms are made up of 50-65% of water

Examples:

1. A tree is made up of 60% by weight of water
2. Animals are made up of 50-65% of water

Forms of water: Water exists in three phases solid, liquid and gas it is circulated in accordance with the hydrological cycle.

Types of fresh water resources: Fresh water resources may be broadly classified into two types

1. Surface water
2. Standing water bodies: lakes, reservoirs
3. Flowing water bodies: streams, rivers

Important uses of water:

1. Water is mainly used for domestic purposes like drinking, cooking, bathing, washing

2. It is also used for commercial purposes like hotels, theaters, etc.
3. Another important use of water for irrigation, like agriculture, almost 60-70% of water is used for irrigation
4. 20-30% of water is used for industrial operations like refiners, iron and steel, paper industries
5. Water is very essential for the sustainable so all the living organisms

Over utilization of water:

Effects:

1. Decrease in ground water
2. **Ground subsidence:** when the ground water withdrawal is more than its recharge rate the sediments in the aquifer get which results in sinking of over laying land surface this process is called ground subsidence

Problems:

1. Structural damage in the buildings
2. Fracture in pipes
3. Tidal flooding

Intrusion of salt water:

Earth quake and landslides:

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Drying up wells: As **Pollution of water**

Floods:

A flood is an over flow of water, whenever the magnitude of flow of water exceeds the carrying capacity of the channel within its banks.

Causes:

1. Heavy rain fall, melting of snow, sudden release of water from dams, often causes floods in the low lying coastal area.
2. Prolonged down pour can also in the over flowing of lakes, rivers resulting into floods
3. Reduction in the carrying capacity of the channel
4. Deforestation, mining increases the run – off from rains and hence the level of flood raises

Effect of floods:

1. Due to flood water spreads in the surrounding areas and submerges them

2. Due to floods the plain surface have become eroded and silted with mud and sand thus the cultivate in some coastal areas also occur

Drought:

Drought is nothing but scarcity of water, which occurs due to inadequate rainfall late arrival of rains and excessive withdrawal of ground water. Drought is understood from dry weather which persists long enough to produce a serious hydrological imbalance leading to damage of plants, animals, human life

Types of drought

1. **Metrological drought:** It occurs when the total amount of rain fall is less than 75% of the normal rain fall
2. **Hydrological drought:** It occurs when the total amount of less than the average rainfall
3. **Agricultural drought:** It occurs when the shortage of overall rain fall occurs which in turn reduces the ground water and reservoir levels soil moisture agriculture drought
4. **Socio economic drought:** Due to the reduction in the availability of food and social security of people in the affected areas it leads to famine.

Mineral resources

Minerals are naturally occurring substances having definite chemical composition and physicals properties

Formation of mineral deposits:

Concentration of the minerals at a particular spot which can be extracted probability gives rise to minerals deposit.

Due to concentration of minerals during cooling of molten rock. Formation of mineral deposits due to the concentration of minerals during weathering, transport and sedimentation.

The important uses of minerals are as follows:

1. Development of industrial plants and machinery
   Eg: iron, aluminum, copper, etc
2. Construction, housing, settlements
   Eg: iron, aluminum, nickel, etc
3. Generation of energy
   Eg: coal, lignite, uranium, etc
4. Designing defence equipments weapons, ornaments

5. Agriculture purposes, as fertilizers and seed dressings
   Eg: zineb—containing zinc, maneb---containing manganese
6. Jewelery----gold, silver, platinum and diamond
7. Medical purposes, particularly in ayur vedic system
   Eg: sulphur, pyrites.

Mining: It is the process of extraction of raw materials from the mineral deposit.

Surface mining: The process of extraction of raw materials from the near surface deposits

Underground mining: the process of extraction of raw materials below the earth's surface it includes

The environmental damage caused by mining across the ore as follows

1. **Devegetation and defacing land scapeGround water contamination: Surface water pollution:**
2. **Air pollutionSubsidence of land:**

Food resources

Food is most essential requirement for all living organisms, each person has minimum food requirement. The main components of food are carbohydrates, fats, proteins, minerals, and vitamins.

1. **Crop lands:** It mostly produces grains and provides about 76% of the world's food.
   Eg: Rice, meat, barley, sugar cane, potato, etc.
2. **Range lands:** it produces food mainly from the grazing lives stock and provide about 17% of the world's food.
   Eg: Meat, milk, fruits, etc
3. **Oceans:** oceanic fishers supply about 7% of the world's food
   Eg: Fish, prawn, crab, etc.

World food problems:

1. We know that 79% of the total land area of the earth is covered with water only 21% of the earth's surface is land, of which most of the areas are forest, desert, mountains, only very less percentage of the land is cultivated so the food supplied from the rest of the land is not enough to feed all the people. The world population increases and cultivable land area decreases therefore the world food problems arises

2. Environmental degradation like soil erosion, water logging, water pollution, affect agricultural lands
3. Urbanization is another problem on developing countries which deteriorates the agricultural lands
4. Since the food grains like rice, wheat, corn, and vegetable like potato are the major food for all the people all over the world the food problem arises

Salinity:

The water not absorbed by the soil undergo evaporation leaving behind a thin layer of dissolved salts in the top soil this process of accumulation of salts is called salinity of the soil the saline soils are characterized by the accumulation of soluble salts like sodium chloride, calcium chloride, magnesium chloride, sodium sulphate, sodium bicarbonate and carbonates. The P^H of water exceeds 8.0.

Problems: most of the water used for irrigation comes only from canal or ground which unlike rain water contains dissolved salts under dry climates the water gets evaporated leaving behind the salt in the upper portion of the soil. Due to salinity the soil becomes alkaline.

Agriculture

Agriculture is an art science and industry of managing the growth of plants and animals for human life. Agriculture includes cultivation of the soil growing and harvesting crops, breeding and raising livestock, dairying and forestry.

Types of agriculture: two major types of agricultural systems

1. Traditional agriculture
2. Modern agriculture

Traditional agriculture: It involves a small plot simple tools surface water organic fertilizers and a mix of crops they produce enough food to feed their families and to sell it for their income

Modern agriculture: It makes use of hybrid seeds of single crop variety, hi-tech equipments lot of fertilizers, pesticides and water to produce large amount of single crops

Effects of modern agriculture:

1. **Micro nutrient imbalance:**

   the micro nutrient zinc in the soil which affects the productivity of the soil. Most of the chemical fertilizers in modern agriculture contain nitrogen, phosphorous, and

potassium which is macro nutrients when excess of the fertilizers are used in the field it causes micronutrient imbalance.

Eg: excessive use of the fertilizer in Punjab and Haryana has caused deficiency of

2. **Blue baby syndrome:(nitrate pollution)**

   When the nitrogenous fertilizers are applied in the fields they reach deep into the soil and contaminants the ground water the nitrate concentration in the water gets increased when the nitrate concentration exceeds 25mg/lit, they cause serious health problem called "blue baby syndrome". This decrease affects infants and leads even to death

3. **Eurthopication:** a large proportion of N and P fertilizers used in crop fields are washed off by the runoff water and reaches the water bodies causing over nourishment of the lakes this process is known as eurthopication.

Problems using in pesticides:

In order to improve the crop yield lots of pesticides are used in the agriculture.

1. **First generation pesticides:**

   Sulphur, arsenic acid, lead are use to kill the pests

2. **Second generation pesticides:**

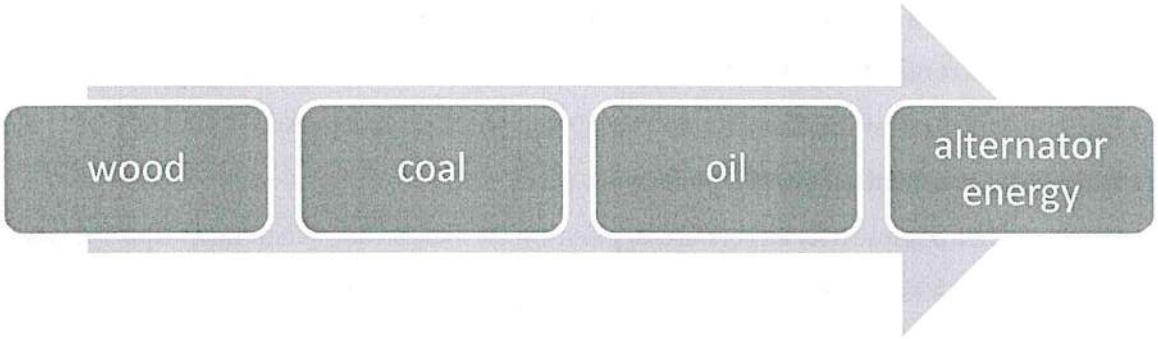
   DDT(di chloro di phenyl tri chloro methane) is used to kill the pests. Although these pesticides our crops huge losses due to pests, they produce number of side effects

   Many of the pesticides are non biodegradable and keep on concentrating in the food chain these process is called biomagnifications these pesticides in a bio magnified form is harmful t o the human beings

Energy resources:

Energy may be defined as **"any property which can be converted into work"** or energy is defined as **" the capacity to do work"**.

Development of energy:



Renewable energy resources:

1. **Solar energy:**
2. **Solar cells or photo voltaic cells:**

   solar battery: when a large number of cells are connected in the series it form a solar battery solar battery produce more electricity

   solar heat collectors: solar heat collectors consist of natural like stones, bricks, materials like glass which can absorb during the dry time and release it slowly at night
3. **Wind energy:** moving air is called wind. Energy recovered from the free of the wind is called wind energy the energy possessed by wind is became of its high speed

   Wind farmsCondition: the minimum speed required for stationary working of a wind generator is 15kmph

   Advantages: it does not came any air pollution ; it is very cheap
4. **Ocean energy:**

Non renewable energy sources:

Coal: coal is a solid fossil fuel formed in several ways as buried remains of land that lived 300-400 million year ago were subjected to intense heat and pressure over millions of years

Various stages of coal: the various stages of coal during the coalification of wood is

The carbon content of anthracite is 90% and is calorific value is 8700 k.cal the carbon content of bituminous, lignite and peat are 80 and 70 and 60 % respectively and India has about 5% of world's coal.

Disadvantages:

1. When coal is burnt produces CO_2, which causes global warming
2. Since coal contains impurities like S and N it produces toxic gases during burning

Petroleum:

Petroleum is a thick liquid consisting of more than hundred of combustible hydro carbons with small amount of S, O, N, M impurities

LPG: the petroleum gas obtained during the cracking and fractional distillation can be easily converted into liquid under high pressure as LPG it is colorless and odorless gas but during bottling some mercaptans is added which produces bad odor there by any leakage of LPG from the cylinder can be detected instantaneously

Natural gas: it is found above the oil in oil well it is a mixture of 50-90% methane and small amount of other hydrocarbons it calorific value ranges from 12000-14000k.cal/m^3

Land resources:

Land is the most important and valuable resources in man kind as it provides food , fire, wood , medicine and other biological materials needed for food, soil is the mixture of in organic materials and organic materials top soil is classified as a renewable resource.

Uses of land resources:

1. Land provide, food, wood, minerals, etc, for us
2. Land natures the plants and animal that provides our food and shelter
3. Land is used as watershed or reservoir
4. Land acts as a dust bin for most of the wastes, created by modern society
5. Land is used for construction of buildings, industries.

Land degradation:

Land degradation is the process of deterioration of soil or loss of fertility of the soil.

Soil Erosion: The process of removal of surface of the soil

Effects: Soil fertility is loss.

UNIT-II

ECO SYSTEMS

Ecology:

Ecology is the study of interactions among organisms (or) group of organisms with their environment.

Ecosystem:

A group of organisms interacting among themselves and with surroundings (i.e., environment) is called as **"ecosystem".**

Examples:

Pond, lake, ocean, forest and desert, Grass land .... etc are some of the examples of the ecosystems.

Structure (or) Components of an ecosystem:

The term structure refers to various components. So, the structure of an ecosystem explains the relationship between the abiotic (non-living) and the biotic (living) components.

Each and every ecosystem has two major components are:

1. Biotic (living) components.
2. Abiotic (Non-living) components.

Biotic Components:

The living components of an ecosystem are called **"Biotic components".** The biotic components of an ecosystem are classified into three types based on how they get their food.

1. Plants (Producers
2. Animals (Consumers) and
3. Micro Organisms (Decomposers)

Producers (or) Autotrophs (Auto=self, troph=feeder):

Self food producing organisms are known as autotrophs. Examples: All green plants and trees.

Producers synthesize their food themselves through photosynthesis. Hence they are also called **"Photo autotrophs".** (photo = light)

Photosynthesis: The green pigments called chlorophyll, present in the leaves of plants, converts CO_2 and H_2O into carbohydrates in the presence of sunlight, and release oxygen into the atmosphere. This process is called **"Photosynthesis".**

$6CO_2 + 12H_2O$ Sunlight (E= hu) $\longrightarrow C_6H_{12}O_6 + 6O_2 + 6H_2O$

Consumers:

Consumers are organisms, which cannot prepare their own food and depend directly (or) indirectly on the producers.

Examples: **Plant Eating Species:** Insects, rabbit, goat, deer, cow, etc.

Animal Eating Species: Fish, lions, tigers, etc.

Depending upon the food habits the consumers are divided into four types.

1. Herbivores (or) Primary Consumers (Plant Eaters)
2. Carnivores (or) Secondary Consumers (Meat Eaters)
3. Omnivores (or) Tertiary Consumers (With plant & meat eaters)
4. Decomposers (dead organism eaters)

Primary Consumers (or) Herbivores:

Animals that eat only plants are called **primary consumers.** They directly depend on the plants for their food. So they are called **Plant eaters.**

Examples: Insects, goat, deer, cow, horse, etc.

Secondary Consumers (or) Carnivores:

Animals that eat other animals are called secondary consumers. They directly depend on the primary consumers for their food.

Examples: Frog, cat, snake & foxes, etc.

Tertiary Consumers (or) Omnivores:

Animals that eat both plants and animals are called omnivores. They depend on both herbivores and carnivores for their food.

Examples: Humans, tigers, lions, rats and fox etc.

Decomposers (or) Saptrotrophs: (Sapros = Rotten, trophos = feeder)

Decomposers attack the dead bodies of producers and consumers and decompose them into simple compounds. During the decomposition inorganic nutrients are released.The organisms which break down the complex compounds into simple products are called decomposers (or) reducers.

Examples: micro-organisms such as bacteria and fungi, etc.

Abiotic Components:

The non-living component of an ecosystem is called **"abiotic component"**

Function of an Ecosystem:

The function of an ecosystem is related to the cycling of materials (matter) and flow of energy.

Types of functions:

Functions of an ecosystem are of three types:

a. **Primary Function:** The producers (plants) can make their food themselves through photosynthesis.

Examples: All green plants and trees.

This process is called primary function of eco system.

b. **Secondary Function:**

The consumers (animals and humans) cannot make their own food. They are always depending upon the producers for their energy.

Examples: Tigers and lions etc.

This is called secondary function of eco system.

c. Tertiary Function:

Decomposers attack the dead bodies of consumers and producers and decompose them into simpler compounds. During the decomposition inorganic nutrients are released.

Examples: Micro organisms like bacteria and fungi, etc.

This is called tertiary function of eco system.

The functions of an ecosystem may be understood by studying the following terms:

a. Food chains
b. Food webs
c. Food pyramids (or) Energy pyramids
d. Energy and material flow.

Food Chain:

The sequence of eating and being eaten in an ecosystem is known as food chain. A food chain always starts with plant life and ends with animal.

1. Anything which we eat to live is called food.
2. Food contains energy.

3. Food can be transferred from one organism to the other.
4. The process of transfer of food (energy) from one organism to a series of organisms is called as **"food chain".**
5. A food chain always starts with a plant life and end with animal life. Thus, a food chain is a picture (or) model that shows the flow of energy from autotrophs (producers) to series of organisms in an environment, as shown in the following figure.

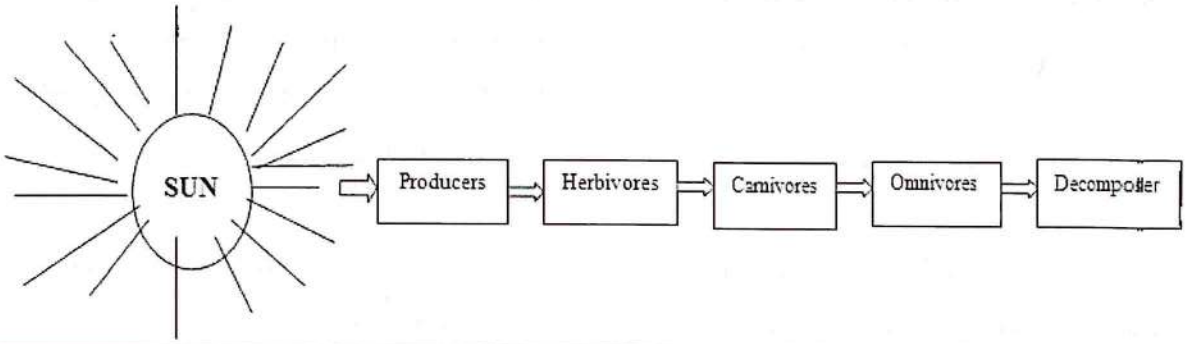


Fig: Schematic representation of food chain.

In fact, all the food chains starts with the sun. The sun provides energy for plants. The producers (plants) can make their food themselves with the help of the sunlight, chlorophyll, water and air. The consumers, including animals and humans, cannot make their own food. They are always depending upon the producers for their energy.

Decomposers are the micro-organisms that break down the dead animals and plants and release nutrients that become part of the soil, which are re-used by new plants, back to the starting point of the food chain.

3.8.2 Aquatic food chain :

This food chain is slightly different from terrestrial food chain.It is seen in aquatic (water) eco system.Food chain in water is called "**Aquatic food chain".**

Example:

Marine food chain **Example:** Ocean

Fresh water food chain **Example:** Pond, lake, river, streams, etc.

Food chain in a pond:

Phytoplankton ⟶ Zoo Plankton ⟶ Small fish ⟶ Large fish ⟶ Man

Marine Food chain:

Sea Weeds ⟶ Small fish ⟶ Large fish ⟶ Sharks and other animals

Food Web:

The interlocking pattern of various food chains an ecosystem called food web.

1. Web means "network" such as spider's web, World Wide Web (WWW.) etc.
2. So, food web is a network of food chains.
3. In a food web many food chains are inter connected, where different types of organisms are connected at different tropic levels, so that there are a number of options of eating and being eaten at each tropic level. Thus, therefore the interlocking pattern of various food chains are called food webs and as shown in following figure.

This food web shows many linear food chains <as shown in figure>. These linear food chains are inter connected with other food chains operating in the eco system to form a food web. The grazing food chains are as follows:

i. Grains → Mouse → Cat

ii. Grains → Mouse → Hawk

iii. Grains → Mouse → Snake → Hawk

iv. Grass → Insect → Sparrow → Hawk

v. Grass → Insect → Lizard → Snake → Hawk

vi. Grass → Insect → Sparrow → Snake → Hawk

The above food web is a simple one. Much more complex food webs do exist in nature.

Ecological Pyramids:

"Graphical representation of structure and function of tropic levels of an ecosystem are called ecological pyramids".

1. The concept of ecological pyramids was first developed by British ecologist Charles Elton in 1927.
2. Ecological pyramids are the graphical representation of tropic structures in which the tropic levels (i.e., tiers) are depicted in successive stages.
3. An ecological pyramid is shown in the following figure.

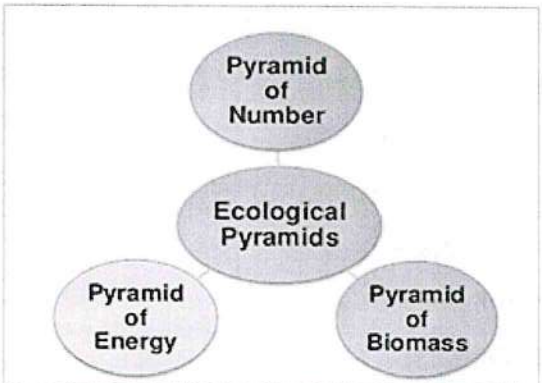


Fig: ECOLOGICAL PYRAMIDS

In ecological pyramids, tropic levels are shown in the following manner:

1. The producers represent first tropic level in the ecological pyramid.
2. The herbivores (or) primary consumers represent second tropic level in the ecological pyramid.
3. The carnivores (or) secondary consumers represent third tropic level in the ecological pyramid.
4. The omnivores (or) tertiary consumers represent fourth tropic level in the ecological pyramid.

On the basis of the number of organisms, the biomass of organisms and energy flow in organist population. Three types of ecological pyramids are:

1. Pyramid of numbers.
2. Pyramid of biomass
3. Pyramid of energy.

Pyramid of numbers:

1. It shows the number of individual organisms present in each tropic level.
2. It is expressed in numbers per unit area.

Depending upon the type of ecosystem, we have three types of pyramid of numbers.

1. Upright pyramid of numbers.
2. Partly upright pyramid of numbers.
3. Inverted pyramid of numbers.

1. Upright Pyramid of numbers:

The number of individual organisms gradually decreases from lower tropic level to higher tropic

level is called ***"upright pyramid of numbers".***

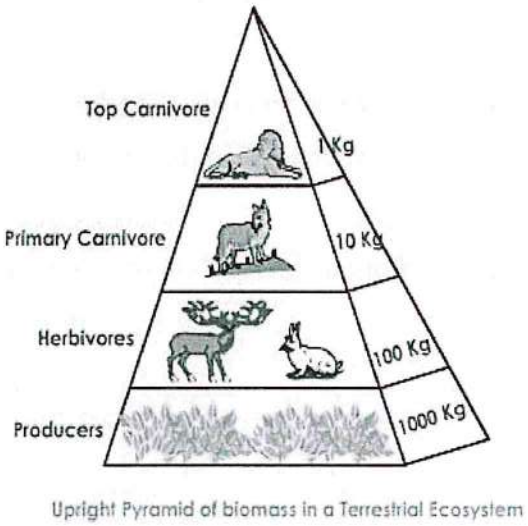
Pyramid Of Biomass:

- It represents the total amount of biomass (mass (or) weight of biological material (or) organism) present in each tropic level.
- It is expressed in gram per unit area.
- Depending upon the type of ecosystem, we have two types of pyramid of biomass.
  a. Upright pyramid of biomass.
  b. Inverted pyramid of biomass.

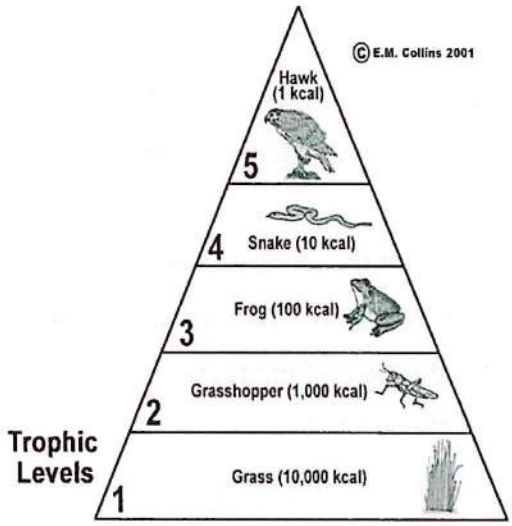
a. **Upright Pyramid Of Biomass:**

The pyramid of biomass gradually decreases from the produce level (or) first tropic level to consumer level (higher tropic level) is called **"upright pyramid of biomass"**

A forest ecosystem showed an upright pyramid of biomass. In this ecosystem, the biomass decreases from the producer level to consumer levels (as shown in figure)



Upright Pyramid of biomass in a Terrestrial Ecosystem



Pyramid of Energy:

- It represents the amount of flow of energy in each tropic level.
- It is expressed in calories per unit area per year.
- In an eco system, the energy flows from producer level to the consumer level. At each successive tropic level, there is a huge loss of energy (about 90%) in the form of heat, respiration, etc. Thus, at each next higher level only 10% of the energy passes on. Hence, there is a sharp decrease in energy at each and every producer to omnivores (or) top carnivores. Therefore, the pyramid of energy is always upright as shown in figure.

Types of Ecosystems: Grassland, Forest, Desert Cropland Ecosystem and water Ecosystem:

Forest Ecosystem:

Forest: A forest is a large area of land covered with many trees and many animals. Forests occupy roughly 40% of the total land. In India about l/10th of the total area is under forests. All the above types of forests have their own typical fauna and flora. Depending on climatic conditions the forests have been divided into the following categories:

1. Tropical forests
2. Ever green forests
3. Subtropical forests
4. Temperate forests

Components of a forest ecosystem:

Abiotic components:

The abiotic components in forests to minerals present in the soil, and the forest floor is rich in dead and decaying organic matter.

Biotic components:

Producers:

In forest ecosystem, the producers form the major functions plants are mainly trees, some shrubs and

ground vegetation.

Consumers:

1. **Primary consumers:**

   These are the herbivores that include the arthropods such as ants, flies, beetles, leaf-hoppers, bugs and spiders, etc.

2. **Secondary consumers:**

   These are the carnivores like snakes, birds, lizards and foxes feeding on herbivores.

3. **Tertiary consumers:** The top carnivores like lion, and tiger etc,

Decomposers:

The decomposers of the forest ecosystem, as like in other ecosystem, are the bacteria and fungi. These organisms obtain energy to carry on the life functions by breaking down the organic compounds of dead organic matter and organic wastes.

Desert Ecosystem:

Deserts: Deserts are often defined as areas that receive less than 10 inches of average annual rain fall. Therefore desert is dry, barren areas, and silent. Not drop of water for months. The deserts occupy about 17% of the total land. Due to extreme of temperature, the species composition of desert ecosystem is less varied and typical.

Components of a desert ecosystem:

Biotic components:

Producers: The main producers in deserts are shrubs, bushes, grasses and some trees. These store water in their stem to be used during the time of water scarcity. Some plants such as lichens, xerophytic mosses and blue green algae and etc.

Consumers: Only a few animals are found in deserts.The most common animals are those reptiles and insects which are able to live under xeric conditions. Mammals are represented by a few species of nocturnal rodents. Some birds are present. The camel, called the ship of desert, feeds on tender shoots of the plants and conserves large quantities of water in its stomach. The larger animals including carnivores are scarce. The desert animals have various morphological and physiological adaptations which enable them to live in such extreme environment.

Decomposers:

Due to poor vegetation and less amount of dead organic matter decomposers are few. They are thermophilic fungi and bacteria.

Aquatic ecosystem:

Water is a color less, tasteless. And odour less substance that is essential to all forms of life that we know of. All known forms of life need water. Water is very important life for all living organisms.

Types of Water ecosystems:

Aquatic ecosystems are classified into the following types: 1. Fresh ware ecosystem and

2. Marine ecosystem

Types of fresh water Ecosystems:

1. Lake ecosystem
2. Pond ecosystem
3. River ecosystem

]Components of Aquatic ecosystem:

Abiotic components: Temperature Sun light, organic and in organic matter etc.

Biotic components: The living components in the water ecosystem are biotic components

1. **Producers:** Producers like water plants, Phytoplankton and Macrophytes.
2. **Consumers:** Zoo Plankton, insects, Small fish and herbivores etc.
3. **Decomposers:** The common decomposers of Aquatic ecosystem are like Bacteria and Fungi.

BIODIVERSITY AND ITS CONSERVATION

Bio means 'life' and diversity means 'variety. Hence biodiversity refers wide variety of life on the earth. The variation in living organisms is called biodiversity. Biodiversity is defined as "the variety and variability among all groups of living organisms and the ecosystem in which they occur".

Value of Biodiversity :

Biosphere is a life supporting system to the human beings.It is the combination of different organisms. Each organisms in the biosphere has its own significance . Biodiversity is virtual for healthy biosphere. Biodiversity is must for the stability and proper functioning of the biosphere.

The values of biodiversity have been classified as follows,

Consumptive Use Value :

These are the direct use values , where the biodiversity products are harvested and consumed directly.

Examples: Food,drug,fuel etc.

1.Food : A large number of wild plants are consumed by human beings as food. Nearly 80-90 % of our food crops have been domesticated only from the tropical wild plants.A large number of wild animals are also consumed as food.

2.Drugs: Around 70% of modern medicines are derived from plant and plant extracts.20,000 plant species are believed to be used medicinally,particularly in the tradition system of Unani,Ayurveda and Sidha .

Examples:

1. Germany alone uses morethan 2,500 species of plants for medicinal purposes in Homepathy and other systems of medicines.
2. India uses 3000 species of plants in Ayurveda,Homepathy and Unani system of medicines.
3. According to research about 85% of global community use plants for primary health care.
4. Life saving drugs like quinine (Malaria), reserpine(hypertension), pencillin (antibiotic) and Morphine (pain kill) are all of plant origin.

3. Fuel: Fire woods are directly consumed by villagers tribals. The fossil fuels like coal,petroleum and natural gas are also the products of fossilized biodiversity.

Productive Use Values:

Biodiversity products have obtained a commercial value. These products are marketed and sold. These products may be derived from the animals and plants.

Animal Products:

Animal product		**Animal**
1. Silk	-	Silkworm
2. Wool	-	Sheep
3. Musk	-	Muskdeer
4. Leather	-	All animals
5. Food	-	Fish and animals.

Many industries are dependent upon the productive use values of biodiversity.

Plants products for various industries:

Plant product		**Industry**
1. Wood	-	Paper, plump industry, plywood industry.
2. Cotton	-	Textile industry
3. Fruits, Vegetables	-	Food industry
4. Leather	-	Leather industry

Rice accounts for 22% of the cropped area and cereals accounts for 39% of the Cropped area.

Threats to Biodiversity:

Any disturbance in an natural ecosystem tend to reduce its biodiversity. The waste generated due to increase in human population and industrialization, spoils the environment and leads to more diversity in biological species. Any change in the normal ecological cycle.

Causes for loss of biodiversity

1. Habitat loss.
2. Poaching of wildlife
3. Man wild life conflicts.

Habitat Loss:

The loss of populations of interbreeding organisms is caused by habitat loss.Habitat loss threatened a wild range of animals and plants.

Factors influencing Habitat loss are:-

1. Deforestation.
2. Destruction of wet lands
3. Raw Material
4. Production of drugs
5. Illegal Trade
6. Developmental Activities.

Poaching (Over harvesting) of wildlife:

Poaching means killing of animals (or) commercial hunting. It leads to animal loss of animal biodiversity.

1. Subsidence Poaching:

Killing animals to provide enough food for their survival is called subsistence poaching.

2. Commercial Poaching:

Hunting and killing animals to sell their products is called commercial poaching.

Factors Influencing Poaching:

1. Human population.
2. Commercial Activities.

Man wildlife Conflicts:

Man-wildlife conflicts arise, when wildlife starts causing immense damage and danger to the man. Under each condition it is very difficult for the forest department to compromise the affected villagers and to gain the villagers support for wildlife conservation.

Examples for man-wildlife conflicts:

1. In Sambalpur, Orissa, 195 humans were killed in the last 5years by elephants. In retaliation, the
2. villagers have killed 98 elephants and badly injured 30 elephants.
3. In the border of Kote-chamranja nagar, Mysore, several elephants were killed because of the massive damage done by the elephants to the farmer's cotton and sugarcane crops.
4. It has been reported that a man-eating tiger killed 16 Nepalese people in powai, Mumbai.
5. Very recently, two men were killed during 19 attacks by the leopards in sanjay Gandhi National Park, Mumbai.

Endangered an Endemic Species of India:

Biologists classify the species into various types.

Endangered Species:

A Species is said to be endangered when its number has been reduced to a critical level. Unless it is protected and conserved, it is in immediate danger to extinction.

Extinct Species:

A species is said to be extinct, when it is no longer found in the world.

Rare Species:

A Species is said to be rare, when it is localized within restricted area (or) more extensive area.

Endangered Species of India:

In India 450 plant species have been identified as endangered species. About 100 mammals and 150 birds are estimated to be endangered species. But India's Biodiversity is threatened due to habitat destruction, degradation and over exploitation of resources.

Factors Affecting Endangered Species:

1. Pollution
2. Over-Exploitation.
3. Climate change.

Endemic species of India:

The Species, which are found only in a particular region are known as endemic species. In India of 47,000 species of plants 7000 are endemic. Out of 81,000 species of animals in our country a large number is endemic. The Western ghats are particular rich in,

1. Amphibians (frog, food etc)
2. Reptiles (lizards, crocodiles etc)

Examples for Endemic Fauna Species:

Monitor lizards (varanus), reticulated phyton and Indian Salamander.

Endemic speices of plants:

Group	No of speices
Pteridophyta	200
angiosperms	4,950

Endemic speices of animals:

Group	No of speices
Land	878
Freshwater	89
Amphibian	110
Repticia	214
Aves	69
Nannakua	38

In-situ and Ex-situ conservation of Biodiversity:

(or) (Types (or) strategy of biodiversity conservation):

Conservation:

Conservation is the protection, preservation, management, or restoration of wildlife and natural resources such as forests and water. Through the conservation of biodiversity the

survival of many species and habitats which are threatened due to human activities can be ensured.

There are two types of diversity conservation

1. In - situ conservation (within habitat).
2. Ex - situ conservation (out side habitat).

In-situconsrvation:-

In-situ conservation involves the protection of fauna and flora with in its natural habitat, where the species normally occurs are called in-situ conservation.

The natural habitats (or) ecosystems maintained under in-situ conservation are called "protected areas".

Important In-situ conservation:

Biosphere reserves, national parks, wildlife sanctuaries.

Methods of In-site conservation: Around 4% of the total geographical area of the country is used for in-situ conservation. The following methods are presently used for in-situ conservation.

Table: In-situ conservation methods and their available numbers.

S.No	In-situ conservation	Number available
1.	Biosphere reserves	7
2.	National parks	80
3.	Wildlife sanctuaries	420
4.	Botanical Gardens	120

1. Biosphere Reserves:

Biosphere reserves cover large area, morethan 5000sq.km. It is used to protect species for long time.

Role of Biosphere Reserves:

1. It gives long-term survival of evolving ecosystem.
2. It protect endangered species.
3. It protect maximum number of species and communities.
4. It serves as site of recreation and tourism.
5. It is also useful for educational and research purposes.

1. **National Park :**

A national park is an area dedicated for the conservation of wildlife along with its environment. It is usually a small reserves covering an area of about 100 to 500 sq.kms. Within the biosphere reserves, one or more national parks are also exists.

Role of a National Park :

1. It is used for enjoyment through tourism, without affecting the environment.
2. It is used to protect, propagate and develop the wildlife.

Ex-Situ Conservation:

Ex-situ conservation involves protection of fauna and flora outside the natural habitats. This type of conservation is mainly done for conservation of crop varieties and the wild relative of crops.

Important Ex-situ conservation:

Botanical gardens, seed banks, microbia culture collections, museums,zoological gardens .

Methods of Ex-situ conservation:

The following important seed bank facilities are used in Ex-situ conservation.

1. National Bureau of plant Genetic Resources (NBPGR):

It is located in located in New Delhi. It was cryo preservation techniques to preserve agricultural and horticultural crops.

2. National Bureau of Animal Genetic Resources(NBAGR) :

It is located at Karnal, Haryana. It preserves the semen of domesticated bovine animals.

Advantages of Ex-situ Conservation: In captive breeding animals are assured food , water shelter and also security and hence longer life span.

1. It is carried out in cases of endangered species, which donot have any changes of survival in the wild.

Disadvantages of Ex-situ conservation:

1. It is expensive method.
2. The freedom of wildlife is lost.
3. The animals cannot survive in natural environment.

***In Situ* Conservation Methods:**

In-situ conservation, the conservation of species in their natural habitats, is considered the most appropriate way of conserving biodiversity.

***Ex Situ* Conservation Methods:**

Ex-situ conservation is the preservation of components of biological diversity outside their natural habitats. Gene banks, e.g. seed banks, sperm and ova banks, field banks;

1. In vitro plant tissue and microbial culture collections;
2. Captive breeding of animals and artificial propagation of plants, with possible reintroduction into the wild; and
3. Collecting living organisms for zoos, aquaria, and botanic gardens for research and public awareness.

In-situ and ex-situ conservation:

Conservation can broadly be divided into two types:

In-situ: Conservation of habitats, species and ecosystems where they naturally occur. This is in-situ conservation and the natural processes and interaction are conserved as well as the elements of biodiversity.

Ex-situ: The conservation of elements of biodiversity out of the context of their natural habitats is referred to as ex-situ conservation. Zoos, botanical gardens and seed banks are all example of ex-situ conservation. In-situ conservation is not always possible as habitats may have been degraded and there may be competition for land which means species need to be remember.

ENVIRONMENTAL POLLUTION AND SOLID WASTE

Environmental Pollution:

The Un favorable alternation of our Surroundings is called Environmental pollution.(or) The excess discharge of any substances into the environment which effects the quality of it and causing damage to human, plants and animals is called environmental pollution.

Air pollution:

Undesirable contaminate of smoke, odour, chemical particles and dust in atmosphere which are causing damage to human health, plants and animals is called air pollution.

Composition of Atmosphere:

The composition of atmosphere is

Constituent of atmosphere	percentage
Nitrogen	78%
Oxygen	21%
Carbon dioxide	0.032%
Argon	Less than 1
Water moisture and others	Very less %

Causes of Air Pollution:

1. Population
2. Industries
3. Urbanization
4. Deforestation
5. Vehicles – emission
6. Another activities of human beings

Sources of Air Pollution:

1. Natural Sources: The pollutants which are caused by natural sources.
   Eg: volcanic eruptions, forest fires, radio active materials, biological decay.
2. Man made activites: These pollutants caused by man made activities.

Eg: industries, vehicle emissions, agricultural activities, thermal power plants.

Types of Air Pollutants:

Based on form of pollutant present in the atmosphere the air pollutant is also into two types.

1. **Primary Pollutants:** The pollutants which are directly released by natural sources into the environment and man-made activities. These types of pollutants are called primary pollutants.

   Eg: Carbon oxides-CO, CO_2

   Sulphur oxides-SO_2, SO_3

   Nitrozen oxides-NO, N_2O, NO_2

2. **Secondary Pollutants:** Primary pollutants which react each other (or) composition of atmosphere forms new pollutants, these pollutants are called secondary pollutants.

   Eg: nitric acid, sulphuric acid, carbonic acid, etc.

Hydro carbons: hydro carbons gets accumulated due to the decay of the vegetable matter.

Sources: agriculture, decay of plants, etc.

Health effects: carcinogenic (cancer).

Suspended particulate matter: it includes single particles or mining of variety of particles. They can be having in atmosphere for short period to long period.

Sources: 1. Burning coal in power plants and industrial plants.

2. burning diesel in vehicles.

Health effects: 1. ENT irritation 2. Lung damage 3. Asthma etc.

Effects: 1. Typhoid 2.malaria 3. Cholera.

Inorganic Chemicals:

Eg: water soluble in organic chemicals.

Acids: HCL,H_2SO_4,HNO_3,ETC.

Salts: $MgCL_2$,NaCl,$Cacl_2$.

Sources: 1. Surface run off 2. Industrial effluence 3. House hold cleansers.

Effects: 1.Skin cancer and neck damage 2. Damage of nervous system 3. Damage of liver and kidneys.

Organic Chemicals:

Eg: oil, kerosene, petroleum products, plastics, pesticides, detergents,.

Sources: 1. Industrial effluence 2. House hold cleansers 3. Surface run off.

Effects: 1. Damage the nervous system 2. Leads to the cancer

Plant nutrients:

Eg: nitrates, phosphates, ammonium ions. NH_2-amine, NH_3- ammonia

Sources: 1. Surface run off 2. Runoff agricultural fertilizer.

Effects: 1. Kill the fishses 2. In drinking water increases of nitrates concentration. So the oxygen carrying capacity of the blood is decreases can kill the children and infants.

Sediments:

Eg: sand, mud.

Sources: 1. Soil erosion

Effects: 1. Reduce photosynthesis 2. Destroy of fish 3. Disturb aquatic food web.

Water Pollution:

Any physical, chemical and biological change in quality of water that causes harmful effects of human and aquatic life is known as water pollution.

Sources of water pollution:

Sources of water pollution are two types 1.Point source pollution 2.Non point source pollution

Point source pollution: Point sources are discharge of pollutants at specific location. This type of pollution is known as point source pollution.

1. Industrial wastage 2. Municipal wastage

Non point source Pollution:

Non point sources are discharge pollutants cannot at specific area used large land areas. This type of pollution is known as non point source pollution.

1. Construction sites 2. Agricultural lands 3. Animal wastage areas.

Causes of water pollution:

1. Infectious agents (Bacteria, virus, fungi etc)
2. Oils and greeze
3. Sediments
4. Agricultural wastages

Control measures of Water Pollution:

1. The administration of water pollution control should be taken state and central govt. boards.
2. Public educate for conservation of water pollution and effects of water pollution.
3. Public awareness of water pollution gives a programs on televisions, radios, newspapers.
4. Rivers, streams, lakes, and wells should be protect from water pollution.

5. Developing economical methods of water treatment
6. from the industry is carried.

Water related diseases:

More than 2 million people die each year from diseases such as cholera, typhoid, and dysentery that are spread by contaminated water or by a lack of water for hygiene. These illnesses have largely been eradicated in developed nations, although outbreaks can still occur.

Water-related illnesses fall into four major categories:

1. **Waterborne diseases**, including cholera, typhoid, and dysentery, are caused by drinking water containing infectious viruses or bacteria, which often come from human or animal waste.
2. **Water-washed diseases**, such as skin and eye infections, are caused by lack of clean water for washing.

Types of Waterborne Diseases:

1. **Amebiasis:** caused by protozoa. Symptoms include fatigue, diarrhea, flatulence, abdominal discomfort and weight loss.
2. **Campylobacteriosis:** caused by bacteria. Symptoms include diarrhea, abdominal pain and fever.
3. **Cholera:** caused by bacteria. Symptoms include muscle cramps, vomiting and diarrhea.
4. **Cryptosporidiosis:** caused by protozoa. Symptoms include diarrhea and abdominal discomfort.
5. **Giardiasis:** caused by protozoa. Symptoms include diarrhea and abdominal discomfort.
6. **Hepatitis:** caused by a virus. Symptoms include fever, chills, jaundice, dark urine and abdominal discomfort.

Soil Pollution:

Soil pollution is defined as the contaminated of soil by human and natural activities, which causes harmful effects to all living organisms.

Composition of soil:

1. Mineral matter or in organic matter: 45%
2. Organic matter-5%
3. Soil air-25%
4. Soil water-25%

Sources and causes of soil pollution:

1. **Industrial waste:** disposal of industrial waste into the soil leads to soil pollution.
   Sources: 1.pulp and paper industries 2. Chemicals and drug industries 3. Sugar factories 4.cement and glass industries 5.Textile industries. 6. Fertilizers companies.
2. **Urban waste:** both chemical and commercial waste is called urban waste.
   Eg: plastics, paper, glass, street sweeping.
3. **Agricultural practice:** Modern agricultural products lead to soil pollution.
   Eg: more concentration of fertilizers and pesticides.
4. **Inorganic chemicals:** These are using increasing of crop yields but these are mixed with soil and lead to soil pollution.
5. **Radioactive waste:** Storage and disposal of radioactive wastage is the main source of soil pollution.
   Eg: nuclear reactors releases radioactive waste like
   a) Barium-Ba^{140}
   b) Iodine-I^{131}
   c) Lanthanum-Ln^{140}

Effects of soil pollution:

1. Toxic substances are mixed with soil this leads to reduces of plant growth and human life.
2. Soil pollution decreases the productivity of crop yield
3. Soil pollution leads damage of flora and fauna species.
4. Nervous disorders respiratory problems and joint pain etc.

Noise Pollution:

1. Noise pollution is defined as un wanted and un pleasant sound that causes discomfort for all living organisms like human and animals

2. Noise or sound intensity is measured in decibels (1 decibel=faintest sound) a human ear can hear
3. It has been found that environment noise is doubled for every year

Types of noise pollution: the source of noise pollution is classified into 3 types 1. Industrial noise. 2. Transport noise pollution.3.neighbour hood noise pollution

1. Industrial noise pollution: it is the main source of noise pollution

1. High intensity sound comes from many machines present in industries
2. So industrial noise pollution is nuisance to public
3. It is observed that by the institute of "otorino" in Chennai increases of industrial pollution and

about 20 % of workers are suffering from hearness

2. Transport noise pollution: it is also main source for noise pollution. Transport noise pollution includes **Road traffic noise, Railway traffic noise, Air-craft noise.**

3. Transport noise road traffic noise is main source because increases of enormous amount of motor

vehicles.

4. Road traffic noise is very high sound intensity in crowded cities and towns

A survey conducted in metropolitan society and it is observed that road traffic noise is very high.

Neighborhood noise pollution:

1. Neighborhood noise pollution including from household and community
2. In neighborhood noise creates music instrument , loud speakers, etc.

Effects of noise pollution: noise pollution effects both human and animal life

1. Contraction of blood vessels leads to high BP
2. Mental stress(anxiety, less sleepy)
3. Heart attack
4. Birth defects and also abortion
5. Damage of kidneys, liver, and causes deaf

Control measures of noise pollution:

1. Source control: it is modification of source such as change of design of the instrument and also limited operating hours
2. Oiling: proper oiling of machines will reduce noise from them
3. People educate about noise pollution and their effects
4. Strictly enforcing noise pollution act

5. Planting of plants and trees along road sides
6. Avoided noise pollution vehicles and honking of horns

SOLID WASTE MANAGEMENT:

Solid waste: The waste generated and discarding from human and animal activities that are normally in solid form is known as solid waste.

Flow chart of solid waste management:

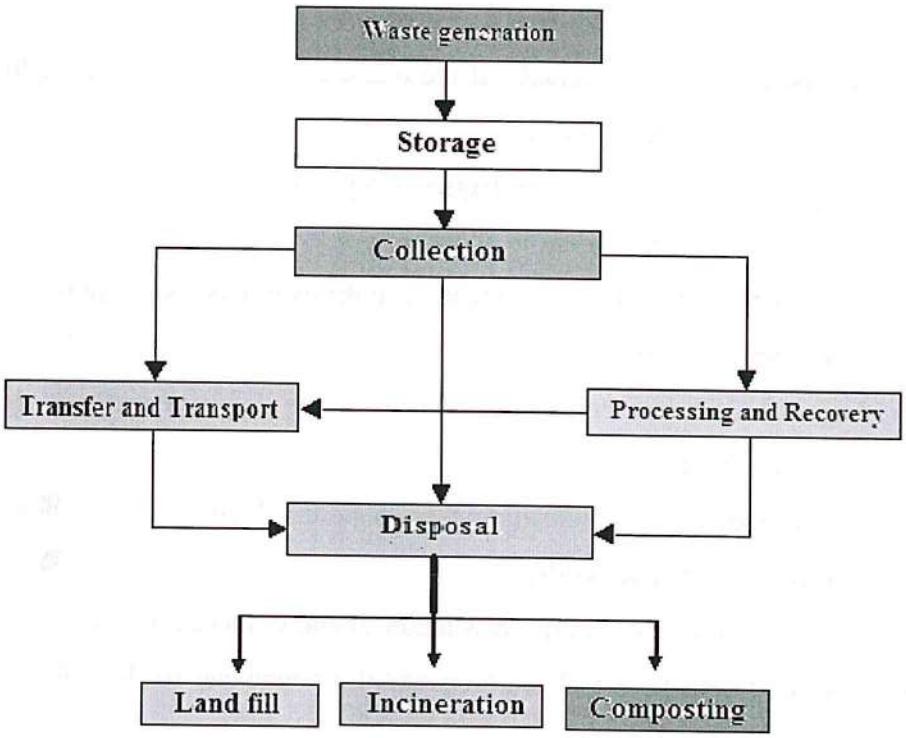


Fig:Flow chart Proocess of Solid - waste management

Types of solid waste:

Based on sources of solid waste it can be classified into 3 types

1. Urban or municipal waste
2. Industrial waste
3. Hazard waste
4. Electronic waste

Sources or causes of urban and industrial waste:

Domestic waste: It includes the waste coming out from homes

Eg: food waste, paper waste, polythene bags

Commercial waste: it includes the waste coming out from shops, institutions, markets, hotels, etc

Eg: wood, concrete, etc

Constructional waste: it includes the waste coming out from the constructional activities (wood, concrete)

Industrial waste: Industrials is also releases a large amount of solid waste

Control measures of solid waste or solid waste management:

Steps involved in the process of solid waste: Solid waste management includes two steps

Step 1: a) Reduce b) Re-use c) Re cycling i.e **3-R approach**

Step 2: discharging waste or disposed waste

a) **Reduce of usage of raw materials:** if the usage of raw materials are reduced the generation of waste is also reduced

   Eg: take your own basket or carrier bags when you going to shop

   reduce of usage of glass jars for storage.

b) **Re- use the waste materials:** re use means you throw things away can it used again.

   Eg: clothing, furniture, sports, etc

c) **Re-cycling of waste materials:** re cycling is the re processing of discarded materials nto use ful new products.

   Eg: preparation of cellulose insulation from paper, New cans and new bottles prepared from old cans and bottles

The above process save money energy raw material and reduces pollution

Step-2: Discarding or disposed waste: discarding of solid waste can be done by following any method

1) Land fill 2) Incineration 3) Composting

Land fill: This process involves spreading the solid waste on the ground and then covering with soil after few years this land is used for small buildings.

Advantages:

1. It is simple method and economically cheap
2. Land filled areas can be used for another purpose
3. Waste land is useful for solid waste management.

Disadvantages: A large area is required.

Incineration: in this method the solid waste area burn in a furnance called incineration. This method is useful for waste substance and dead organisms in this method gives higher amount of ash

Advantages:

1. It requires very little space
2. Reduces of solid waste is very is very fast

Disadvantages:

1. It is more expensive compared to land fill
2. It gives ash it causes of air pollution

Composting:

It is another method in practice in many cities. In this method bulk organic waste is converted into fertilizer manure by biological action.

It is useful for growing of plants and trees.WHO has setup compost plant in new Delhi in1981 with a capacity to handle 90-100 tons of waste every day.

The prepared compost was supplied to greeneries, nurseries , departments, now a days the composting technology is widely employed in developing countries.

Advantages:

1. A number of solid waste can also used in this method
2. This fertilizers can be sold so economically improvement and reducing solid waste and pollution.

Solid waste management includes the waste generation, mode of collection, transportation, storage, segregation of waste and disposal technology.

Role of individual in prevention of pollution:

Pollution prevention is not a job of any specific person but all individuals must participate in preventing of pollution every individual should think about reducing of pollution

A small effort made by each individual at his own place will have pronounced at the global level it is "think globally and act globally"

Each individual should change his or her life style in such way as to reduce environmental pollution.

Individual participations in reducing of pollution:

1. Importance of plantation of trees
2. Reduce use of wood, paper, etc that comes from forest
3. Avoid using strong pesticides and fertilizers

4. Save electricity and use solar energy rechargeable batteries
5. Avoid use of non biodegradable slowly bio degradable compounds
   Eg: plastics, lead, mercury, etc.
6. Prefer organic forming and avoid synthetic fertilizers
7. Reducing consuming of fossil fuels
8. Use rechargeable batteries because these are reduced metal pollution
9. Control growth of population
10. Use natural gas than coal
11. Purchase recyclable and reused environmental safe products
12. Learn and educate local eco system and bio diversity
13. Conserve water implement by using rain water harvesting

Disaster management:

Floods: These are defined as in rivers and lakes the magnitude of water flow excess the carrying capacity of the channel the excess flow of water flows on the surrounding areas is called floods.

Causes:

1. Heavy rainfall
2. Sudden snow melt
3. Sudden and excess releases of water from darns

Effects:

1. Flood water brings diseases like cholera, typhoid, malaria, etc
2. economic loss
3. loss of crops and livestock
4. soil erosion

Control measures:

1. constructions of check dams
2. insuring life and property from floods .3. proper diversion of water channel

cyclones: A meteorilogical phenomenon caused by atmospheric pressure in which there is low central pressure control to surrounding pressure

Effects:

1. loss of human life and livestock
2. soil erosion

3. loss of crops and economy

preventing methods:

1. Identifying cyclone areas
2. Advance information from satellite images
3. It is difficult to stop the formation of cyclones but the effect which is minimized by planting more trees.

Case studies:

Ex: Hudhud cyclone:

Hudhud:

Very Severe Cyclonic Storm Hudhud was the second strongest tropical cyclone of 2014 within the North Indian Ocean, as well as the most destructive tropical cyclone in the basin since Nargis in 2008.

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UNIT-IV

SOCIAL ISSUES AND THE ENVIRONMENT

Sustainable development:

"Sustainable development is development that meets the needs of the present, without compromising the ability of future generations to meet their own needs."

Water Conservation:

The process of saving and storing rain water for future utilization is known as water conservation.

Rain Water harvesting:

Rainwater harvesting is a technology used for collecting and storing rainwater from roof tops, the land surface or rock catchments using simple techniques such as jars and pots as well as more complex techniques such as underground check dams. The techniques usually found in Asia and Africa arise from practices employed by ancient civilizations within these regions and still serve as a major source of drinking water supply in rural areas. Commonly used systems are constructed of three principal components; namely, the catchment area, the collection device, and the conveyance system. For example, a three person household should have a minimum capacity of 3 (Persons) x 90 (l) x 20 (days) = 5 400 l.

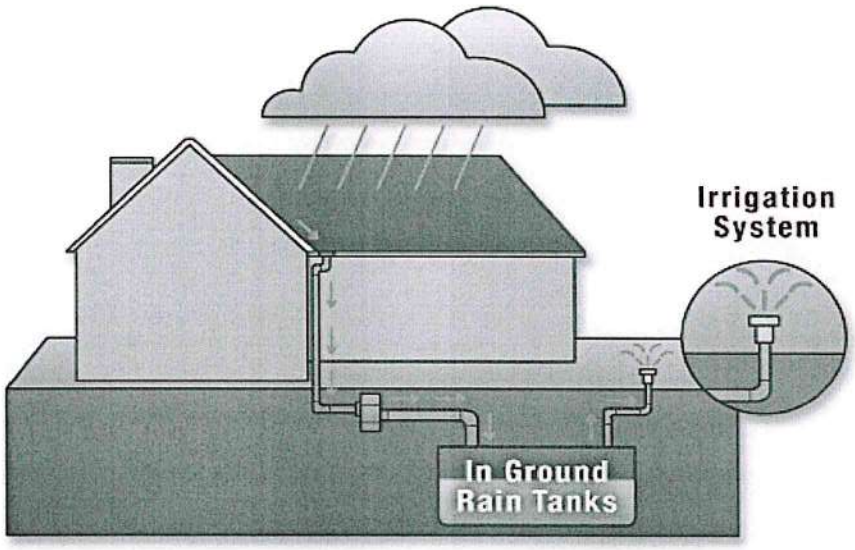


Fig: Rain water harvesting.

Methods of water conservation:

1. **Roof top catchments:** In the most basic form of this technology, rainwater is collected in simple vessels at the edge of the roof. Variations on this basic approach include collection of rainwater in gutters which drain to the collection vessel through down-pipes constructed for this purpose, and/or the diversion of rainwater from the gutters to containers for settling particulates before being conveyed to the storage container for the domestic use. As the roof top is the main catchment area, the amount and quality of rainwater collected depends on the area and type of roofing material.

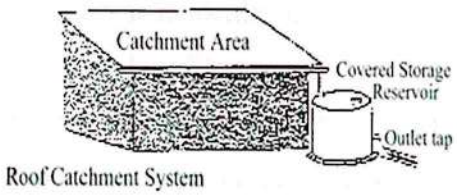
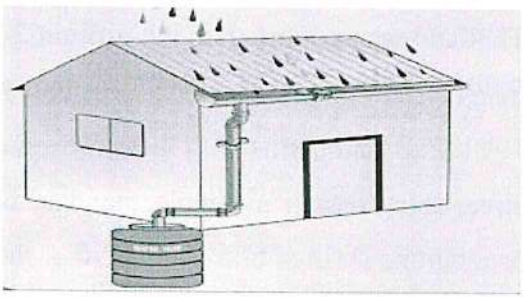


Figure 1: Rooftop Catchment System.



2. **Land surface catchments:**

Rainwater harvesting using ground or land surface catchment areas is less complex way of collecting rainwater. It involves improving runoff capacity of the land surface through various techniques including collection of runoff with drain pipes and storage of collected water. Compared to rooftop catchment techniques, ground catchment techniques provide more opportunity for collecting water from a larger surface area. By retaining the flows (including flood flows) of small creeks and streams in small storage reservoirs (on surface or underground) created by low cost (e.g., earthen) dams, this technology can meet water demands during dry periods. There is a possibility of high rates of water loss due to infiltration into the ground, and, because of the often marginal quality of the water collected, this technique is mainly suitable for storing water for agricultural purposes. Various techniques available for increasing the runoff within ground catchment areas involve: i) clearing or altering vegetation cover, ii) increasing the land slope with artificial ground cover, and iii) reducing soil permeability by the soil compaction and application of chemicals (see figure 2).

B) Collection Devices

- **Storage tanks:** Storage tanks for collecting rainwater harvested using guttering may be either above or below the ground.
- **Rainfall water containers:** As an alternative to storage tanks, battery tanks (i.e., interconnected tanks) made of pottery, ferrocement, or polyethylene may be suitable. The polyethylene tanks are compact but have a large storage capacity (ca. 1 000 to 2 000 l), are easy to clean and have many openings which can be fitted with fittings for connecting pipes. In Asia, jars made of earthen materials or ferrocement tanks are commonly used. During the 1980s, the use of rainwater catchment technologies, especially roof catchment systems, expanded rapidly in a number of regions, including Thailand where more than ten million 2 m3 ferrocement rainwater jars were built and many tens of thousands of larger ferrocement tanks were constructed between 1991 and 1993. Early problems with the jar design were quickly addressed by including a metal cover using readily available, standard brass fixtures. The immense success of the jar programme springs from the fact that the technology met a real need, was affordable, and invited community participation. The programme also captured the imagination and support of not only the citizens, but also of government at both local and national levels as well as community based organizations, small-scale enterprises and donor agencies. The introduction and rapid promotion of Bamboo reinforced tanks, however, was less successful because the bamboo was attacked by termites, bacteria and fungus. More than 50 000 tanks were built between 1986 and 1993 (mainly in Thailand and Indonesia) before a number started to fail, and, by the late 1980s, the bamboo reinforced tank design, which had promised to provide an excellent low-cost alternative to ferrocement tanks, had to be abandoned.

Steps to Establish a Water Conservation Program

1. **Audit current water use:**
    1. Install water meters at strategic locations in the facility
    2. Read/record water readings weekly and analyze the data. Look for high water use areas, trends, and unusual occurrences Identify water conservation opportunities
2. **Identify water conservation opportunities:**
    1. Fix drips, leaks, and unnecessary flows
    2. Implement changes to improve practices in cleaning, laundry and kitchens

3. List opportunities requiring engineering/equipment solutions (toilets, sterilizers, boiler, chillers, etc.)Determine cost of opportunities and potential return on investment

3. Determine cost of opportunities and potential return on investment
4. Prioritize water conservation opportunities
5. Develop a phased plan that fits your budget
6. Obtain funding (revise plan, if necessary)
7. Implement plan
8. Measure and document success

Where to look for Water Conservation Opportunities:

Wherever water is used there is often an opportunity for conservation. Here are several ideas for getting started on water conservation projects and programs.

Increase Awareness:

1. Increase employee awareness of water conservation (educate staff, seek suggestions, assign responsibility, post signs, etc.)
2. Increase patient and visitor awareness of water conservation (e.g., signs in patient rooms and restrooms, publicize water conservation policy)

Pick the low hanging fruit:

1. Locate and correct drips, leaks, and unnecessary flows in bathrooms, laundry, kitchen, labs, etc.
2. Repair/adjust flush mechanisms on toilets so that they work as designed
3. Irrigate grounds and wash vehicles less often

Reduce domestic water use:

1. Install toilet tank water displacement devices on older models or replace inefficient toilets and urinals with low-flow models
2. Retrofit flush meter toilets with water-saving diaphragms
3. Before selecting new equipment (e.g., low flush, dual flush), check out third party tests to determine actual effectiveness. Under third party maximum performance (MaP) tests, toilets are tested to see how much waste they will flush away instead of their ability to clear away a minimal amount of media.
4. Install flow reducers (<2.5 gpm) and aerators on sinks and showers
5. Install automatic shutoff valves or motion sensor-activated faucets

Save water from your taps: Turn the faucet/tap off while you are brushing your teeth, shaving, washing your hands, doing dishes, and so on. Turn the tap off when you shower, too. Get wet, then turn off the water while you soap up. Turn it back on for long enough to rinse. Look for a twist valve that installs behind your shower head to keep the water temperature where you set it while the water is off.

1. Catch the cold water that comes out of the faucet, tap, or shower while you are waiting for the hot water. Use it to water plants or pour into your toilet reservoir after flushing.
2. Water from a hot water tank may have more sediment or rust than water from the cold water tank, but is otherwise suitable for drinking. If you use a **water filter**, you can filter the saved water, and put it in bottles in the refrigerator for drinking water.

Water Reuse:

3. Water can be taken from the reject side of the radiation therapy linear accelerator (creates high-energy radiation to treat cancers) heat exchangers and pumped to the facility's cooling towers and reused for evaporative cooling
4. Reject water produced in the reverse osmosis process can be reclaimed for non-miscellaneous potable water use or in the cooling towers.

Kitchen and Laundry:

1. Wash only full loads in the dishwasher
2. Turn off the continuous flow used to clean the drain trays of the coffee/soda beverage island (only clean the trays as needed)
3. Reprogram washing machines to eliminate additional rinse cycles, if possible and not restricted by the health department
4. Wash full loads only or reduce water levels to minimize water required per load of washing

Water Supply/Systems

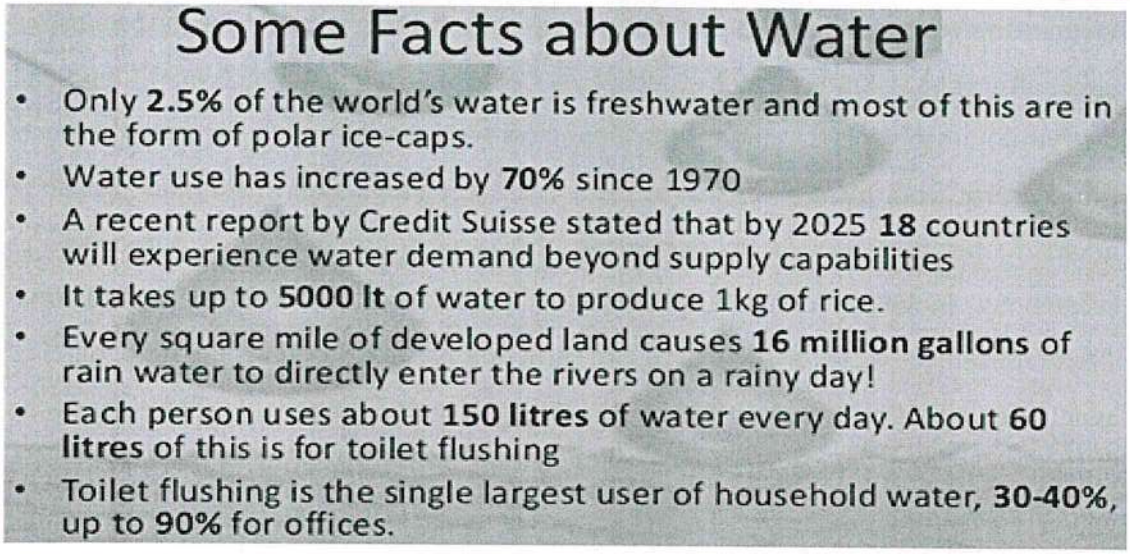
Install pressure-reducing valves where system pressure is higher than 60 psi

1. Reduce excessive blow down of cooling towers; operate cooling towers near manufacturer recommended level of total dissolved solids (TDS)
2. Consider using ozone as a cooling tower treatment to reduce water used for make-up
3. Return steam condensate to boilers for reuse

4. Minimize water use for irrigation (e.g., adjust or repair sprinklers, install wet weather shutoff and/or soil moisture controllers)
5. Investigate sources of used water

Watershed management:

Watershed is defined as a hydro-geological unit of area from which the rainwater drains through a single outlet. Water shed development refers to the conservation, regeneration and judicious use of all the natural resources (like land, water, plants, animals) by human beings.The main aim of water shed management is to improve underground water level.



Green house effect:

Chlorofluorocarbons (CFCs) and other halogenated **ozone depleting** substances (ODS) are mainly responsible for man-made chemical **ozone depletion**. The total amount of effective halogens (chlorine and bromine) in the stratosphere can be calculated and are known as the equivalent effective stratospheric chlorine (EESC).

Global warming:

A gradual increase in the overall temperature of the earth's atmosphere generally attributed to the greenhouse effect caused by increased levels of carbon dioxide, CFCs, and other pollutants. The progressive warming up the earth surface is called Global warming.

Disadvantages of Global Warming:

1. Ocean circulation disrupted, disrupting and having unknown effects on world climate.
2. Higher sea level leading to flooding of low-lying lands and deaths and disease from flood and evacuation.
3. Deserts get drier leaving to increased **desertification.**
4. Changes to **agricultural** production that can lead to food shortages.
5. Water shortages in already water-scarce areas.
6. Starvation, malnutrition, and increased deaths due to food and crop shortages.
7. Increased disease in humans and animals.

5. **Ozone depletion.** Ozone is a gas that occurs both at ground-level and in the Earth's upper atmosphere, known as the stratosphere. At ground level, ozone is a pollutant that can harm human health. In the stratosphere, however, ozone forms a layer that protects life on earth from the sun's harmful ultraviolet (UV) rays. But this "good" ozone is gradually being destroyed by man-made chemicals referred to as ozone-depleting substances, including chlorofluorocarbons, hydrochlorofluorocarbons, and halons. These substances were formerly used and sometimes still are used in coolants, foaming agents, fire extinguishers, solvents, pesticides, and aerosol propellants. Thinning of the protective ozone layer can cause increased amounts of UV radiation to reach the Earth, which can lead to more cases of skin cancer, cataracts, and impaired immune systems. UV can also damage sensitive crops, such as soybeans, and reduce crop yields.

http://www.epa.gov/globalwarming/.

Wild Life (Protection) Act 1972:

The Government of India enacted ***Wild Life (Protection) Act 1972*** with the objective of effectively protecting the wild life of this country and to control poaching, smuggling and illegal trade in wildlife and its derivatives. The Act was amended in January 2003 and punishment and penalty for offences under the Act have been made more stringent. The Ministry has proposed further amendments in the law by introducing more rigid measures to strengthen the Act. The objective is to provide protection to the listed endangered flora and fauna and ecologically important protected areas.

UNIT-V

HUMAN POPULATION AND THE ENVIRONMENT

Human population:

Population is defined as a group of individuals belonging to the same species which live in a given area at a given time.

Population density:

It is expressed as the number of individuals of the population per unit area(or) unit volume.

Population growth:

The rapid growth of the global's population for the past 100 years results from the difference between the rate of birth and death. The general trend in the population growth is explained graphically as shown in the following graph.

In 1800,the global population was about 1 billion people. It took about 130 years(in 1930) to reach 2 billions. But the population reached to 4 billions with in 45 years(in 1975). Now we have already crossed 6 billion and may have to reach about 10 billions by 2050 as per the world bank calculations.

Causes of rapid population growth:

1. The rapid population growth is due to decrease in death rate and and increase in birth rate.
2. The availability of anti biotics,immunization,increased food production,clean water and air decreases the famine related deaths and infant mortality
3. In agricultural based countries,childerns are required to help parents in the fields that is why population increases in the developing countries.

Population Explosion:

The enormous increase in population, due to low death rate and high birth rate is termed as population explosion.The human population is not increasing at uniform rate in all parts of the world.

Doubling time: number of years of time taken for a population to double in size. The human population is not increasing at uniform rate in all parts of the world. In many non industrial, poor developed called less developed countries like Asia,Africa and south America shows higher growth rate. In contrast the population of industrialized developed countries like U.S.A,U.K,France,Italy.Soviet union the growth rate is low.

Causes of population explosion:

1. .Low death rate and high birth rate
2. .Availability of antibiotic and medicial fecilities.
3. Increase of life expectancy

Ex: In 1950,the average life expectancy of the human being was 40 years,but now it is 61 years.

4. Illiteracy

Effects of populatin growth:

1.Population explosion leads to environmental degradation

2. Population explosion leads to exploitation of natural resources.

3.increase of population will increase disease,economic inequity and communal war.

Family welfare and planning programmes

Family welfare programme:

Family welfare programme was implemented by the Government of India as a voluntary programme. It ia an internal part of overall natural policy of growth covering human health,mertinity,family welfare,child care and women's right.

8.6.1 Objectives of family welfare programme:

1. Slowing down the population explosion by redusing the fertility
2. Pressure on the environment due to over exploitation of natural resources reduced.

Population based on age structure:

Age structure of population can be classified into three types:

1.Pre-productive age (0-14 years)

2.Re-productive age (15-44 years)

3.Post productive age (above 45 years)

Family planinig programme:

Family planning provides educational and clinical services that help couples to choose how many children to have?and when to have them? such programs vary from culture to culture,but it provides information on birth spacing, birth control and health care for pregnant women and infants. It also has reduced the number of legal and illegal abortions per year and decreased the risk of death from pregnancy.

Objectives of family planning programmes:

1. Reduce infant mortality rate to below 30 per 1000 infants.
2. Achieve 100% registration of births, deaths,marriage and pregnancy.
3. Encourage late marriages and later child-bearings.
4. Encouraging brest feeding
5. Enables to improve women's health, education and employment.
6. Making family planning available to all women,who wanted to choose the number of children and the spacing of births.
7. Constrain the spread of AIDS/HIV.
8. Prevention and control of communal diseases
9. Promote vigorously the small family norms.
10. Making school education upto age of 14 free and compulsory.

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Environment and Human health:

Human health and environment are two in sparable entities. If one disturbed other will be automatically disturbed. Generally a physically fit person, not suffering from any disease,is called a healthy person. But, the factors like nutritutional, biological, chemical or psychological, which cause harmful changes in the body's conditions are called disease.

Important Hazards and their Health effects:

Physical hazards and their effects:

1. Radioactive radiations: 1.These are affects the cells in the body and the function of glands and organs. 2. Suffer from cancer.

2. UV radiations: Skin cancer
3. Global warming: Temperature increase causes famine, mortality
4. Chloro fluorocarbons: Damage O_3 layer, allows more UV rays, cause skin cancer.
5. Noise: Painful and irreparable damage to human ear.

Chemical hazards and their effects:

1. Combustion of fossil fuels: Asthama, bronchitis and other lung disease.
2. Industrial effluents(toxic): Kill cells and cause cancer and death.
3. Pesticides: excessive amount breath to suffer soffacating problems and harmful for all living organisms.

Education:

Education is nothing but learning, through which knowledge about the particular thing can be acquired.

Types of Education:

1. **Formal Education:** All learning process in formal education are self related. All people will read, write, will get good jobs and tackle any problems only with the help of formal education.
2. **Value education:** value education is an instrument used to analyse our behavior and provide proper direction to our youths. It reaches them the distinction between right and wrong, to be compassionate, helpful, loving, generous and tolerant. So that a youth can move towards the sustainable future.

Ex: If a person is highly qualified, well employed and rich living style, some times he does not know how to behave properly with his environment.

Value –based Environmental Education:

Environmental education provides knowledge about the principles of ecology, fundamentals of environment and biodiversity. It creats a sense of duty to care for the natural resources and to manage them in a sustainable way.

Objectives of value Education:

1. To improve the internal growth of human being.
2. To create attitudes and improvement towards sustainable life style.
3. To increase awareness about our national history, our cultural heritage, constitutional rights, national integration, community development and environment.
4. To create and develop awareness about the values and their significance and role.

5. To understand about our natural environment in which how land, air and water are interlinked.
6. To Know about various living and non-living organisms and their interaction with environment.

Types of values:

1. Universal value (or) social values.
2. Cultural values
3. Individual values
4. Global values
5. Spiritual values.

HIV:

Since AIDS was first identified in the early 1980s, an unprecedented number of people have been affected by the global AIDS epidemic. Today, there are an estimated 35.3 million people living with HIV and AIDS worldwide.

AIDS (Acquired immune deficiency syndrome or acquired immunodeficiency syndrome) is a disease caused by a virus called **HIV** (Human Immunodeficiency Virus). The illness alters the immune system, making people much more vulnerable to infections and diseases. This susceptibility worsens as the disease progresses. HIV is found in the body fluids of an infected person (semen and vaginal fluids, blood and breast milk). The virus is passed from one person to another through blood-to-blood and sexual contact. In addition, infected pregnant women can pass HIV to their babies during pregnancy, delivering the baby during childbirth, and through breast feeding.

HIV can be transmitted in many ways, such as vaginal, oral sex, anal sex, blood transfusion, and contaminated hypodermic needles.Both the virus and the disease are often referred to together as **HIV/AIDS**. People with HIV have what is called HIV infection. As a result, some will then develop AIDS. The development of numerous opportunistic infections in an AIDS patient can ultimately lead to death.

The signs and symptoms of some of these infections may include:

1. Soaking night sweats
2. Shaking chills or fever higher than 100 F (38 C) for several weeks
3. Cough
4. Shortness of breath
5. Chronic diarrhea
6. Persistent white spots or unusual lesions on your tongue or in your mouth
7. Headaches

8. Persistent, unexplained fatigue
9. Blurred and distorted vision
10. Weight loss
11. Skin rashes or bumps

When to see a doctor:

If you think you may have been infected with HIV or are at risk of contracting the virus, see a health care provider as soon as possible.

HIV is the virus that causes AIDS. If a person infected with HIV does not take effective antiretroviral treatment, over time HIV will weaken their immune system, which will make them much more vulnerable to opportunistic infections.See more at: http://www.avert.org/hiv-aids-symptoms.htm#sthash.FpLfzo06.dpuf.

Women and child welfare:

Women and child are usually soft,who suffer in a number of ways mainly because they are weak, help less and economically dependent.

Women welfare:

The main aim of women welfare is to improve the status of the women by providing opportunities in education, employment and economic impedance.

Need of women welfare:

1. Generally women suffer gender discrimination and devaluation at home,at work place,in

   matrimony, in public life and power.

2. High number of cases of dowry, deaths, rape, domestic violence, criminal offences and mental

   torture to women.

3. The human rights of women are violated, in the male dominated Society.
4. Generally in policy making and decision making process, women are neglected.

Objectives of women welfare:

1. To improve education
2. To impart vocational training
3. To generate awareness about the environment
4. To improve the employment opportunities.
5. To aware problems of population

6. To restore the diginity, status, equality and respect for women
7. To provide constitutional and legal rights for women.

Organisations to wards Women welfare:

1. The National network for women and mining(NNWM)
2. United nations decade for women
3. International convention on the Elimination of all forms of Discrimination against Women(CEDAW)
4. Non Government organizations (NGO's) as Mahila mandals.
5. Ministry of women and child development.

Child welfare:

Children occupy nearly 40% of total population. They are considered to be the assets of a society of 21 million children born evry year in India,20milion childerns in our country are estimated to be working as child labours in various hazardous industry like match industry,fire work industry,pottery industry.

Reason for Child labours:

1. **Poverty:** Poverty is the main reason to force these children to work in un healthy conditions.
2. **Want of money:** Parents require money for their family,So they are in a position to send their children for work.
3. In agricultural families parents are forced to childrens to work in the fields.

Organisations for Children Welfare:

1. UN conventions on right of child
2. **Right to survival:** it emphances on good standards of living, good nutrition and health.
3. **Right to participation:** It means freedom of thought and appropriate information to the child.
4. **Right to development:** It ensures access to education, childhood care and support social security and recreation
5. **Right top protection:** It means freedom from exploitation, in human treatment and neglect.
6. **Ministry of Human Resource Development (MHRD):** It concentrates on child's health, education, nutrition, clean safe drinking water, sanitation and environment.

Role of Information Technology in Environment and Human Health:

Role of IT in Environment: Role of Information Technology in Environment and Human Health Information technology has tremendous potential in the field of environment education and healthas in any other field like business, economics, politics or culture.

Information technology plays a most important role in the field of environmental education. Important role in the field of environmental education. Information technology means collection, processing storage of information. A number of softwares have been developed to study about the environment. The internet facilities, information through satellites, world wide web and geographical Information systems(GIS) provide us up-to –date information on various aspects of environment, weather.

Remote sensing:

Remote sensing refers to any method, which can be used to gather information about an object with out actually coming in contact with it. Any force field like acoustic, gravity, magnetic, electromagnetic etc. could be used for remote sensing.

Component of a remote sensing system:

A remote sensing system consists of a sensor to collect radiation and other important parts includes 1.An Air craft 2.Rocket and satellite.

Applications of remote sensing:

In Agricultutre: remote sensing can provide valuable information for land and water management.

In Forestry: Sustainable forest management requires reliable information on the type,density and extent of forest cover,wood volume and bio mass,forest fire,pest and disease induced losses,encroachment etc. remote sensing provides all such information clearly.

In Land cover: remote sensing data is converted to map,the spatial resolution plays a role on the scale of mapping.

Data base:

Data base is the collection of inter-related data on various subjects. In the computer the information of data base is arranged in a systematic manner that is easily manageable and can be very quickly retrieved.

Environmental Information system:

It functions in 25 centres all over the country. They generate a network of database in areas like pollution control, clean technologies, remote sensing, bio diversity, environmental management.

World Wide Web:

More current data is available on World Wide Web.

Online learning centre provides the current and relavant information on principles, problems, requires, application of environmental science.

It has digital files of photos, power point lecture presentations, animations, web-exercises and quiz. These are useful to both animations, web-exercises and quiz. These are useful to both students and teachers of environmental studies.

Geographical Information System (GIS): It has proved to be a very effective tool in environmental management. GIS is a technique of superimposing various thematic maps using digital data on a large no.of inter-related or inter dependent aspects. Several useful soft-wares have been developed for working in the field of GIS.

Role of IT in Human Health:

Human Health: Health is a state of complete physical, mental and social well-being accepted definition of health.

Mental health may be defined as a state of balance between the individual and the surroundings world,a state of harmony between one self and others.

The health of a man is determined by the interplay and integration of the internal environment that surrounds him.

IT plays a key role in human health.It has changed the human life style completely. Many health organization are turning to package solution of IT for stream lining service oriented work in an effective manner.

The health service technology mainly involves three systems. They are 1.Finance and accounting 2.Pathalogy 3.Patient administration, clinical system.