

LECTURE NOTES ON ENVIRONMENTAL STUDIES

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CHAPTER -1

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

The word environment is derived from the French word '**environment**' which means to 'encircle or surround'.

Definition:-Environment literally means the surrounding in which we are living.

Environment includes all those things on which we are directly or indirectly dependent for our survival, whether it is a living components like animals, plants or non-living component like soil, air water.

Environmental Protection Act (1986) defined "Environment as the sum total of water, air and land, their interrelationship among themselves and with the human beings, other living beings and property."

Segments of environment

- 1. Atmosphere-** The Atmosphere is the Protective blanket of gases surrounding the earth. It sustains life on the earth and saves it from the hostile environment of outer space.
- 2. Hydrosphere-** The Hydrosphere comprises all types of water resources oceans, seas, lakes, rivers, streams, reservoir, polar icecaps, glaciers, and ground water
- 3. Lithosphere-** Lithosphere is the outer mantle of the solid earth. It Contains various types of soils and rocks on the earth.
- 4. Biosphere-** Biosphere composed of all living organisms and their interactions with the environment.

Scope of the environment:

- Environmental studies as a subject has a wide scope. It includes a large number of areas and aspects, which may be summarized as follows:
 - Natural resources- their conservation and management
 - Ecology and Biodiversity
 - Environmental pollution and control
 - Human population and environment
 - Social issues in relation to development and environment
- Several career options have emerged in these fields that are broadly categorized:
 - Research and development in an environment
 - Green advocacy
 - Green marketing
 - Green Media
 - Environmental consultancy

Importance of environmental studies

Environmental factors greatly influence every organism and their activities.

The environment studies enlighten us, about the importance of protection and conservation of our natural resources, indiscriminate release of pollution into the environment etc. Environment studies have become significant for the following reasons:

1. **Environment Issues are being global:** It has been well recognized that environment issues like global warming, ozone depletion, acid rain, marine pollution and loss of biodiversity are not merely national issues but are global issues and hence require international efforts to solve them.
2. **Problems Cropped in The Wake of Development:** Development, in its wake gave birth to Urbanization, Industrial Growth, Transportation Systems, Agriculture and Housing etc. However, it has become phased out in the developed world.
3. **Explosively Increase in Pollution:** World census reflects that one in every seven persons in this planet lives in India. Evidently with 16 per cent of the world's population and only 2.4 per cent of its land area, there is a heavy pressure on the natural resources including land.
4. **Need for An Alternative Solution:** It is essential, specially for developing countries to find alternative paths to an alternative goal. (1) A goal, which ultimately is the true goal of development an environmentally sound and sustainable development. (2) A goal common to all citizens of our earth.
5. **Need For Wise Planning of Development:** Our survival and sustenance depend. Resources withdraw, processing and use of the product have all to be synchronized with the ecological cycles in any plan of development. Our actions should be planned ecologically for the sustenance of the environment and development.

Need for public awareness

- Increasing population, urbanization and poverty have generated pressure on the natural resources and lead to a degradation of the environment.
- To prevent the environment from further degradation ,the supreme court has ordered and initiated environment protection awareness through government and non-government agencies to take part in protecting our environment.
- Environmental pollution cannot be prevented by laws alone. Public participation is equally important with regard to environmental protection.
- Environmental education is a process of learning by giving an overall perspective of knowledge and awareness of the environment.
- It sensitizes the society about environmental issues and challenges interested individuals to develop skills and expertise thereby providing appropriate solution.
- Climate change, loss of diversity ,ozone layer depletion, illegal trade of endangered species, destruction of habitats, land degradation, environmental pollution, storm water pose a serious threat to ecosystem in forest, rural, urban and marine ecosystem.
- Both formal and informal education on the environment will give the interested individual the knowledge, values, skills and tools needed to the face the environmental challenges on a local and global level.

Multidisciplinary nature of environmental studies

- The Environment studies is a multi-disciplinary science because it comprises various branches of studies like chemistry, physics, medical science, life science, agriculture, public health, sanitary engineering etc.
- It is the science of physical phenomena in the environment. It studies about the sources, reactions, transport, effect and fate of physical and biological species in the air, water, soil and the effect of from human activity upon these.
- As the environment is complex and actually made up of many different environments like natural, constructed and cultural environments, environmental studies is inter disciplinary in nature including the study of biology, geology, politics, policy studies, law, religion engineering, chemistry and economics to understand the humanity's effects on the natural world.
- This subject educates the students to appreciate the complexity of environmental issues and citizens and experts in many fields.
- By studying environmental science, students may develop a breadth of the interdisciplinary and methodological knowledge in the environmental fields that enables them to facilitate the definition and solution of environmental problems.

CHAPTER -2

NATURAL RESOURCES

- Natural resources can be defined as ‘variety of goods and services provided by nature which are necessary for our day-to-day lives’.
- E.g.: Plants, animals and microbes (living or biotic part), Air, water, soil, minerals, climate and solar energy (non-living or abiotic part).

Types of natural resources

They are of two types of resources namely Renewable and Non-Renewable Resources.

1. **Renewable resources:** The resources that can be replenished through rapid natural cycles are known as renewable resource. Ex: Plants, (crops and forests) and animals.
2. **Nonrenewable resources:** The resources that cannot be replenished through natural processes are known as non-renewable resources. These are available in limited amounts, which cannot be increased. Ex: These resources include fossil fuels (petrol, coal etc.), metals (iron, copper, gold, silver, lead, zinc etc.), minerals and salts (carbonates, phosphates, nitrates etc.). Once a non-renewable resource is consumed, it is gone forever.

Natural resources and associated problems:

The main problem associated with natural resources is unequal consumption. A major part of natural resources are consumed in the ‘developed’ world. The ‘developing nations’ also over use many resources because of their greater human population. However, the consumption of resources per capita (per individual) of the developed countries is up to 50 times greater than in most developing countries.

Forest resources

A forest can be defined as a biotic community predominant of trees, shrubs or any other woody vegetation usually in a closed canopy.

USES OF FOREST

1. Commercial uses
2. Ecological use

Commercial uses:

Wood – used as a fuel ii. Supply wood for various industries – Raw materials as pulp, paper, furniture timber etc. iii. Minor forest products – gum, dyes, resins iv. Many plants – Medicines v. Supply variety of animal products – honey. Ivory, horns etc. vi. Many forest lands are used for - Mining, grazing, for dams and recreation.

Ecological uses:

- Production of oxygen: Photosynthesis produces large amount of oxygen which is essential for life.
- Reducing global warming: Carbon dioxide is one of the main greenhouse gas. It is absorbed by plants for photosynthesis. Therefore, the problem of global warming caused by CO₂ is reduced.
- Wild life habitat: Forest is the home of millions of wild animals and plants.
- Pollution moderators: Forest can absorb many toxic gases and noises and help in preventing air and noise pollution.

Over exploitation of forest: Due to over population, there is an increased demand for medicine, shelter, wood and fuel. Hence exploitation of forest materials is going on increasing.

Cause of over exploitation:

1. Increasing agricultural production.
2. Increasing agricultural activities.
3. Increase in demand of wood resources.

Deforestation:

It is process of removal of forest resources due to natural or manmade activities (i.e.) destruction of forests.

Causes of deforestation:

1. Developmental projects: Developmental projects causes deforestation through two ways.
 - Through submergence of forest area.
 - Destruction of forest area.
- Ex: big dams, hydroelectric projects, road construction etc.
2. Mining operations: It reduces forest areas. Ex: Mica, coal, Manganese and lime stone.
3. Raw materials for industries: Wood is an important raw material for various purposes. Ex: Making boxes, furniture and paper etc.
4. Fuel requirement: Wood is the important fuel for rural and tribal population.
5. Shifting cultivation: Replacement of natural forest ecosystem for mono specific tree plantation. Ex: Teak Forest fires: Forest fire destructs thousands of acres of forest. Over grazing: Over grazing by cattle reduces the cultivation land.

Consequences of deforestation (or) impacts of deforestation:

1. Economic loss
2. Loss of biodiversity
3. Destructs the habitats of various species
4. Increases the rate of global warming
5. Disruption of weather patterns and global climate
6. Degradation of soil and acceleration of the rate of soil erosion.
7. Induces and accelerates mass movement / landslides.
8. Increases flood frequency, magnitude / severity.

Preventive measures (or) avoid of deforestation (or) methods of conservation of forests

1. New plants of more or less of the same variety should be planted to replace the trees cutdown for timber
2. Use of wood for fuel should be discouraged.
3. Forest pests can be controlled by spraying pesticides by using aero planes
4. Forest fire must be controlled by modern techniques.
5. Over grazing by cattle must be controlled.
6. Steps should be taken by the government to discourage the migration of people into the islands from mainland.
7. Education and awareness programs must be conducted.
8. Strict implementation of law of Forest conservation Act.

Case study:

Deforestation in the Himalayan region, involves clearing of natural forests and plantation of monoculture like Eucalyptus. Nutrient in the soil is poor; therefore, soil losing their fertility, hence, Himalayan area facing the serious problem of desertification.

Timber extraction

Wood used for engineering purposes like building houses, making furniture is called timber. The products derived from timber have been important to many civilizations, and thus it has acquired value within these civilizations. Timber extraction results in deforestation and in the fragmentation of the last remaining forests. It harms valuable species of trees, birds and wild animals.

Effects of Timber Extraction

1. Poor logging results in a degraded forest.
2. Floods may be intensified by cutting of trees or upstream watersheds.
3. Loss of biodiversity.
4. Climatic changes such as less rains.
5. Exploitation of tribal people by the contractors.
5. Soil erosion especially on slopes occurs extensively

Case Study-Chipko Movement

The world famous Chipko Movement, pioneered by Dasohli Gram Swarajya Mandal in Gopeshwar brought about a general awareness about conservation of forests. Environmental Science 14 AITT & H&S The first Chipko Movement dates back to 1731, when a village woman named Amrita Bai led the Bishnoi women against the Maharajas men to prevent them from cutting trees. In this attempt to save the trees, she sacrificed her life along with the lives of her husband, three daughters and 363 people. The movement was given this name because the village women embraced or hugged the trees to stop them from being cut.

DAMS

Today there are more than 45,000 large dams around the world, which play an important role in communities and economies that harness these water resources for their economic development.

Effects of dams on forest:

1. Thousands of hectares of forest will be cleared.
2. Killing of wild animals and destruction of aquatic life.
3. Spreading of water borne diseases.
4. Water logging increases the salinity of the soil.

Ex: Narmadha Sagar project it has submerged 3.5 lakhs hectares of forest.

Effects of dam on tribal people

1. Construction of big dams lead to the displacement of tribal people.
2. Displacement and cultural change affect the tribal people both mentally and physically.
3. They do not accommodate the modern food habits and life style.
4. Tribal people are ill-treated by the modern society.
5. Many of the displaced people were not recognized and resettled or compensated.

Case study- Sardar Sarovar Project:

The World Bank's withdrawal from the Sardar Sarovar Project in India in 1993 was a result of the demands of local people threatened with the loss of their livelihoods and homes in the submergence area. This dam in Gujarat on the Narmada has displaced thousands of tribal folks, whose lives and livelihoods were linked to the river, the forests and their agricultural lands. While they and the fishermen at the estuary, have lost their homeland, rich farmers downstream will get water for agriculture.

Mining

The process of extracting mineral resources and fossil fuels like coal from the earth is

called as mining. Types of mining

1. Surface mining: Mining of minerals from shallow deposits 2. Underground mining: Mining of minerals from deep deposits .

Effects of mining

1. Pollute soil, water and air. 2. Destruction of natural habitat. 3. Continuous removal of minerals leads to the formation of trench where water is logged which contaminates the ground water. 4. Vibrations cause earth quakes. 5. Produces noise pollution 6. Reduces shape and size of the forest. 7. Increased risk of landslides.

Water resources

Water claims to be an important resource. An important use of water in our country is for irrigation. Besides, water is also required in large amounts for industrial and domestic consumption.

Uses

- Is essential for all forms of life.
- Many uses of water include agricultural, industrial, household, recreational and environmental activities. Virtually, all of these human uses, require fresh water.

Effects of over utilization of water

1. Decrease of ground water:

- a. Increased usage decreases the ground water. ii. Insufficient rain fall iii. Building construction activities sealing the permeability of the soil.
2. **Ground subsidence:** If ground water withdrawal is greater than its recharge rate, then the sediments in the aquifers get compacted. As a result, shrinkage of land surface takes place.
- i. Problems: a. Structural damages to the buildings b. Fracture in pipes. c. Reversing the flow of canals.
3. **Lowering of water table:** Over utilization of ground water in arid and semi-arid regions for agriculture disturbs the state of equilibrium of the hydrological cycle.
4. Over utilization of water causes earth quakes, landslides and famines.
5. **Drying up of wells:** Due to over utilization, ground water level decreases much faster than can be regenerated. It leads to drying up of dug well and bore wells.
6. **Pollution of water:** Near the agricultural land ground water decreases therefore water containing nitrogen enters into the ground and pollute the ground water.
- a. Problem: Water which contains excess nitrate content is not suitable for drinking

Flood

It is an over flow of water. It happens when the magnitude of flow of water exceeds the carrying capacity of the channel within its bank.

Causes of flood

1. Heavy rainfall, melting of snow and sudden release of water from dams. (Flash floods)
2. Reduction in the carrying capacity of the channel.
3. Deforestation, mining and over grazing increase the runoff from rains and the level of flood raises.

Effect of flood

1. Water spreads in the surrounding area and submerges them.
2. Cultivated land gets affected.
3. Extinction of civilization.

Flood management

1. Floods can be controlled by dams.
2. Channel management control flood.
3. Flood hazards reduced by forecasting or flood warning.

4. Flood may also be reduced by reduction of run off by increasing infiltration through appropriate afforestation in the catchment area.

Drought

Drought is nothing but scarcity of water, which occurs due to

1. Inadequate rain fall
2. Late arrival of rain fall
3. Excessive withdrawal of ground water.

Causes of drought

1. When annual rain fall is below normal and less than evaporation, drought is created.
2. High population.
3. Intensive cropping pattern

Ex: Maharashtra - There has been no recovery from drought for the last 30 years due to overexploitation of water by sugarcane crop.

Effects of drought

1. Drought causes hunger, malnutrition and scarcity of drinking water and also changes the quality of water
2. Drought causes widespread crop failure leading to acute shortage of food and adversely affects human and livestock population.
3. Worst situation of drought causes desertification.
4. Raw materials of agro based industries are critically affected during drought time, hence industrial and commercial growth decreases.
5. Drought increases the degradation of natural resources.

Drought management

1. Indigenous knowledge is essential.
2. Rain water harvesting system.
3. Construction of reservoirs to improve ground water level.
4. Modern irrigation technology (drip irrigation) very useful to conserve water.
5. Afforestation activities also improve the potential of water in the drought area.
6. Crop mixing and dry farming are the suitable methods which minimize the risk of crop failures in dry area.

Dams

Dams made significant contributions to human development and the benefits derived from them have been considerable. Large dams are designed to control floods and to help the drought prone areas, with supply of water but large dams have proved to cause severe environmental damage. Hence an attempt has been made to construct small dams. Multiple small dams have less impact on the environment.

Benefits:

Dams ensure a year-round supply of water for domestic use and provide extra water for agriculture, industries and hydropower generation.

Problems:

- Dam construction and submersion leads to significant loss of farmland and forest and land submergence
- Siltation of reservoirs, water logging and salination in surrounding lands reduces agricultural productivity
- Serious impacts on ecosystems - significant and irreversible loss of species and ecosystems, deforestation and loss of biodiversity, affects aquaculture
- Socio economic problems for example, displacement, rehabilitation and resettlement of tribal people. Fragmentation and physical transformation of rivers

- Displacement of people - People living in the catchment area, lose property and livelihood Impacts on lives, livelihoods
- cultures and spiritual existence of indigenous and tribal people .

Sustainable water management

- Building several small reservoirs instead of few mega projects
- Developing small catchment dams and protecting wetlands
- Soil management, micro-catchment development and afforestation permits recharging of underground aquifer, thus reducing the need for large dams
- Treating and recycling municipal waste water for agricultural use.
- Preventing leakages from dams and canals and loss in municipal pipes
- Effective rainwater harvesting in urban environments
- Water conservation measures in agriculture, such as using drip irrigation, control of growing water intensive cash crops ; control of water logging.
- Pricing water at its real value makes people use it more responsibility and efficiently and reduces wastage
- In deforested areas where land has been degraded, appropriate soil management practices, making bunds along the hill-slopes and making nalla plugs can help retain moisture and make it possible to revegetate degraded areas
- Use waste water for activities that does not need fresh water – Recycling
- Adopt mini water harvesting models for domestic usage.
- Protect existing tanks
- Develop systematic water management and adopt strict water auditing
- “Save water Campaigns” for public awareness on water scarcity
- Through rainwater harvesting, community based participatory initiatives and holistic watershed management.
- Responsible water usage can only be achieved by empowering local communities and creating local accountability.
- The government should develop policies that protect water resources, promote sustainable watershed management and invest in technologies that will increase efficiency in irrigation, industrial usage and improve water harvesting techniques.

Water conflicts

Conflict through use: Unequal distribution of water led to interstate and international disputes. National conflicts:

- a. Sharing of Cauvery water between Karnataka and Tamil Nādu.
- b. Sharing of Krishna water between Karnataka and Andhra Pradesh
- c. Sarvani – Tamilnad and Kerala International conflicts:
Indus – India and Pakistan & Colorado river – Mexico and USA

Mineral resources

Naturally occurring inorganic crystalline solids with uniform chemical composition are called as minerals.

Uses and exploitation of minerals

1. Development of industrial plants and machinery. - Fe, Al & Cu
2. Construction work – Fe, Al & Ni
3. Generation of energy - coal, lignite, uranium
4. Designing defense equipment's like weapons and ornaments
5. Agricultural purposes – fertilizers and fungicides – Zn & Mn

6. Jewellery –Au, Ag & Pt
7. Making alloys for various purposes
8. Communication purposes – telephone, wires, cables and electronic devices
9. Medicinal purposes, particularly in ayurvedic system

Environmental damages caused by mining activities

1. Devegetation:
Topsoil and vegetation get removed Deforestation leads to several ecological losses
Land scape gets badly affected
2. Ground water contamination: Mining pollutes ground water; sulphur is converted into sulphuric acid which enters into the soil.
3. Surface water pollution: Radioactive wastes and other acidic impurities affect the surface water, which kills many aquatic animals.
4. Air pollution: Smelting and roasting are done to purify the metal which emits air pollutants and damage the nearby vegetation. It causes many health problems.
5. Subsidence of land: Mainly underground mining results in cracks in houses, tilting of buildings and bending of rail tracks.

Effects of over exploitation of minerals

1. Rapid depletion of mineral deposits
2. Wastage
3. Environmental pollution
4. Needs heavy energy requirements.

Case studies-mining and quarrying in Udaipur

200 open cast mining and quarrying in Udaipur. But 100 mines are illegal. 150 tons of explosives are used per month. It pollutes air, soil and water. It affects irrigation and wild life.

Food resources

Food is an essential requirement for survival of life. Main components are carbohydrates, fats, proteins, minerals and vitamins

Types of food supply

1. Crop plants: Grains mostly constitute about 76% of the world's food. Ex: Rice, Wheat and Maize
2. Range lands: Produces 17% of world's food from trees and grazing animals. Ex: Fruits, milk and meat
3. Ocean: Fisheries – 7% of world's food

World food problem

1. In the earth's surface, 79% is water out of total area. 21% land (forest, desert, mountain and barren land) . Less % cultivated land, at the same time population explosion is high therefore world food problem arises.
2. Environmental degradation like soil erosion, water logging, water pollution, salinity affects agricultural land.
3. Urbanization affects agricultural land. Hence production of rice, wheat, corn and other vegetable is difficult.

Over grazing

It is a process of eating the forest vegetation without giving a chance to regenerate.

Effects of over grazing

1. Land degradation: Over grazing removing the cover of vegetation Exposed soil gets compacted Soil moisture reduces. Desertification - OG leads to poor, dry and compacted soil. Land cannot be used for further cultivation.

2. Soil erosion: When the grasses are removed the soil becomes loose and gets eroded by the action of wind and rain fall.
3. Loss of useful species: OG affects the plant population and their regenerating capacity. Ogr place the plant of high nutritive value with plant of low nutritive value.

Agriculture

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

Types of agriculture

1. Traditional agriculture 2. Modern (or) industrialized agriculture

Traditional agriculture

Small plot, simple tools, surface water, organic fertilizer and a mixture of crops constitute traditional agriculture. They produce enough food to feed their family and to sell it for their income.

Modern agriculture

Hybrid seeds of single crop variety, high tech equipment's, lot of fertilizers, pesticides and water to produce large number of single crops.

Effects of modern agriculture

1. Problems in using fertilizers

- a. Excess of fertilizers causes micronutrient imbalance. (e.g) Punjab and Haryana deficiency of nutrient zinc in the soil affect the productivity of the soil.
- b. Blue baby syndrome (nitrate pollution): Nitrate present in the fertilizer causes blue baby syndrome, when the amount exceeds the limit leads to death.
- c. Eutrophication: Nitrogen and phosphorus in the crop fields washed out by runoff water in the water bodies, which increases the nourishment of the lakes called eutrophication. Hence algal species increases rapidly. Life time of the species is less and they decompose easily and pollute the water which affects the aquatic life.

2. Problems in using pesticides Death of non-target organism. Producing new pest – super pest
Bio magnification – Most of the pesticides are non-bio degradable, keep on concentrating in the food chain and it is harmful to human beings.

Risk of cancer: a. It directly acts as carcinogen b. It indirectly supports immune system.

3. Water logging: Land where water stand for most of the year. Causes of water logging:

1. Excessive water supply 2. Heavy rain 3. Poor drainage Remedy:
1. Preventing excessive irrigation
2. Subsurface drainage technology
3. Bio drainage like trees like Eucalyptus

4. Salinity

Water not absorbed by soil, is evaporated leaving behind a thin layer of dissolved salts in the top soil. This is called salinity of the soil. Saline soils are characterized by accumulation of soluble salts like sodium chloride, calcium chloride, magnesium chloride, sodium sulphate, sodium carbonate and sodium bicarbonates. Saline conditions are exhibited when pH is greater than 8.0

Problems in salinity

1. Saline soils yield less crop

In order to remedy the condition of saline soils the following two techniques may be used:

1. Salt deposit is removed by flushing with good quality water.
2. By using a sub-surface drainage system, the salt water is flushed out slowly.

Case study- pesticides in India

In Delhi the accumulation of pesticide in the body of mother causes premature delivery and low birth weight infant.

Pesticides in Pepsi and Coca Cola India has reported that Pepsi and coca cola companies are selling soft drinks with pesticide content 30-40 times higher than EU limits. This damages the nervous system.

Energy resources

Energy distribution in the world

Developed countries like USA and Canada constitute only 5% of the world's population but consume 25% of the world's available energy.

Energy consumed by a person in a developed country for a single day is equal to energy consumed by a single person in a poor country for one year.

Types of energy resources:

1. Renewable energy resource (or) non-conventional energy resources
2. Nonrenewable energy resources (or) conventional energy resources

Renewable energy sources: energy which can be regenerated.

Types of renewable energy resources:

1. Solar energy: Nuclear fusion reaction of sun produces enormous amount of energy. Several techniques are available for collecting, storing and using solar energy.
 - a. Solar cell (or) Photovoltaic cell (or) PV cell: Solar cell consists of p-type semiconductor (Si doped with B) and n-type semiconductor (Si doped with P). P-type forms top layer and n-type forms bottom layer.
Uses: It is used in calculators, electronic watches, street light, water pumps etc.
 - b. Solar battery: Large number of solar cells connected in series is called solar battery. It is used in remote areas where continuous power supply is a problem.
 - c. Solar water heater: It consists of insulated box painted with black paint with glass lid. Inside the box black painted copper coil is present. Cold water is allowed to flow, it is heated up and flows out into a storage tank from which water is supplied through pipes.
2. Wind energy: Moving air is called wind. The energy recovered from the force of the wind is called wind energy. Its speed is high.
 - a. Wind mills: When a blowing wind strikes the blade of the wind mill, it rotates continuously. And rotational motion of the blade drives number of machines like water pump, flour mills and electric generators.
 - b. Wind farms: When a large number of mills are installed and joined together in a definite pattern – it forms wind farm. It produces large amount of electricity.

Advantages: 1. It does not cause air pollution 2. Very cheap

3. Ocean energy: Tidal energy (or) Tidal power: Ocean tides are due to gravitational force of sun and moon which produce enormous amount of energy. High tides – rise of water in the ocean. Low tides – fall of water in the ocean. Tidal energy can be used by constructing a tidal barrage. During high tides sea water enters into the reservoirs and rotates the turbine, produce electricity. During low tides water from reservoir enters into the sea rotate the turbine produce electricity.
4. Geo thermal energy: Temperature of the earth increases at a of 20 – 750C per/km when we move down the earth. The energy utilized from the high temperature present inside the earth is called geo thermal energy.

5. Bio mass energy: Bio mass: Organic matter produced by plants or animals used as source of energy Bio gas: Mixture of methane, carbon dioxide and hydrogen sulphide. Methane is the major constituent.

Non renewable energy sources:

Energy which cannot be regenerated is called as non-renewable.

1. Coal: It is a solid fossil fuel.
Disadvantages: When coal is burnt large amount of CO₂ is released which causes global warming. S, N produces toxic gases during burning.
2. Petroleum: Crude oil is a liquid consists of more than hundreds of hydrocarbons and small number of impurities. The petroleum can be refined by fractional distillation. In the world level 25% of oil reserves are in Saudi Arabia. At present rate of usage, the world crude oil reserves are expected to get exhausted in just 40 years.
3. Natural gas: These are found above oil in oil wells. It is a mixture of methane and other hydrocarbons. Calorific value is high. There are two types. Dry gas and wet gas.
4. Liquefied petroleum gas (LPG): Petroleum gases obtained during FD and cracking can be easily converted into liquid under high pressure as LPG. It is colorless and odorless gas.
5. Nuclear energy: Dr.H.Bhabha is a father of nuclear power development in India. 10 nuclear reactors are present in India. It produces 2% of India's electricity. Nuclear energy can be produced by two types of reactions. Nuclear fission and nuclear fusion.

Case study:

Wind energy in India: India generating 1200 MW electricity using the wind energy. Largest wind farm situated near Kanyakumari in Tamilnadu. It produces 380 MW electricity.

Hydrogen fuel car: General motor company of China discovered a experimental car (fuel H₂) can produce no emission only water droplets and vapors come out of the exhaust pipe. This car will be commercially available by 2010.

Land resources

Land is a very valuable resource. It provides food, fiber, wood, medicine and other biological materials needed for food. Soil is a mixture of inorganic materials and (rocks and minerals) and organic materials (dead materials and plants). Top soil is classified as a renewable resource as it is continuously regenerated by natural processes at a very slow rate. However, if the rate of erosion is faster than the rate of renewal, the soil becomes a non-renewable resource.

Land degradation

Land degradation is the major consequences of direct interference of human activities in the natural phenomenon.

Land degradation means:

1. Loss of natural fertility of soil because of loss of nutrients.
2. Less vegetation covers
3. Changes in the characteristic of soil.
4. Pollution of water resources from the contamination of soil through which water sweeps into ground or runoff to the water bodies.
5. Changes in climatic conditions because of unbalanced created in the environment.

Causes of Land Degradation:

(a) Deforestation:

Deforestation is taking place at a faster rate due to increasing demands of timber, fuel and forest products which results into degradation of land resources.

(b) Overgrazing:

Overgrazing refers to excessive eating of grasses and other green plants by cattle. It results into reduced growth of vegetation, reduced diversity of plant species, excessive growth of unwanted plant species, soil erosion, and degradation of land due to cattle movement.

(c) Agricultural practices:

The modern agricultural practices, excessive use of fertilizers and pesticides has adversely degraded the natural quality and fertility of the cultivation land.

(d) Industrialization:

Development of industries for the economic growth of the country leads to excessive deforestation and utilization of land in such a way that it has lost its natural up gradation quality.

(e) Urbanization:

Increasing growth of population and demand for more residential areas and commercial sectors is also one of the reasons for land degradation.

Prevention and Control Measures for Land Degradation:

Following are some practices for controlling land degradation:

1. **Strip farming:**
It is a practice in which cultivated crops are sown in alternative strips to prevent water movement.
2. **Crop Rotation:**
It is one of the agricultural practices in which different crops are grown in same area following a rotation system which helps in replenishment of the soil.
3. **Ridge and Furrow Formation:**
Soil erosion is one of the factors responsible for land degradation. It can be prevented by formation of ridge and furrow during irrigation which lessens run off.
4. **Construction of Dams:**
This usually checks or reduces the velocity of run off so that soil support vegetation.
5. **Contour Farming:**
This type of farming is usually practiced across the hill side and is useful in collecting and diverting the run off to avoid erosion.

Landslides

Landslides are the downward movement of a slope composed of earth materials such as rock, soil or artificial fills. Landslides are also called rock-slide, debris-slide, slump, earth-flow or soil-creep. During construction of roads and mining activities huge portions of mountainous fragile areas are cut down and thrown into adjacent areas and streams. These land masses weaken the already fragile mountain slopes leading to man-induced landslides.

Effects of landslides:

Landslides increase the turbidity of nearby streams, thereby reducing their productivity. Destruction of communicative links

Loss of habitat and biodiversity

Loss of infrastructure and economic loss

Causes of landslides

- Removal of vegetation - deforestation in slopes creates soil erosion leading to landslides
- underground mining activities cause subsidence of the ground.
- Movement of heavy vehicles in areas with unstable slopes causes landslides. Addition of weight by construction on slopes causes landslides.
- Over exploitation of groundwater also leads to landslides.

Soil-erosion

- Soil erosion is the process of removal of superficial layer of soil. Soil erosion removes soil components.
- Harmful effects of soil erosion.
- Soil fertility is lost.
- Loss of soil ability to hold water and sediment.
- Sediment runoff can pollute water courses and kill aquatic life types of soil erosion
- Normal erosion: this is caused by the gradual removal of topsoil by natural processes.
- The rate of erosion is slow.
- Accelerated erosion: this is caused by manmade activities. In this case, the rate of erosion is much faster than the rate of formation of soil.

Causes of soil erosion

Water: water affects soil erosion in the form of rain, run-off, rapid flow or wave action

Wind: wind is an important climate agent that carries away the fine particles of soil there by contributing to soil erosion.

Biotic agents: overgrazing, mining and deforestation are the major biotic agents causing soil erosion. These processes disturb the top soil thereby exposing the soil to various physical forces inducing erosion. Landslides cause soil erosion. Construction of dams, buildings and roads removes the protective vegetal cover leading to soil erosion

Desertification

“Desertification is a type of land degradation in which a relatively dry land region becomes increasingly arid, typically losing its bodies of water as well as vegetation and wildlife. It is caused by a variety of factors, such as climate change and human activities. Desertification is a significant global ecological and environmental problem.”

Causes of desertification

Overgrazing: animal grazing is a huge problem for many areas that are starting to become desert biomes. If there are too many animals that are overgrazing in certain spots, it makes it difficult for the plants to grow back

Deforestation: when people are looking to move into an area, or they need trees in order to make houses and do other tasks, then they are contributing to the problems related to desertification. Without the plants (especially the trees) around, the the biome cannot thrive.

Farming practices: some farmers do not know how to use the land effectively. They may essentially strip the land of everything that it has before moving on to another plot of land. By stripping the soil of its nutrients, desertification becomes more and more of a reality for the area that is being used for farming.

Urbanization and other types of land development. As mentioned above, development can cause people to go through and kill the plant life. It can also cause issues with the soil due to chemicals and other things that may harm the ground. As areas become more urbanized, there are less places for plants to grow, thus causing desertification.

Climate change: climate change plays a huge role in desertification. As the days get warmer and periods of drought become more frequent, desertification becomes more and more eminent. Unless climate change is slowed down, huge areas of land will become desert; some of those areas may even become uninhabitable as time goes on.

Stripping the land of resources. If an area of land has natural resources like natural gas, oil, or minerals, people will come in and mine it or take it out. This usually strips the soil of nutrients, which in turn kills the plant life, which in turn starts the process toward becoming a desert biome as time goes on.

Natural disasters: There are some cases where the land gets damaged because of natural disasters, including drought. In those cases, there isn't a lot that people can do except work to try and help rehabilitate the land after it has already been damaged by nature.

Effects of desertification

Farming becomes next to impossible. If an area becomes a desert, then it's almost impossible to grow substantial crops there without special technologies. This can cost a lot of money to try and do, so many farmers will have to sell their land and leave the desert areas.

Hunger: without farms in these areas, the food that those farms produce will become much scarcer, and the people who live in those local areas will be a lot more likely to try and deal with hunger problems. Animals will also go hungry, which will cause even more of a food shortage.

Flooding: without the plant life in an area, flooding is a lot more eminent. Not all deserts are dry; those that are wet could experience a lot of flooding because there is nothing to stop the water from gathering and going all over the place. Flooding can also negatively affect the water supply, which we will discuss next.

Poor water quality: if an area becomes a desert, the water quality is going to become a lot worse than it would have been otherwise. This is because the plant life plays a significant role in keeping the water clean and clear; without its presence, it becomes a lot more difficult for you to be able to do that.

Overpopulation: when areas start to become deserts, animals and people will go to other areas where they can actually thrive. This causes crowding and overpopulation, which will, in the long run, end up continuing the cycle of desertification.

Poverty: all of the issues that we've talked about above (related to the problem of desertification) can lead to poverty if it is not kept in check. Without food and water, it becomes harder for people to thrive, and they take a lot of time to try and get the things that they need.

Role of an individual in conservation of natural resources

'Environment protection' means limiting the impairment of environment and it includes conservation of resources. It has three main objectives:

1. To prevent damage and discomfort
2. To improve productivity and pleasure and,
3. To maintain balance of the ecosystem.

Conservation

Conservation is sustainable use of natural resources, such as soils, water plants, animals and minerals. To conserve natural resources an individual can do these things.

- Turn off the lights when you leave a room.
- Replace energy-hungry incandescent lights with fluorescent lighting.
- Check with your utility company for energy conservation tips.

- Use a programmable thermostat that automatically turns off the air conditioner or heater when you don't need them.

1. Use a fan instead of air-conditioning.
2. Choose recycled products.
3. Have your gas appliances and heaters regularly inspected and maintained.
4. Walk or use on a bike.
5. Be within the set speed limit.
6. Replace your car's air filter.
7. Ensure that the tires are adequately inflated.
8. Report smoking vehicles.
9. Improve the quality of landscapes, which includes soils, water, etc.
10. Maintain the production of 'clean' food.
11. Don't waste water.
12. Stop hunting and over-exploitation, mainly for commercial and often illegal purposes.
13. Stop improper use of agro-chemicals, and reduce the pollution.
14. Plant trees. Stop illegal cutting of trees.

Equitable use of resources for sustainable lifestyles

Standard of living refers to the consumption of goods and services by an individual. It relates directly to the economic development whereas the well-being or quality of life of population refers to a combination of attributes that provide physical, mental, spiritual and social wellbeing.

• Sustainable development (sd) implies economic growth together with the protection of environmental quality, each reinforcing the other. Sustainable development, thus, is maintaining a balance between the human needs to improve lifestyles and feeling of

Well-being on one hand, and preserving natural resources and ecosystems, on which we and future generations depend. a desirable human condition: a society that people want to sustain because it meets their needs. An ecosystem that maintains its capacity to support human life and others. A balance between present and future generations; and within the present generation .Sustainable consumption is related to the production and distribution, use and disposal of products and services ,and provides the means to rethink our lifecycle. The aim is to ensure that the basic needs of the entire global community are met, the excess is reduced and environmental damage is avoided.

CHAPTER -3

ECOSYSTEM

SYSTEMS

Ecosystems

In 1935, the British ecologist A.G.Tansley coined the term “eco system”.

- The term “eco system” is made up of two Greek words. “**Eco**” means ecological sphere(or) place of living while “**system**” means “group of organisms joined in regular and interdependent manner.
- A group of organisms interacting among themselves and with environment is known as ecosystem. (OR)
- A system of interaction of organisms with their surroundings (i.e., environment) is called as “ecosystem”. Examples: Pond, lake, ocean, forest and desert.... etc are some of the examples of the ecosystems.

Classification of ecosystem:

The ecosystem can be generally classified into two types:

1. Natural Ecosystem
2. Artificial Eco system

1. NATURAL ECOSYSTEM: A natural ecosystem is developed and governed by nature.

These are capable of operating and maintaining themselves without any major interference by man. The following are the two types of natural ecosystem based on their habitat.

1. Terrestrial Ecosystem.

2. Aquatic Ecosystem.

1) Terrestrial Ecosystem:

This ecosystem is related to land.

Examples: Grassland ecosystem. Forest ecosystem, and Desert ecosystem etc.

2) Aquatic Ecosystem:

This ecosystem is related to water, it is further sub divided into two types based on salt content.

i. Fresh Water Ecosystem:

- a. Running Water Ecosystems Examples: Rivers, streams (small narrow rivers)
- b. Standing Water Ecosystems Examples: Pond, lake & well, etc

ii. Marine Ecosystem:

Examples: seas and sea shores <land along the edges of sea>

2. Man made (or) artificial ecosystem:

An artificial ecosystem is created and maintained by man for his different needs.

Examples: Reservoirs, Artificial lakes and gardens, etc

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 component of an ecosystem is called “Biotic component”.

Examples: Plants (Producers), Animals (Consumers) and Micro Organisms (Decomposers)

The biotic components of an ecosystem are classified into three types based on how they get their food.

A. Producers (Autotrophs) : Plants

B. Consumers (Heterotrophs) : Animals

C. Decomposers (Saprotrophs) : Micro organisms

A. Producers (or) Autotrophs (Auto=self, troph=feeder)

The sun which is the primary source of energy, gives energy to the plants to produce food through photosynthesis. Plants use the light, carbon dioxide, water and the green pigment chlorophyll in their leaves to produce sugars and oxygen. These plants that produce food through photosynthesis are called producers. They are autotrophic organisms because they manufacture their own food. Producers are called energy transducers.

B. Consumers (or) Heterotrophs (Hetero = other, troph = feeder):

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

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

- i. Herbivores (or) Primary Consumers (Plant Eaters)
- ii. Carnivores (or) Secondary Consumers (Meat Eaters)
- iii. Omnivores (or) Tertiary Consumers (With plant & meat eaters)
- iv. Detritivores (dead organism eaters)

Herbivores:

Animals that eat only plants are called Herbivores. They directly depend on the plants for their food. So, they are called Plant eaters. Examples: Insects, goat, deer, cow, horse, etc.

Carnivores:

Animals that eat other animals are called carnivores. They directly depend on the herbivores for their food. Examples: Frog, cat, snake & foxes, etc.

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.

Detritivores:

Animals that eat dead organisms and waste of living are called detritivores. Examples: beetles, termites, ants, crabs, earthworms, etc.

C. Decomposers (or) Saprotrophs: (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 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 the “abiotic component”.

These non-living components enter the body of a living organisms, take part in metabolic activities and then return to the environment. The abiotic component of the ecosystems divided into three portions.

1. Climate factors: Solar radiation, temperature, wind, water current, rainfall, etc.
2. Physical factors : light, fire, soil, air, etc.
3. Chemical factors : Organic and Inorganic substances.

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:

1. Primary Function: The producers (plants) can make their food themselves through photosynthesis. This process is called primary function of eco system. Examples: All green plants and trees.
2. Secondary Function: The consumers (animals and humans) cannot make their own food. They are always depending upon the producers for their energy. This is called secondary function of eco system.

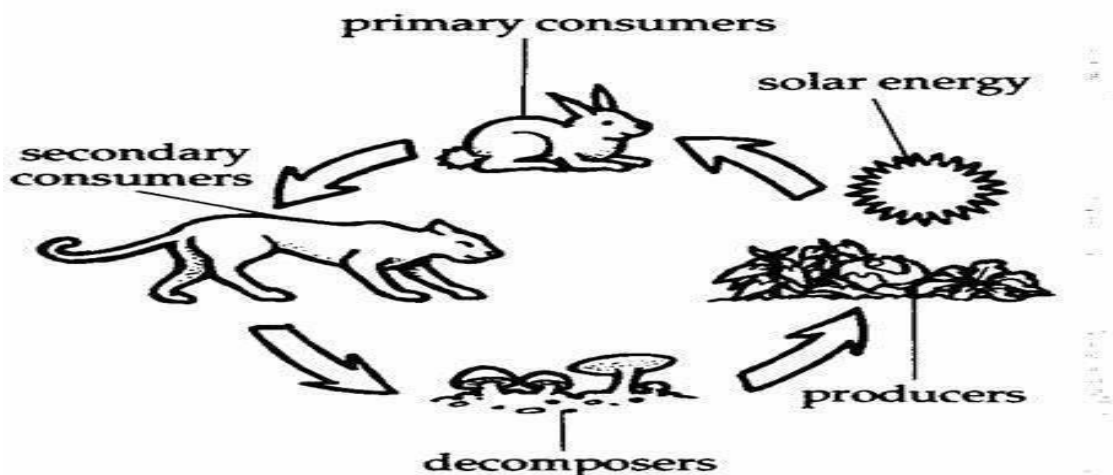
3. Tertiary Function: Decomposers attack the dead bodies of consumers and producers and decompose them into simpler compounds. During the decomposition inorganic nutrients are released. Examples: Microorganisms like bacteria and fungi, etc

The functioning 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:

- Anything which we eat to live is called food.
- Food contains energy.
- Food can be transferred from one organism to the other.
- The process of transfer of food (energy) from one organism to a series of organisms is called as “**food chain**”.



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.

Infact, 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.

Types of food chain:

Three basic types of food chains are found in a typical eco system. They are: **1. Grazing food chains.**
2. Detritus food chains. **3. Parasitic food chains.**

1. Grazing food chains:

Grazing food chain starts with green plants (producers) and goes to decomposer food chain (or) detritus food chain through herbivores and carnivores. It has two types : a. Terrestrial food chain and b. Aquatic food chain

a. Terrestrial food chain: Food chain on land is called terrestrial food chain. Example: Grassland food chain , Forest land food chain , Desert land food chain

Grass land food chain

Grasses → Grasshoppers → Frog Snake → Eagles

Forest food chain

Green plants → Deer → Tiger (or) lion

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, 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

1. Detritus’ food chain:

Detritus food chain starts with dead organic matter (plants and animals) and goes to decomposer through consumers. Detritus food chains, independent of solar energy, but they depend on influx of dead organic matter.

Example: Dead Plants Soil mits Algae Crabs Small fish Large fish

2. Parasitic food chain:

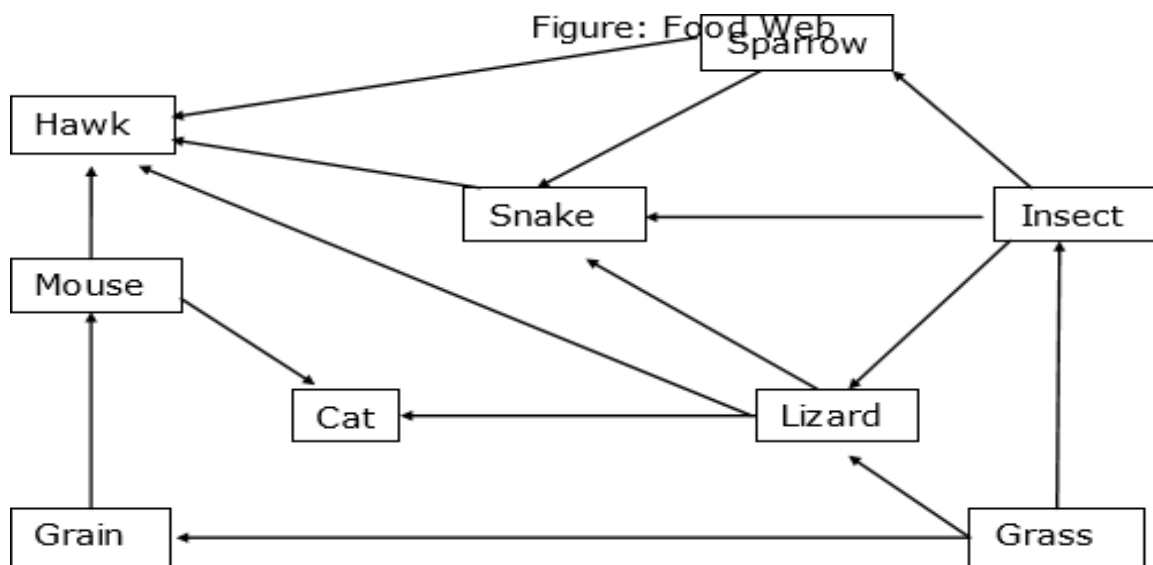
Parasitic food chain operates in many ecosystems. In this food In this food chain either consumer (or) producer is parasitized and the food passes to smaller organisms. A parasitic food chain involves host parasite hyper parasites’ links.

Example : Trees Fruit eating birds Lice & Bugs Bacteria Fungi

Food Web

- Web means “network” . So, food web is a network of food chains.
- In a food web many food chains are inter connected, where different types of organisms are connected at different tropic levels.
- So, food web is the natural interconnection of food chains and a graphical representation of what-eats-what in an ecological community.
- Another name for food web is consumer-resource system.

This food web shows many linear food chains . 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:

- Grains → Mouse → Cat
- Grains → Mouse → Hawk
- Grains → Mouse → Snake → Hawk
- Grains → Insect → Sparrow → Hawk
- Grass → Insect → Lizard → Snake → Hawk
- Grass → Insect → Sparrow → Snake → Hawk

Ecological Pyramids

- The concept of ecological pyramids was first developed by British ecologist Charles Elton in 1927.
- An ecological pyramid is a graphical representation of the relationship between the different living organisms at different trophic levels.
- An ecological pyramid is shown in the following figure. _

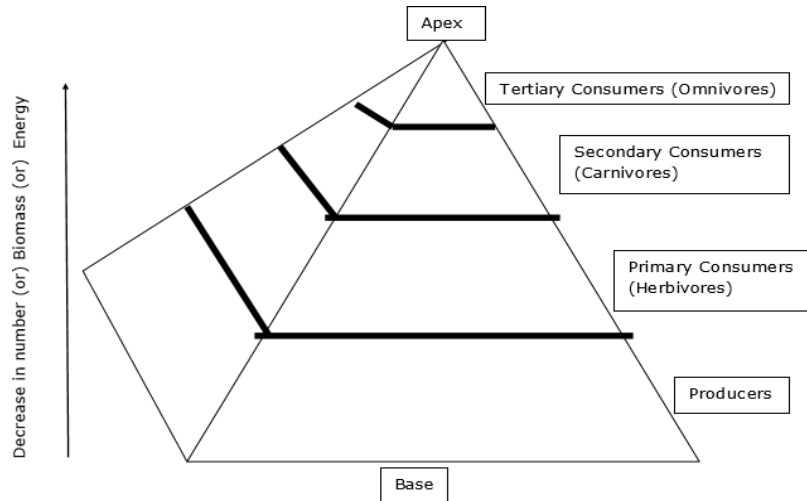


Figure: Formation of an Ecological Pyramid

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

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

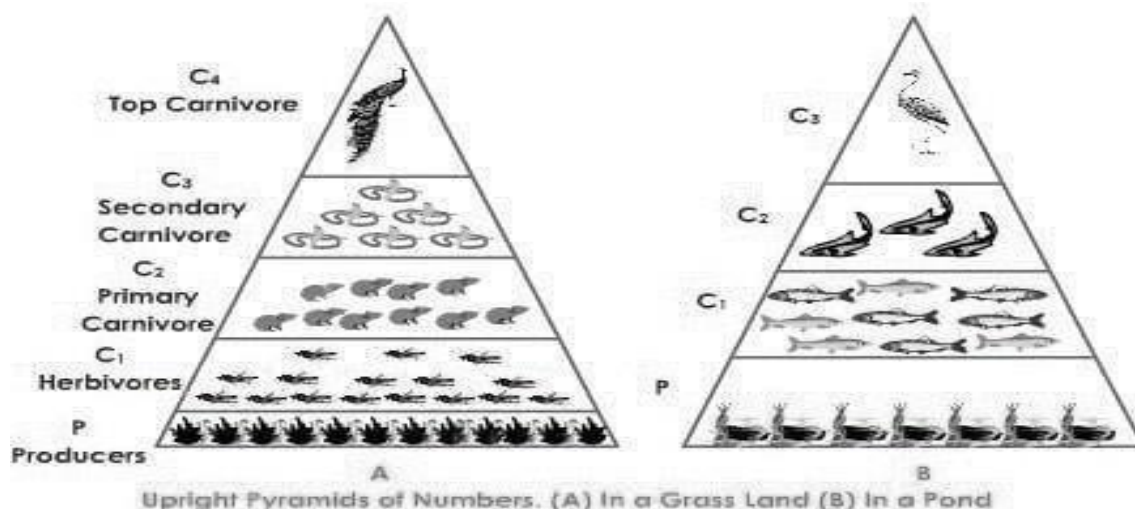
1. Pyramid of numbers

- It shows the number of individual organisms present in each trophic level.
- It is expressed in numbers per unit area.
- Depending upon the type of ecosystem, we have three types of pyramids of numbers.
 - a. Upright pyramid of numbers.
 - b. Partly upright pyramid of numbers.
 - c. Inverted pyramid of numbers.

a. Upright pyramid of numbers.

The number of individual organisms gradually decreases from lower trophic level to higher trophic level is called "upright pyramid of numbers".

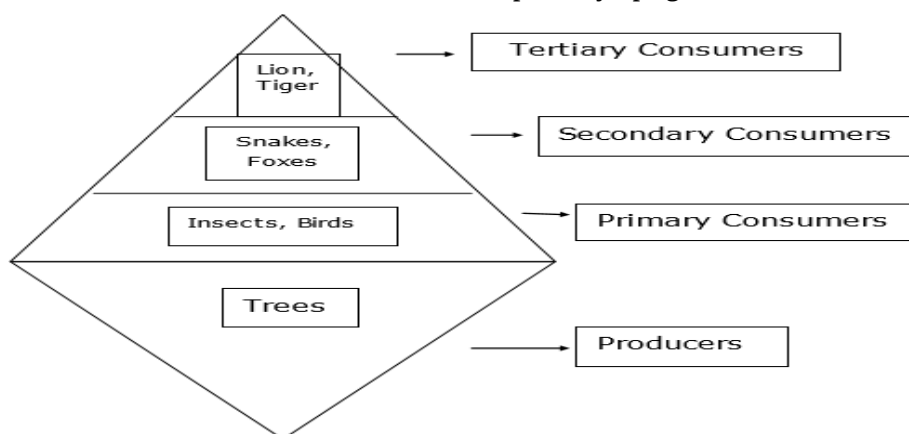
Example: A grassland ecosystem and a pond ecosystem show an upright pyramid of numbers. The producers in the grasslands are grasses, which are small in size and large in numbers. So, producers occupy lower trophic level (1st trophic level). The primary consumers (herbivores) are rats, which occupy the II trophic level. Since the numbers of rats are lower when compared to the grasses, the size of which is lower. The secondary consumers (carnivores) are snakes, which occupy the III trophic level. Since the numbers of snakes are lower when compared to the rats, the size of which is lower. The tertiary consumers (omnivores) are eagles, which occupy the IV trophic level. The number and size of the last trophic level is lowest.



b. Partly upright pyramid of numbers.

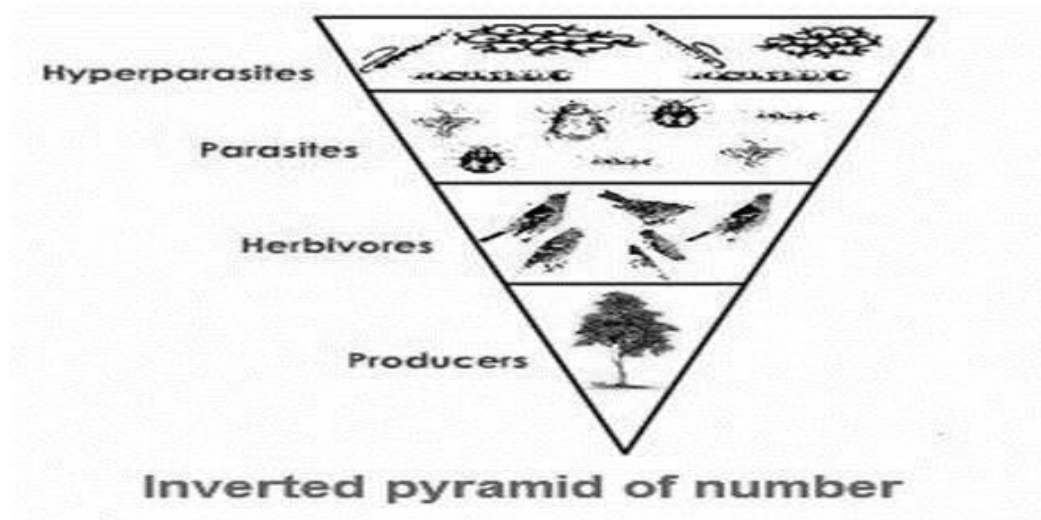
A forest eco system is an example of partially upright pyramid.

In a forest eco system, big trees are the producers, which are less number. So, these producers occupy the lower tropic level which is narrow base. The primary consumers (herbivores) are birds, insects, which occupy the II tropic level. Since the number of birds, insects and other species are higher when compared to the trees, the size of which is broader. The secondary consumers (Carnivores) are fox, snakes, lizards, which occupy the third tropic level. Since the number of foxes, snakes are lower when compared to the birds, insects the size of which is lower. The tertiary consumers (omnivores) are lion, tiger, which occupy the IV tropic level. Since the number of lions, tiger is lower when compared to the fox and snakes the size of which is very (or) narrow lower. So, the pyramid is narrow on both sides and broader in the middle and hence it is called partially upright of number as shown in figure.



c. Inverted pyramid of numbers

The number of individual organisms gradually increases from lower tropic level to higher tropic level, is known as “inverted pyramid of numbers”. Example: Parasitic food chain shows as inverted pyramid of number as shown in the following figure.



2. Pyramid of Biomass:

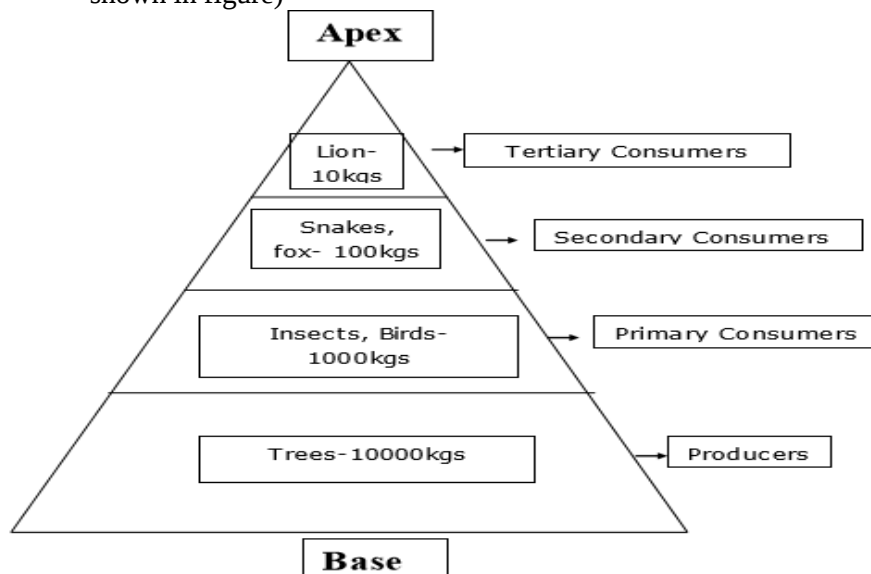
It represents the total amount of biomass (mass (or) weight of biological material (or) organism) present in each trophic level. · It is expressed in gram per unit area.

Depending upon the type of ecosystem, we have two types of pyramids of biomass.

- i. Upright pyramid of biomass.
- ii. Inverted pyramid of biomass

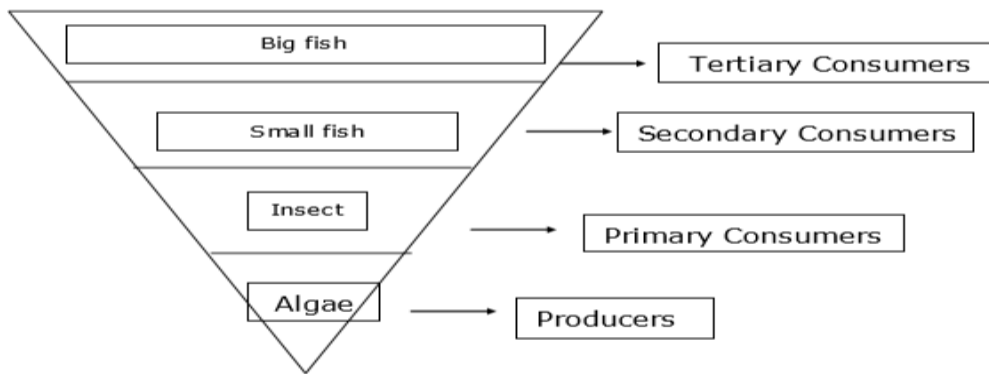
i. Upright Pyramid Of Biomass

- 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)



ii. Inverted pyramid of biomass

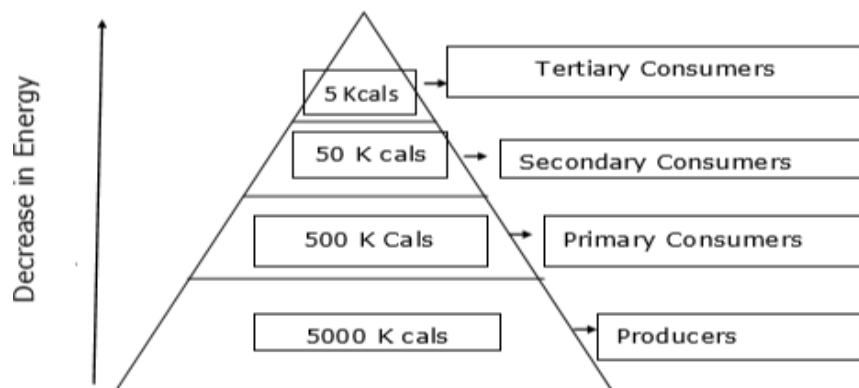
The pyramid of biomass gradually increases from producer level to consumer level are called as Inverted pyramid of biomass. Example: The pond ecosystem shows an inverted pyramid of biomass.



3. 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.



What is an Ecosystem?

An ecosystem is a structural and functional unit of ecology where the living organisms interact with each other and the surrounding environment. In other words, an ecosystem is a chain of interactions between organisms and their environment. The term “Ecosystem” was first coined by A.G.Tansley, an English botanist, in 1935.

MAJOR TYPES OF ECOSYSTEMS

Types of Ecosystems

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

- Terrestrial Ecosystem
- Aquatic Ecosystem

Forest ecosystem

Definition: It is a natural ecosystem consisting of dense growth of trees and wild animals.

Characteristic features of forest ecosystems:

1. **Seasonality:** In countries that have seasonal climates, forest ecosystems will change with the seasons.
 2. **Deciduous or evergreen:** A forest may be deciduous (i.e., it sheds its leaves in winter) or evergreen (i.e., its leaves stay green and intact all the time), or it may be a mix of both deciduous and evergreen trees.
 3. **Different levels:** Some forest ecosystems such as rain forests, feature several distinct levels – such as the forest floor, the lower canopy, the upper canopy and the tree tops.
 4. **Attractive to birds:** Many bird species nest in tree tops and this makes forest ecosystems attractive to birds.
 5. **Attractive to insects:** Many insects live in tree bark, leaf mulch or flowers and as such they find forest ecosystems very attractive places to make their homes.
- Structure and Function of Forest Ecosystem Abiotic:** soil, sun light, temperature etc .

Biotic : forest trees, shrubs and animals

Structure:

Producer : Trees and shrubs

Consumer : Primary – elephants, deer etc. Secondary – snakes, birds, lizards etc

Tertiary – lions, tigers etc

Decomposers : fungi, bacteria

Types of forest ecosystem:

- The forest type depends upon the abiotic factors such as climate and soil characteristics of region.
- Forests in India can be broadly divided into 2 types. 1. Coniferous forests

2. Broadleaved forests

1. Coniferous Forests

- Grow in the Himalayan Mountain region
- Temperature is low.
- Have tall trees with needle-like leaves and downward sloping branches so that the snow can slip off the branches.
- Have cones instead of seeds and are called gymnosperms.

2. Broadleaved forests.

- Broadleaved forests have several types, such as : evergreen forests, deciduous forests, thorn forests, and mangrove forests. Broadleaved forests have large leaves of various shapes. **Evergreen Forests**
- grow in the high rainfall areas of the Western Ghats, North Eastern and the Andaman and Nicobar islands.
- monsoon lasts for several months.
- Shed a few of their leaves throughout the year.
- No leafless phase.
- Only shade loving trees can grow in the ground layers as canopy overlap.
- Forest is rich in orchids and ferns abounds in animal life and is most rich in insect life.

Deciduous Forests

- are found in regions with a balanced amount of seasonal rainfall.
- lasts for only few months.
- most of the forests in which Teak grow are of this type.
- trees shed their leaves during the winter and hot summer months and regain their fresh leaves just before the monsoon.
- Light can penetrate easily onto the forests floor.

Thorn Forests

- are found in the semi- arid regions.
- Trees are scattered and are surrounded by open grassy areas.
- can conserve water.
- Have long and fibrous roots to reach water at great depths.
- reduce loss of water
- some species have small leaves and some have thick waxy leaves. Have thorns – protect plants from herbivores

Mangrove Forests

- grow along the coast especially in the river deltas.
- are able to grow in a mix of saline and fresh water, in muddy areas.
- have breathing roots. Prevents soil erosion.

What is the Aquatic Ecosystem?

- In contrast to terrestrial ecosystems, which are established on land, an aquatic environment is one that forms around a body of water.
- Aquatic ecosystems feature populations of creatures that are mutually and environmentally reliant.
- Marine and freshwater ecosystems are the two primary types of aquatic ecosystems.
- Freshwater environments can be lentic (including pools, ponds, and lakes), lotic (including streams and rivers), or wetland (areas where the soil is saturated or inundated for at least part of the time).

Pond ecosystem

- Pond Ecosystem refers to fresh water ecosystem on which different organisms depend for their survival and to fulfill their nutritional needs as well.
- The ponds are the water bodies which are usually of 12-15 feet deep in which the sun rays can reach which results into growing of plants down there.
- pond ecosystem falls under the Lentic ecosystem for the reason that the water remains stagnant in ponds for a relatively longer period time.

Structure:

There are two main components:

(A) Abiotic component:

Abiotic component of pond consists of water, dissolved minerals, oxygen and carbon dioxide. Solar radiations are the main source of energy.

(B) Biotic component:

It includes the following:

Producers-Phytoplankton.

These are small, usually single-celled, photosynthetic organisms, also known as algae.

Primary Consumers-Zooplankton

These are other small organisms that live in pond, these are members of the animal kingdom that are suspended in the water column. Examples - water fleas, tadpoles. They consume phytoplankton

Secondary Consumers-Larger invertebrates

Snails, worms, leeches insects consume these smaller animals.

Tertiary Consumers-Vertebrates

Vertebrates are animals with backbones. In a pond these might include fish, frogs, salamanders, and turtles.

Characteristics

1. Still waters: pond ecosystems are lentic ecosystems – i.e., they involve stagnant or standing water.
2. Surrounded by banks: pond ecosystems are surrounded by either artificial or natural banks.
3. Wet: these ecosystems are wet and humid ones.
4. Different levels: distinct communities of creatures will live at different levels of a pond. Crustaceans and deep-water fish may live at the lower level, for example, whilst birds and blooming plants may live towards the surface.
5. Variable in size: some pond ecosystems can be very small (such as a rockpool) while others can be almost as large as a lake.

Types of pond ecosystem

Ponds can come in many different forms, and they all have their own differentiating characteristics.

1. Salt ponds.

Salt ponds contain brackish (i.e., salty) water and can occur close to the sea side where

waterlogged ground creates natural pools. Salt ponds can also occur in rocky areas on the beach, though here they are called rock pools

2. Garden ponds.

These artificially created ponds can contain ornamental plant and animal species that come from all over the world .

3. Freshwater pools.

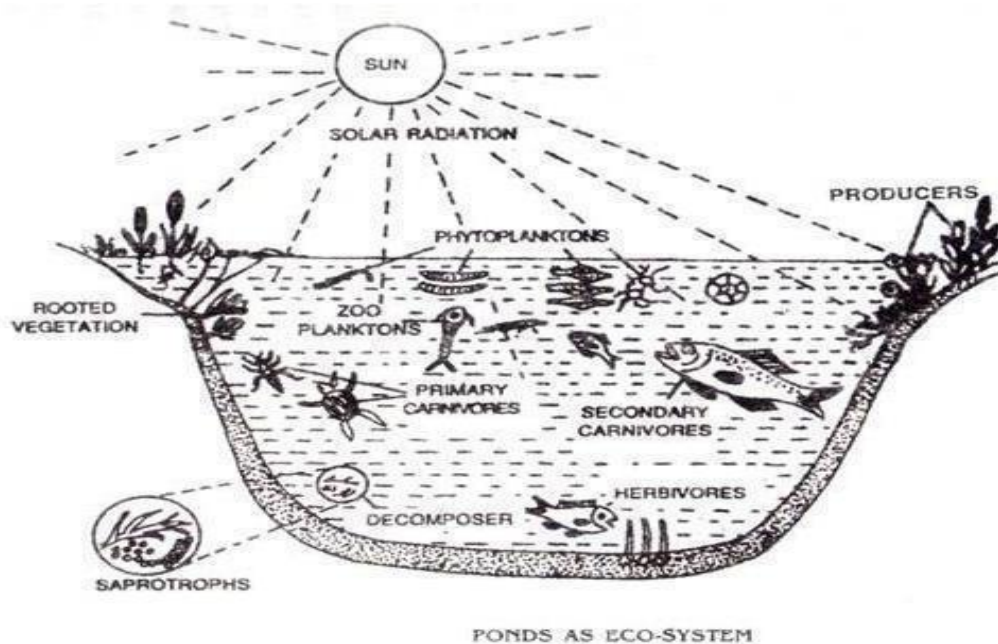
Freshwater pools can form anywhere inland, either from rainfall or from the presence of water saturating the soil. They can also be created by rivers flowing in to a depression in the ground.

4. Vernal pools.

Vernal pools are seasonal ponds. They form in depressions in the ground, but only during certain types of the year when the rainfall is heaviest. As a result, they will attract certain types of animals and birds that are in need of a drink whenever they appear and at other times of the year will be relatively deserted – one example for instance is a seasonal oasis in the desert.

5. Underground ponds.

Ponds can also form underground, in the rocky environment of caves. Here, a surprising amount of life can be found, including fish, different bacteria, lichens and so on.



Lake ecosystem:

These are big fresh water ecosystem.

zones

- Top layer – shallow, warm, prone to anthropogenic activities – Littoral zone
- Second layer – enough sunlight, high primary productivity – Limnetic zone
- Third layer – very poor or no sunlight – Profundal zone
- Eg. Dal lake in Srinagar, Naini lake in Nainital

structure

Abiotic factors

Abiotic factors in a lake environment include: sunlight, temperature, water flow, rocks and oxygen content.

Biotic factors:-

1. Planktons – phytoplankton eg. Algae – zooplankton eg. Rotifers
2. Nektons – that swim in water eg. Fishes
3. Neustons – that float on the surface of water Benthos – that attached to sediments eg. Snails

Types of lakes :

1. **Oligotrophic lakes** – with less nutrient content
2. **Eutrophic lakes** – with very high nutrient content due to fertilizer contamination
3. **Desert salt lakes** – that contains high saline water due to over evaporation
4. **Volcanic lakes** – formed by water emitted from magma due to volcanic eruptions
5. **Dystrophic lakes** – that contains highly acidic water (low pH)
6. **Endemic lakes** – lakes that contain many endemic species, etc.

Stream Ecosystem

- A stream is a general term as a small channel of freshwater that contains flowing water.
- Oxygen and nutrient content are uniform.
- They carry sediments, nutrients and other materials into rivers and lakes and on to the ocean.
- they do not suffer from oxygen deficiency as pond and lake organisms.
- This is because large surface area of running water provides more oxygen supply.

Structure

Abiotic Factors

- Temperature
- Sunlight levels
- pH level of the water
- Vitamins and minerals in the water
- Water clarity

Biotic Factors

Biotic factors are all of the living things and factors within an ecosystem.

According to the U.S. Geological Survey, there are three key and dominant biotic factors that make up a stream ecosystem: fish, invertebrate species and algae.

- Biotic Factor: Algae
- **Algae** is perhaps the most important biotic factor .
- **Invertebrate species** that are important to freshwater ecosystems like streams generally include earthworm leeches, water beetles, mayflies, dragonflies, mussels and more
- **Fish Species**
- **Fish species** are another critical biotic factor that make up stream communities. These fish will eat both the algae and the invertebrate species in the water.
- **Other animal species** common in streams include crayfish, spiders, frogs, water snakes and bird species (ducks, kingfishers, etc

Types

1. **Perennial streams** flow all year long .
2. **seasonal streams** are only seen at certain times of year, usually in wet season or as a result of snow or ice melting.
3. **Continuous streams** flow without stopping until they reach an endpoint or another body of water.
4. **Interrupted steams**, may have breaks or different reaches depending on seasonality, barriers another factors.

River ecosystem

Large streams flowing from mountain highlands are rivers. Three phases:

1. Mountain highlands – rushing down water fall of water – large quantity of dissolved oxygen – plants attached to rocks and fishes that require more oxygen are found.
 2. Second phase – gentle slopes of hills – warmer – supports the growth of plants and fishes that require less oxygen are seen.
 3. Third phase: river shapes the land – lots of silts, nutrients are brought – deposited in plains and delta
- very rich in biodiversity

Ocean Ecosystem

- Gigantic reservoirs of water covering.
- The oceans cover about 70 percent of the earth's surface and have an average depth of 2.4 miles. The planet has five oceans: Arctic, Atlantic, Pacific, Indian , Antarctic.

- huge variety of sea products, drugs etc.
- provide Fe, Mg, oils, natural gas, sand etc

Zones:

Divided in to 3 zones.

- Euphotic zone – abundant sunlight
- Bathyal zone – dim sunlight
- Abyssal zone – dark zone – world’s largest ecological unit

Organisms in ocean: Ocean Plant Life

- Marine plants live in the euphotic zone of the ocean, because they need sunlight to create food through photosynthesis. These plants include seaweeds, marine algae and sea grasses.
- Kelp provides food and shelter to ocean animals and is even used by humans in things like ice-cream and toothpaste.
- Phytoplankton is another important plant found in the ocean. This is the food for many ocean creatures, from the largest whales to the smallest fish.

Ocean Animals

- The ocean contains a large variety of animal life, including fish, mollusks, dolphins, seals, walrus, whales, crustaceans, bacteria, sea anemones and many others. Most marine animals live in the top two ocean zones, where they have access to plants and other ocean animals to eat.

Estuary Ecosystem

- An estuary is a body of water that forms when freshwater from the land meets and mixes with saltwater from the ocean.
- Estuaries come in a variety of sizes and are also known as bays, lagoons, harbors, inlets, sounds, wetlands, and swamps.
- Estuaries are special environments to which plants and animals have evolved.
- Estuaries serve as a transition zone (ecotone) between river and maritime environments.
- Reefs, barrier islands, headlands, and deltas protect estuaries from ocean forces.
- Estuaries transport and trap nutrients and sediment by combining the actions of freshwater flow, wind, waves, and tidal action.
- Example: Tapi estuaries in Gujarat and Narmada in Maharashtra.

Types

There are four different kinds of estuaries, each created a different way.

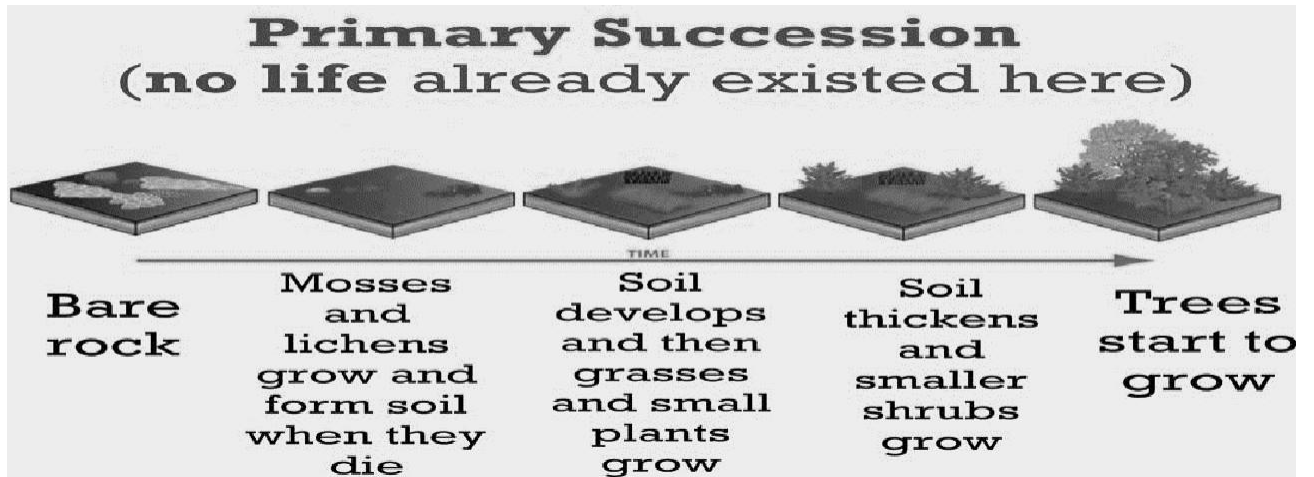
1. **Coastal plain estuaries:-** are created when sea levels rise and fill in an existing river valley. The Chesapeake Bay, on the East Coast of the United States, is a coastal plain estuary.
2. **Tectonic estuaries:-**the mixture of seawater and fresh water creates a tectonic estuary. San Francisco Bay, on the West Coast of the United States, is an excellent example of a tectonic estuary.
3. **Bar-built estuaries:-** When a lagoon or bay is protected from the ocean by a sandbar or barrier island, it is called a bar-built estuary . The Outer Banks, a series of narrow barrier islands in North Carolina and Virginia, create sandy, bar-built estuaries.
4. **Fjord estuaries :-** are a type of estuary created by glaciers. Glacier Bay in Alaska and the Georgia Basin region of Puget Sound in Washington State are good examples of fjords

Ecological succession

- “Ecological succession is a series of changes that occur in an ecological community over time.”
- It is the steady and gradual change in a species of a given area with respect to the changing environment.

1. Primary Succession

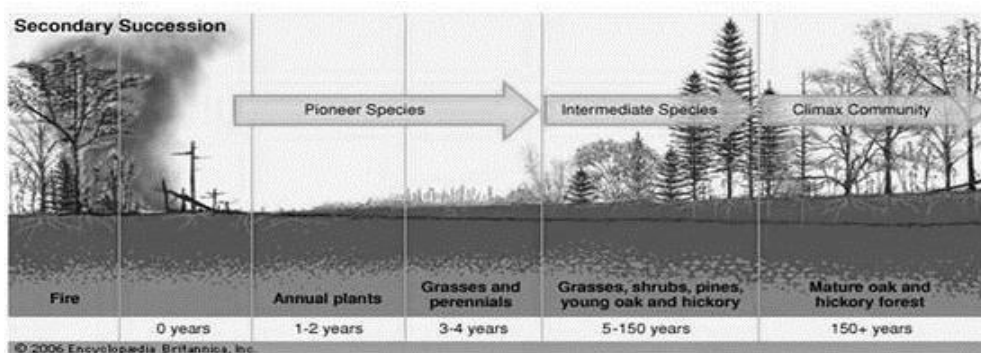
- Primary succession is the succession When plants and animals settle for the first time in an area where there was previously no life. Usually occurs where there was previously no soil
- When the planet was first formed there was no soil on earth. The earth was only made up of rocks. These rocks were broken down by microorganisms and eroded to form soil. The soil then becomes the foundation of plant life. These plants help in the survival of different animals and progress from primary succession to the climax community.
- If this primary ecosystem is destroyed, secondary succession takes place.



2. Secondary Succession

Secondary succession occurs when the primary ecosystem gets destroyed.

For e.g., a climax community gets destroyed by fire. It gets recolonized after the destruction. This is known as secondary ecological succession. Small plants emerge first, followed by larger plants. The tall trees block the sunlight and change the structure of the organisms below the canopy. Finally, the climax community arrives.



CHAPTER -4

BIODIVERSITY AND ITS CONSERVATION

Biodiversity is the abbreviated word for —biological diversity (bio-life or living organisms, diversity- variety). Thus, biodiversity is the total variety of life on our planet, the total number of races, varieties and species. The sum of total of various types of microbes, plants and animals (producers, consumers and decomposers) in a system. It is the most complex and important feature of our planet. Without biodiversity, life would not sustain.

LEVELS OF BIODIVERSITY

The concept of biodiversity may be analyzed in 3 different levels. They are

1. Ecosystem diversity
2. Species diversity
3. Genetic diversity

Ecosystem diversity

- A set of biotic components (plants, animals and microorganisms) and abiotic components (soil, air, water, etc) interacting with each other is known as an ecosystem.
- Ecological biodiversity refers to the variations in the plant and animal species living together and connected by food chains and food webs.
- It is the diversity observed among the different ecosystems in a region. Diversity in different ecosystems like deserts, rainforests, mangroves, etc., include ecological diversity.

Species diversity:

- A discrete group of organisms of the same kind is known as species.
- Species diversity is the diversity between different species.
- Species diversity refers to the variety of different types of species found in a particular area. It is the biodiversity at the most basic level. It includes all the species ranging from plants to different microorganism.
- No two individuals of the same species are exactly similar. For example, humans show a lot of diversity among themselves.

Genetic diversity:

- A species with different genetic characteristics is known as a sub-species or "genera".
- Genetic diversity is a measure of the variety of versions of same gene within individual species.
- Within individual species, there are varieties, that are slightly different from one other. These differences are due to differences in the combination of genes.
- Genes are the basic units of hereditary information transmitted from one generation to the other.

Ex: (i) Rice varieties - All rice varieties belong to the species "oryzasativa". However, there are thousands of rice varieties that show variation at the genetic level in the form of different size, shape, colour and nutrient content. (ii) Teak wood varieties: The various teak wood varieties available are - Indian teak, Burma teak, Malaysian teak etc.

Bio-geographical classification of India

India has different climate and topography in different parts and hence is termed as a mega diversity country. India occupies 10th place among plant rich countries of the world.

- It is essential to acquire knowledge about the distribution and environmental
- interaction of flora and fauna of India. Bio- geographers have classified India into ten bio-geographic zones with each zone
- having characteristic climate, soil and biodiversity.

These zones are described below:

1. The cold mountainous snow covered Trans Himalayan region of Ladakh.
2. The Himalayan ranges and valleys of Kashmir, Himachal Pradesh, Uttarakhand, Assam and other North Eastern States.
3. The Terai, the lowland where the Himalayan rivers flow into the plains.
4. The Gangetic and Brahmaputra plains.
5. The Thar Desert of Rajasthan.
6. The semi arid grassland region of the Deccan plateau Gujarat, Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu.
7. The Northeast States of India,
8. The Western Ghats in Maharashtra, Karnataka and Kerala.
9. The Andaman and Nicobar Islands.
10. The long western and eastern coastal belt with sandy beaches, forests and mangroves.

Functions of biodiversity: Two main functions of biodiversity are 1. It is the source on which the entire human species depends on for food, fibre, shelter, fuel and medicine. 2. It depends on biosphere which in turn leads to stability in climate, water, soil, air and overall health of biosphere.

Value of biodiversity

Consumptive use value:

- The consumptive use value is the value placed on nature's products that are consumed directly, without passing through a market. Some of them are firewood, food, and game meat.
- High consumptive use values on resources may lead to the following problems:
 - Over-exploitation of wildlife in developing countries
 - Loss of traditional controls on hunting and Loss of wildlife populations at productive levels.
 - Consumptive use value benefits the communities closest to the resource if harvested sustainably and managed efficiently.

Productive use value:

- Productive use value refers to products that are commercially harvested (sold in a market).
- Its value is estimated at the production end rather than retail end by adding an inflated cost to the finished product.
- Productive use value is often the only value of biological resource reflected in national income accounts and may have a major impact on the national economy.
- Timber, fish, honey, construction materials, mushrooms, fruits, medicinal plants and game meat sold in a market have productive use value.

Social value:

The loss of biodiversity directly influences the social life of the country possibly through influencing ecosystem functions (energy flow and biogeochemical cycle). This can be easily understood by observing detrimental effects of global warming and acid rain which cause an unfavorable alteration in logical processes.

Aesthetic Values:

Beautiful plants and animals inspire us to protect biodiversity. The most important aesthetic value of biodiversity is eco-tourism.

Ex: 1. People from distant places spend time and money to visit areas where they can enjoy aesthetic value of biodiversity. This is called eco-tourism.

2. The pleasant music of wild birds, beautifully colored butterflies, color of peacocks and colour of flowers are very important for their aesthetic value.

Optional value:

- This refers to the potential of biodiversity that is currently known and needs to be explored.
- This refers to the idea that there may be several existing species that may prove to be important in future and their usefulness needs to be studied with reference to a specific problem currently plaguing the society.
- Ex: 1. The growing biotechnology field is searching for the cure for diseases like cancer and AIDS.
- Medicinal plants and herbs play a very important role in the economic growth of our country. peacocks and colour of flowers are very important for their aesthetic value.

Threats to biodiversity

Any disturbance in a natural ecosystem tends to reduce its biodiversity. Waste generated due to increase in human population and industrialization spoils the environment and leads to decreased diversity in biological species.

Causes for loss of biodiversity are: 1. Habitat loss 2. Poaching of wildlife and 3. Man-wildlife conflicts

1. Habitat loss:

The loss of populations of interbreeding organisms is caused by habitat loss. Factors influencing habitat loss are:

a. Deforestation: Loss of habitat is mainly caused by deforestation activities. Forests and grasslands are cleared for conversion into agriculture lands or settlement areas or b. developmental projects. Forests and grasslands are natural home to thousands of species which disintegrate due to the loss of their natural habitat.

Destruction of wetlands: Wetlands, estuaries and mangroves are destroyed due to farming, filling and pollution that cause loss of biodiversity

c. Habitat fragmentation: When the habitat is divided into small and scattered patches the phenomenon is called habitat fragmentation. This leads to the disappearance of most wildlife

d. Raw material: To produce hybrid seeds, wild plants are used as raw materials leading to extinction of many wild plant species.

e. Production of drugs: Pharmaceutical companies collect wild plants for the production of drugs leading to extinction of several medicinal plant species.

f. Illegal trade: Illegal trade of wildlife reduces biodiversity leading to habitat loss

g. Developmental activities: Construction of dams in forest areas coupled with the discharge of industrial effluents kills birds and other aquatic life.

2. Poaching of wildlife:

Poaching refers to killing animals or commercial hunting. It contributes to loss of biodiversity. Poaching can be of two types listed below:

a. **Subsistence poaching:** This refers to killing animals for survival.

commercial poaching: This refers to hunting animals in order to sell their products. Factors influencing poaching:

Human population: Increased human population in India has led to pressure on forest resources, leading to degradation of wildlife habitats.

Commercial activities: Although a ban has been imposed internationally on the trade of products of endangered species, there is a continued smuggling of wildlife products. Since trading of such products is highly profitable, poachers continue to hunt endangered animals

and smuggle their fur, skin and tusks to other countries. Wildlife products include furs, horns, tusks, live specimens and herbal products.

3.Man-Wildlife Conflicts:

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

Ex: 1. In Sambalpur, Orissa, several people were killed by elephants. In retaliation, the villagers killed and injured several elephants.

Villagers sometimes hide explosives in their fields to ward-off animals which explode when the elephants enter the fields.

Several people were killed when leopards attacked them in Sanjay Gandhi National Park, Mumbai. Factors influencing man-animal conflicts

1. Shrinking forest cover compels wildlife to move outside the forest
2. Human encroachment into forest area induces a man-wildlife conflict
3. Injured animals have a tendency to attack man
4. Wild animals venture out of the forest area in search of food
5. Villagers set-up electric wiring around their fields. This injures animals (Elephants) who suffer pain and get violent.

India as a mega – diversity nation:

Nearly 170 countries in this world and 12 of them contain 70% of the earth's biodiversity India is one among the 12 mega biodiversity countries The Ministry of Environment and Forests, Government of India record 47,000 species of plants, 81,000 species of animals, Which is about the 7% and 6.5% of global flora and fauna respectively.

Biodiversity at global, national and local levels:

Global Level: Conservative estimates of the existing biodiversity is ten million species, but if estimates for insects are correct then it could be around 30 million species, we have till now enlisted about 1.4 million species. It includes among others about 98% birds, 95% reptiles and amphibians, 90% fish and about 85% higher plants known to exist on this Earth. Most of the world's bio-rich nations are in the South, which are the developing nations. In contrast, the majority of the countries capable of exploiting biodiversity are Northern nations, in the economically developed world. These nations however have low levels of biodiversity. Thus, the developed world has come to support the concept that biodiversity must be considered to be a 'global resource'.

National and Local Level: Geological events in the landmass of India have provided conditions for high levels of biological diversity. India has over 108,276 species of bacteria, fungi, plants and animals already identified and described (Table 4.2). Out of these, 84 percent species constitute fungi (21.2 percent), flowering plants (13.9 percent), and insect (49.3 percent). In terms of the number of species, the insect alone constitute nearly half of the biodiversity in India. These species occur on land, fresh and marine waters, or occur as symbionts in mutualistic or parasitic state with other organisms. In the world as a whole, 16, 04,000 species of Monera, Protista, Fungi, Plantae and Animalia have been described so far. However, it is estimated that at least 179, 80,000 species exist in the world, but as a working figure 122, 50,000 species are considered to be near reality. It is estimated that 18% of Indian plants are endemic to the country and found nowhere else in the world. Among the plant species the flowering plants have a much higher degree of endemism, a third of these are not found elsewhere in the world. Apart from the high biodiversity of Indian wild plants and animals there is also a great diversity of cultivated crops and breeds of domestic livestock. This is a result of several thousand years during which civilizations have grown and flourished in the Indian subcontinent. The traditional cultivars included 30,000 to 50,000 varieties of rice and a number of cereals, vegetables and fruit. The highest diversity of cultivars is concentrated in the high rainfall areas of the Western Ghats, Eastern Ghats, Northern

Himalayas and the North- Eastern hills.

Endangered species of India:

When the number of species has been reduced to a critical level Unless it is protected and conserved, it is in immediate danger of extinction. In India the following species are endangered 450 plant species, 100 mammal's species, 150 bird's species. India's biodiversity is threatened due to habitat destruction, degradation and over exploitation of resources.

Important endangered species:

Reptiles – tortoise, green sea turtle, python, etc. Birds – peacock, Siberian white crane, etc.

Mammals – Indian wolf, tiger, Indian lion, etc. Primates – capped monkey, golden monkey, etc. Plants – medicinal plants, sandal wood tree, etc.

Factors affecting endangered species: Pollution , Over – exploitation, Climatic changes.

Endemic species:

Species found only in particular region.

In India 47,000 species and 7000 plants are endemic.

62% of our endemic species are found in Himalayas and Western Ghats.

1. Fauna – Animals present in a particular region

i. 81,000 species of animals ii. Western Ghats is rich in 62% amphibians and 50% reptiles

2. Flora – Plants present in a particular region

FACTOR AFFECTING ENDEMIC SPECIES: Habitat loss and fragmentation , Pollution.

Hot spots of biodiversity in India:

1. Eastern Himalayas – Indo Burma region:

- Geographically comprises of Nepal, Bhutan and neighboring state of Northern India
- 35,000 plant species of which 30% are endemic
- 63% mammals
- 60% of the Indian Birds

2. Western Ghats – Sri Lanka:

- Geographically comprises of Maharashtra, Karnataka, Tamil Nadu and Kerala.
- 1500 endemic, dicotyledonous plant species
- 62% amphibians and 50% lizards

Conservation of biodiversity:

The following measures should be taken to conserve biodiversity.

1. Illegal hunting and trade of animals and animal products should be stopped immediately
2. People-at-large should boycott purchasing coats, purse or bags made of animal skin
3. Bio-diversity laws should be strengthened.

Types of conservation:

1. In-situ conservation and
2. Ex-situ conservation

In-situ conservation:

In-situ conservation involves protection of flora and fauna within its natural habitat. The natural habitats or ecosystems under in-situ conservation are called "protected areas". a. Biosphere reserves b. National parks c. Wildlife sanctuaries d. Gene sanctuaries

Biosphere reserves

They cover large areas (>5000 sq.km.) They are normally used to protect species for a long time.

National parks

It is an area dedicated for the conservation of wildlife along with its environment. It covers an area ranging from 100 to 500 sq.km. One or more national parks may exist within a biosphere

reserve. A national park is used for enjoyment through tourism, without affecting the environment.

Wildlife sanctuaries

is an area that is reserved for the conservation of animals only. i. It protects animals only ii. It allows operations such as harvesting of timber, collection of forest products, private ownership rights and forestry operations, provided it does not affect animals adversely.

Gene sanctuaries

It is an area where plants are conserved.

Advantages of in-situ conservation

It is cheap and convenient.

Species get adjusted to natural disasters like drought, floods, forest fires etc.

Disadvantages of in-situ conservation

A large surface area of earth is required to preserve biodiversity Maintenance is not proper due to shortage of staff and pollution

ex-situ conservation

Ex-situ conservation involves protection of flora and fauna outside their natural habitats. This type of conservation is mainly done for conservation of crop varieties and wild relatives of crops. Important centers of ex-situ conservation: 1. Botanical gardens

2. Seed banks
3. Microbial culture collections
4. Tissue and cell cultures
5. Museums and
6. Zoological gardens

Advantages of Ex-situ conservation

1. Survival of endangered species is increasing due to special care and attention
2. In captive breeding the animals are assured of food, water, shelter and security thereby have a longer life span

Disadvantages of Ex-situ conservation

1. It is an expensive method
2. Freedom of wildlife is lost

CHAPTER-5

ENVIRONMENTAL POLLUTION

Introduction

Pollution may be defined as an undesirable change in the physical, chemical or biological characteristics of air, water and land that may be harmful to human life and other animals, living conditions, industrial processes and cultural assets. Pollution can be natural or manmade.

Pollutants

The agents that pollute are called pollutants.

Classification of Pollutants

Pollutants are of two types:

1. Non-degradable pollutants:

These are the pollutants, which degrade at a very slow pace by the natural biological processes. These are inorganic compounds such as salts (chlorides), metallic oxides waste producing materials and materials like, aluminum cans, mercuric salts and even DDT.

2. Biodegradable pollutants:

These include domestic sewage that easily decomposes under natural processes and can be rapidly decomposed by natural/ artificial methods. These cause serious problems when accumulated in large amounts as the pace of deposition exceeds the pace of decomposition of disposal.

Types of pollution

1. Air pollution

Air pollution refers to any physical, chemical or biological change in the air. It is the contamination of air by harmful gases, dust and smoke which affects plants, animals and humans drastically.

Types of Air Pollutants

There are two types of air pollutants:

1. Primary Pollutants

The pollutants that directly cause air pollution are known as primary pollutants. Sulphur-dioxide emitted from factories is a primary pollutant.

2. Secondary Pollutants

The pollutants formed by the intermingling and reaction of primary pollutants are known as secondary pollutants. Smog, formed by the intermingling of smoke and fog, is a secondary pollutant.

Causes of Air pollution:

Following are the important causes of air pollution:

1. Burning of Fossil Fuels

The combustion of fossil fuels emits a large amount of Sulphur dioxide. Carbon monoxide released by incomplete combustion of fossil fuels also results in air pollution.

2. Automobiles

The gases emitted from vehicles such as jeeps, trucks, cars, buses, etc. pollute the environment. These are the major sources of greenhouse gases and also result in diseases among individuals.

3. Agricultural Activities

Ammonia is one of the most hazardous gases emitted during agricultural activities. The insecticides, pesticides and fertilizers emit harmful chemicals in the atmosphere and contaminate it.

4. Factories and Industries

Factories and industries are the main source of carbon monoxide, organic compounds, hydrocarbons and chemicals. These are released into the air, degrading its quality.

5. Mining Activities

In the mining process, the minerals below the earth are extracted using large pieces of equipment. The dust and chemicals released during the process not only pollute the air, but also deteriorate the health of the workers and people living in the nearby areas.

6. Domestic Sources

The household cleaning products and paints contain toxic chemicals that are released in the air. The smell from the newly painted walls is the smell of the chemicals present in the paints. It not only pollutes the air but also affects breathing.

Effects of Air Pollution

The hazardous effects of air pollution on the environment include:

1. Diseases

Air pollution has resulted in several respiratory disorders and heart diseases among humans. The cases of lung cancer have increased in the last few decades. Children living near polluted areas are more prone to pneumonia and asthma. Many people die every year due to the direct or indirect effects of air pollution.

2. Global Warming

Due to the emission of greenhouse gases, there is an imbalance in the gaseous composition of the air. This has led to an increase in the temperature of the earth. This increase in earth's temperature is known as global warming. This has resulted in the melting of glaciers and an increase in sea levels. Many areas are submerged underwater.

3. Acid Rain

The burning of fossil fuels releases harmful gases such as nitrogen oxides and Sulphur oxides in the air. The water droplets combine with these pollutants, become acidic and fall as acid rain which damages human, animal and plant life.

4. Ozone Layer Depletion

The release of chlorofluorocarbons, halons, and hydro chlorofluorocarbons in the atmosphere is the major cause of depletion of the ozone layer. The depleting ozone layer does not prevent the harmful ultraviolet rays coming from the sun and causes skin diseases and eye problems among individuals.

5. Effect on Animals

The air pollutants suspend on the water bodies and affect the aquatic life. Pollution also compels the animals to leave their habitat and shift to a new place. This renders them stray and has also led to the extinction of a large number of animal species.

Air pollution control

Following are the measures one should adopt, to control air pollution:

- **Avoid Using Vehicles**

People should avoid using vehicles for shorter distances. Rather, they should prefer public modes of transport to travel from one place to another. This not only prevents pollution, but also conserves energy.

- **Energy Conservation**

A large number of fossil fuels are burnt to generate electricity. Therefore, do not forget to switch off the electrical appliances when not in use. Thus, you can save the environment at the individual level. Use of energy-efficient devices such CFLs also controls pollution to a greater level.

- **Use of Clean Energy Resources**

The use of solar, wind and geothermal energies reduce air pollution at a larger level. Various countries, including India, have implemented the use of these resources as a step towards a cleaner environment. Other air pollution control measures include:

1. By minimizing and reducing the use of fire and fire products.
2. Since industrial emissions are one of the major causes of air pollution, the pollutants can be controlled or treated at the source itself to reduce its effects
3. Fuel substitution is another way of controlling air pollution.
4. The last and the best way of reducing the ill effects of air pollution is tree plantation.

2. water pollution

Water pollution is the contamination of water bodies (like oceans, seas, lakes, rivers, aquifers, and groundwater) usually caused due to human activities. Water pollution is any change in the physical, chemical or biological properties of water that will have a detrimental consequence of any living organism.

Drinking water, also called Potable Water, is the water that is considered safe enough for human and animal consumption. This is water that is generally used for drinking, cooking, washing, crop irrigation, etc. These days chemicals, bacteria, and other pollutants are even affecting our drinking water.

Sources of Water Pollution

Some of the most commonly occurring water pollutants are

- Domestic Waste
- Industrial effluents
- Insecticides and pesticides
- Detergents and Fertilizers

Some of the water pollution that is caused is by Direct Sources, such as factories, waste management facilities, refineries etc, that directly release waste and harmful by-products into the nearest water source without treating them. Indirect sources include pollutants that enter the water bodies via groundwater or soil or via the atmosphere as acid rain.

Effects of Pollution of Water

1. Diseases: In humans, drinking or consuming polluted water in any way has many disastrous effects on our health. It causes typhoid, cholera, hepatitis and various other diseases.
2. Destruction of Ecosystems: Ecosystems are extremely dynamic and respond to even small changes in the environment. Water pollution can cause an entire ecosystem to collapse if left unchecked.
3. Eutrophication: Chemicals in a water body, encourage the growth of algae. These algae form a layer on top of the pond or lake. Bacteria feed on this algae and this decreases the amount of oxygen in the water body, severely affecting the aquatic life there.
4. Effects the food chain: Disruption in food chains happens when toxins and pollutants in the water are consumed by aquatic animals (fish, shellfish etc) which are then consumed by humans.

Prevention

The best way to prevent large-scale water pollution is to try and reduce its harmful effects. There are various small changes we can make to protect ourselves from a scary future where water is scarce.

1. Save Water: Conserving water is our first aim. Water wastage is a major problem globally and we are only now waking up to the issue. Simply small changes you can make domestically will make a huge difference.
2. Better treatment of sewage: So, treating waste products before disposing of it in a water body helps reduce water pollution on a large scale. Agriculture or other industries can reuse this wastewater by reducing its toxic contents.
3. Use environmentally friendly products: By using soluble products that do not go on to become pollutants, we can reduce the amount of water pollution caused by a household.

3. Soil pollution

Soil pollution is defined as, “contamination of soil by human and natural activities which may cause harmful effect on living organisms”.

Causes of Soil Pollution

1. Industrial wastes:- Disposal of Industrial wastes is the major problem for soil pollution. This has probably been the biggest contributor in the last century, especially from mining and manufacturing, as the by-products are often contaminated, and not disposed of properly.
2. Urban wastes — Urban wastes comprise of both commercial and domestic wastes consisting of garbage and rubbish materials like plastics, glasses, metallic cans, fibres, paper, rubbers etc. Urban wastes, can be dangerous. This happens because they are not easily degraded.
3. Agricultural practices —Modern agricultural practices pollute the soil to a large extent. With the advancing agro-technology, huge quantities of fertilizers, pesticides, herbicides and weedicides are added to increase the crop yield. They are full of chemicals that are not produced in nature and cannot be broken down by it. As a result, they seep into the ground after they mix with water and slowly reduce the fertility of the soil.
4. Radioactive pollutants/ - Radioactive substances resulting from explosions of nuclear testing

laboratories and industries giving rise to nuclear dust radioactive wastes, penetrate the soil and accumulate giving rise to land/soil pollution.

5. Accidental Oil Spills-Oil leaks can happen during the storage and transport of chemicals. This can be seen at most of the fuel stations. The chemicals present in the fuel deteriorates the quality of soil and make them unsuitable for cultivation.

6. Acid Rain- when there are pollutants in the air, and it starts to rain, they mix and fall back to the ground, causing acid rain. This pollution can then dissolve important nutrients, changing the structure of the soil.

7. Biological agents – Soil gets a large amount of human, animal and bird excreta which constitute a major source of land pollution by biological agents.

Effects of Soil Pollution on Human Beings

Crops and plants that are grown on polluted soil absorb much of the pollution and then pass these on to us. This could explain the sudden surge in small and terminal illnesses. Long term exposure to such soil can affect the genetic make-up of the body, causing chronic health problems that cannot be cured easily. In fact, it can cause food poisoning over a long period of time.

Effects on Plants and Animals

Since soil pollution is often accompanied by a decrease in the availability of nutrients, plant life ceases to thrive in such soils. Soils contaminated with inorganic aluminum can prove toxic to plants. Also, this type of pollution often increases the salinity of the soil, making it inhospitable for the growth of plant life.

Effects on the Ecosystem

Since the volatile contaminants in the soil can be carried away into the atmosphere by winds or can seep into underground water reserves, soil pollution can be a direct contributor to air and water pollution.

It can also contribute towards acid rain (by releasing huge quantities of ammonia into the atmosphere). Crop yield is greatly affected by this form of pollution. In China, over 12 million tons of grain (worth approximately 2.6 billion USD) is found to be unfit for human consumption due to contamination with heavy metals (as per studies conducted by the China Dialogue).

Control measures of soil pollution:

1. Soil erosion can be controlled by a variety of forestry and farm practices. Ex: Planting trees on barren slopes. Contour cultivation and strip cropping may be practiced instead of shifting cultivation.
2. Proper dumping of unwanted materials: Excess wastes by man and animals pose a disposal problem. Open dumping is the most commonly practiced technique. Nowadays, controlled tipping is followed for solid waste disposal. The surface so obtained is used for housing or sports field.
3. Production of natural fertilizers: Bio-pesticides should be used in place of toxic chemical pesticides. Organic fertilizers should be used in place of synthesized chemical fertilizers. Ex: Organic wastes in animal dung may be used to prepare compost manure instead of throwing them wastefully and polluting the soil.
4. Proper hygienic condition: People should be trained regarding sanitary habits. Ex: Lavatories should be equipped with quick and effective disposal methods.
5. Public awareness: Informal and formal public awareness programs should be imparted to educate people on health hazards by environmental education.
6. Recycling and Reuse of wastes: To minimize soil pollution, the wastes such as paper, plastics, metals, glasses, organics, petroleum products and industrial effluents etc should be recycled and reused.
7. Ban on Toxic chemicals: Ban should be imposed on chemicals and pesticides like DDT, BHC, etc which are fatal to plants and animals.

4. Marine Pollution

The discharge of waste substances in to the sea resulting in harm to the living resources, hazards to the human health hindrances to the fishery and impairment of quality use of sea water.

Causes

1. Dumping the wastes: Dumping of untreated wastes and sewages in the oceans by coastal towns, cities and industries. Rivers on the way to sea carry huge amount of sewage garbage agricultural discharge pesticide heavy metals. Huge quantity of plastic dumped in to the sea.

2. Oil: This is discharged in to the sea as crude oil and as separate fraction. Oil and it's fractions are used in houses automobiles and industries. This causes devastation of marine environment
3. Radioactive materials enter the ocean from nuclear weapon testing.
4. Toxics: Toxic waste is the most harmful form of marine pollution. Once toxic wastes affects an organism it quickly passes along the food chain and as sea food which cause various problems.
5. Marine Debris: Garbage like plastic bags, ropes helium balloons

Effects of marine pollution

1. Heavy metals and organic pollutants damages birds by thinning of egg shells and tissue damage of egg.
2. Oil pollution causes damage to marine animals and plants including algae bird, fish etc.
3. Oil spilling in the sea causes abnormal low body temperature in birds resulting in hypothermia. During Exxon Valdez accident 150 rare species of bald eagles are affected by ingested oil.
4. Oil films are able to retard the rate of oxygen uptake by water.
5. Hydrocarbon and benzopyrene accumulate in food chain and consumption of fish by man may cause cancer.
6. Many marine birds ingest plastic that causes gastrointestinal disorders.
7. Oil spills inhibit photosynthesis and the growth of planktons. All aquatic animals depend either directly or indirectly on planktons the basis of food chain.

Control of marine pollution

The industrial unit on the coastal lines should be equipped with pollution control instrument.

Methods of removal of oil by skimming the oil off the surface with suction device or Chemical methods like dispersion , emulsification etc.

Municipal and industrial waste should be treated before disposing in to sea

2. Coastal waste are periodically analyzed for detecting pollution level
3. Soil erosion in the coastal land should be arrested by suitable techniques
4. Recreation beaches should be maintained to meet hygienic and aesthetic standard.

Thermal pollution

Thermal pollution is defined as the addition of excess of undesirable heat to water thereby making it harmful to man, animal or aquatic life.

Sources of Thermal Pollution

1. Nuclear power plants: Nuclear power plants including drainage from hospitals, research institutions, nuclear experiments and explosions discharge a lot of heat that is not utilized.
2. Coal-fired power plants: Coal fired power plants constitute a major source of thermal pollution. The condenser coils in such plants are cooled with water from nearby lakes or rivers. The resulting heated water is discharged into streams thereby raising the water temperature by 15°C.
3. Industrial effluents: Industries like textile, paper, pulp and sugar manufacturing release huge amounts of cooling water along with effluents into nearby natural water bodies.
4. Domestic Sewage: Domestic sewage is discharged into rivers, lakes, canals or streams with minimal treatment or without any treatment. These wastes have a higher organic temperature and organic load.
5. Hydro-electric power: Generation of hydroelectric power sometimes leads to negative thermal loading in water systems.

Effects of Thermal pollution

1. Reduction in dissolved oxygen: Concentration of Dissolved Oxygen (DO) decreases with increase in temperature.
2. Increase in toxicity
The concentrated pollutant causes the rise in the temperature of water which increases the toxicity of the poison present in water. The toxicity in water will increase the death rate in marine life.
3. Disruption of Biological activities
Temperature changes disrupt the entire marine ecosystem because changes in temperature causes change in physiology, metabolism and biological process like respiration rate, digestion, excretion and development of an aquatic organism.

4. Interference in reproduction: In fishes, several activities like nest building, spawning, hatching, migration and reproduction depend on optimum temperature.

Control measures for thermal pollution

The following measures can be taken to prevent or control high temperature caused by thermal pollution:

1. Heated water from the industries can be treated before discharging directly to the water bodies.
2. Heated water from the industries can be treated by the installation of cooling ponds and cooling towers.
3. Industrial treated water can be recycled for domestic use or industrial heating.
4. Through artificial lakes: In this lake Industries can discharge their used or heated water at one end and water for cooling purposes may be withdrawn from the other end. The heat is eventually dissipated through evaporation.
5. Noise Pollution

Noise pollution means an unwanted or undesirable sound that leads to physical and mental problems. Noise pollution is dependent on the loudness and frequency of the sound. In fact, when the sound exceeds its limit, it becomes fatal for human and other organisms.

Types of Noise Pollution

Following are the three types of pollution:

- Transport Noise
- Neighborhood Noise
- Industrial Noise

– Transport Noise

It mainly consists of traffic noise which has increased in recent years with the increase in the number of vehicles. The increase in noise pollution leads to deafening of older people, headache, hypertension, etc.

– Neighborhood Noise

The noise from gadgets, household utensils etc. Some of the main sources are musical instruments, transistors, loudspeakers etc.

– Industrial Noise

It is the high-intensity sound which is caused by heavy industrial machines. According to many researches, industrial noise pollution damages the hearing ability to around 20%.

Causes and Sources of Noise Pollution

Following are the causes and sources of noise pollution:

- Industrialization: Industrialization has led to an increase in noise pollution as the use of heavy machinery such as generators, mills, huge exhaust fans are used, resulting in the production of unwanted noise.
- Vehicles: Increased number of vehicles on the roads are the second reason for noise pollution.
- Events: Weddings, public gatherings involve loudspeakers to play music resulting in the production of unwanted noise in the neighborhood.
- Construction sites: Mining, construction of buildings, etc add to the noise pollution.

Effects of Noise Pollution on Human Health

Noise pollution can be hazardous to human health in the following ways:

- **Hypertension:** It is a direct result of noise pollution which is caused due to elevated blood levels for a longer duration.
- **Hearing loss:** Constant exposure of human ears to loud noise that are beyond the range of sound that human ears can withstand damages the eardrums resulting in loss of hearing.
- **Sleeping disorders:** Lack of sleep might result in fatigue and low energy level throughout day affecting everyday activities. Noise pollution hampers the sleep cycles leading to irritation and uncomfortable state of mind.
- **Cardiovascular issues:** Heart-related problems such as blood pressure level, stress, and cardiovascular diseases might come up in a normal person .

Control measures:

There are four fundamental ways in which noise can be controlled: **Reduce noise at the source, block the path of noise, increase the path length and protect the recipient.** In general, the best control method is to reduce noise levels at the source.

Source reduction can be done by effectively muffling vehicles and machinery to reduce the noise. one of the best methods of noise source reduction is regular and thorough maintenance of operating machinery. Noise levels at construction sites can be controlled using proper construction planning and scheduling techniques.

The path of traffic noise can also be blocked by construction of vertical barriers alongside the highway. Planting of trees around houses can also act as effective noise barriers.

Increasing the path length between the source and the recipient offers a passive means of control.

Use of earplugs and earmuffs can protect individuals effectively from excessive noise levels.

Preventive measures

1. Prescribing noise limits for vehicular traffic
2. Ban on honking (usage of horns) in certain areas
3. Creation of silence zones near schools and hospitals
4. Redesigning buildings to make them noise proof
5. Reduction of traffic density in residential areas
6. Giving preference to mass public transport system.

6. Nuclear Hazards

Nuclear pollution is the physical pollution of air, water and soil by radioactive materials. Nuclear energy can be both beneficial and harmful depending on the way in which it is used. Approximately 17 % of the electrical energy generated in the world comes from nuclear power plants. However, on the other hand it is impossible to forget the destruction that nuclear bombs caused the cities of Hiroshima and Nagasaki. The radioactive wastes from nuclear energy have caused serious environmental damage.

Causes

Nuclear accidents from nuclear energy generation plants: In the postmodern world, various forms of energy are being discovered. Among them is nuclear energy, which is touted to be the most potent source of energy due to its high latent power. Reports indicate that the high latent power is due to its high level of radiation.

The use of nuclear weapons: The use of nuclear missiles and atomic bombs, a form of nuclear energy, in the Second World War not only explains cause but also the damaging nature of radioactive pollution or contamination.

Use of radio isotopes: Radio isotopes are used to make detectors and in other industrial activities. Isotopes such as uranium have high concentrations of radiation in them. On the other hand, common Isotopes such as carbon containing radioactive material are easily found in water ways through sewage lines.

Cosmic rays: These come from outer space to our planet with intense radiation as their nature, therefore, causing radioactive pollution. Gamma rays, for example, are said to have the highest level of radiation and yet, depending on their intensity.

Effects

Effects of nuclear hazards: All organisms are affected from radiation pollution, and the effects are extremely dangerous. The effects may be somatic (individual exposed is affected) or genetic (future generations) damage. the effects are cancer, shortening of life span and genetic effects or mutations. Some of the possible effects are listed as under:

- Break DNA in cells
- Man do not die, but suffer from fatigue, nausea, vomiting and loss of hair
- Bone marrow is affected & blood cells are reduced.
- Kill organism by damaging the tissue of heart and brain.

- Kill organism by damaging the tissue of heart and brain
- Develops different types of cancer
- Through food chain also, radioactivity effects are experienced by man But the most significant effect of radioactivity is that it causes long range effects, affecting the future of man and hence the future of our civilizations.

Control Measures

- I. Laboratory generated nuclear wastes should be disposed off safely and scientifically.
- II. Leakage of radioactive elements from nuclear reactors, careless use of radioactive elements as fuel and careless handling of radioactive isotopes must be prevented.
- III. Safety measure against accidental release of radioactive elements must be ensured in nuclear plants.
- IV. Unless absolutely necessary, one should not frequently go for diagnosis by x-rays.
- V. Regular monitoring of the presence of radioactive substance in high-risk area should be ensured
- VI. Among the many options for waste disposal, the scientists prefer to bury the waste in hundreds of meters deep in the earth's crust is considered to be the best safety long term option.

Solid waste management

Rapid population growth and urbanization in developing countries has led to people generating enormous quantities of solid waste and consequent environmental degradation. The waste is normally disposed in open dumps creating nuisance and environmental degradation. Solid wastes cause a major risk to public health and the environment. Management of solid wastes is important in order to minimize the adverse effects posed by their indiscriminate disposal.

Types of solid wastes:

Depending on the nature of origin, solid wastes are classified into

1. Urban or municipal wastes
2. Industrial wastes

Sources of urban wastes:

Domestic wastes containing a variety of materials thrown out from homes. Ex: Food waste, Cloth, Waste paper, Glass bottles, Polythene bags, Waste metals, etc.

Commercial wastes: coming out from shops, markets, hotels, offices, institutions, etc. Ex: Wastepaper, packaging material, cans, bottle, polythene bags, etc.

Construction wastes: includes wastes of construction materials. Ex: Wood, Concrete, Debris, etc.

Biomedical wastes: It includes mostly waste organic materials Ex: Anatomical wastes, Infectious wastes, etc.

Classification of urban wastes

Bio-degradable wastes - Those wastes that can be degraded by micro-organisms are called bio-degradable wastes Ex: Food, vegetables, tea leaves, dry leaves, etc.

Non-biodegradable wastes: Urban solid waste materials that cannot be degraded by micro-organisms are called non-biodegradable wastes. Ex: Polythene bags, scrap materials, glass bottles, etc.

Sources of industrial wastes

The main source of industrial wastes is chemical industries, metal and mineral processing industries. Ex: Nuclear plants: It generated radioactive wastes.

Thermal power plants: It produces fly ash in large quantities.

Chemical Industries: It produces large quantities of hazardous and toxic materials.

Other industries: Other industries produce packing materials, rubbish, organic wastes, acid, alkali, scrap metals, rubber, plastic, paper, glass, wood, oils, paints, dyes, etc.

Effect of improper solid waste management

1. Due to improper disposal of municipal solid waste on the roads and immediate surroundings, biodegradable materials undergo decomposition producing foul smell and become a breeding ground for disease vectors.
2. Industrial solid wastes are the source for toxic metals and hazardous wastes that affect soil characteristics and productivity of soils when they are dumped on the soil
3. Toxic substances may percolate into the ground and contaminate the groundwater.
4. Burning of industrial or domestic wastes (cans, pesticides, plastics, radioactive materials

and batteries) produce furans, dioxins and polychlorinated biphenyls that are harmful to human beings.

Control measures of urban and industrial waste

Two important steps involved in solid waste management are-

1. Reduce, Reuse and Recycle of Raw Materials.
2. Discarding wastes

Reduce, Reuse and Recycle of Raw Materials.

1. **Reduce** - If usage of raw materials is reduced, the generation of waste also gets reduced. 2. **Reuse** - Refillable containers that are discarded after use can be reused. Rubber rings can be made from discarded cycle tubes and this reduces waste generation during manufacture of rubber bands. 3. **Recycle**- Recycling is the reprocessing of discarded materials into new useful products Ex: Old aluminum cans and glass bottles are melted and recast into new cans and bottles, preparation of cellulose insulation from paper, Preparation of automobile body and construction material from steel cans This method (Reduce, Reuse & Recycle), i.e, 3R's help save money, energy, raw materials and reduces pollution.

Discarding wastes

The following methods are adopted for discarding wastes:

1. **Landfill**: Solid wastes are placed in a sanitary landfill in which alternate layers of 80 cm thick refuse is covered with selected earth-fill of 20 cm thickness. After 2-3 years solid waste volume shrinks by 25-30% and land is used for parks, roads and small buildings. This is the most common and cheapest method of waste disposal and is mostly employed in Indian cities.
2. **Incineration**: It is a hygienic way of disposing solid waste. It is suitable if waste contains more hazardous material and organic content. It is a thermal process and very effective for detoxification of all combustible pathogens. It is expensive when compared to composting or land-filling. In this method municipal solid wastes are burnt in a furnace called incinerator. Combustible substances such as rubbish, garbage, dead organisms and noncombustible matter such as glass, porcelain and metals are separated before feeding to incinerators.
3. **Composting**: It is another popular method practiced in many cities in our country. In this method, bulk organic waste is converted into fertilizer by biological action.

Role of an individual in prevention of pollution

There are a host of environmental problems caused by human actions on the environment. If we are to respond to these problems, we have to recognize that each of us is individually responsible for the quality of the environment we live in. Individuals contribute towards a better quality of our environment and human life is:

- Try to plant trees wherever you can and more importantly take care of them. They reduce air pollution.
- Reduce the use of wood and paper products wherever possible. Manufacturing paper leads to pollution and loss of forests which releases oxygen and takes up carbon dioxide. Try to recycle paper products and use recycled paper wherever possible.
- From the mail you receive reuse as many envelopes that you can.
- Do not buy furniture, doors, window frames made from tropical hardwoods such as teak and mahogany. These are forest based.
- Help in restoring a degraded area near your home or join in an afforestation program.
- Use pesticides in your home only when absolutely necessary and use them in as small amounts as necessary. Some insect species help to keep a check on the populations of pest species.
- Reduce the use of fossil fuels by either walking up a short distance using a car pool, sharing a bike or using public transport. This reduces air pollution.

- Shut off the lights and fans when not needed.
- Doesn't use aerosol spray products and commercial room air fresheners. They damage the ozone layer.
- Do not pour pesticides, paints, solvents, oil or other products containing harmful chemicals down the drain or on the ground.
- Buy consumer goods that last, keep them as long as possible and have them repaired as far as possible instead of disposing them off. Such products end up in landfills that could pollute ground water.
- Buy consumer goods in refillable glass containers instead of cans or throwaway bottles.
- Try to avoid asking for plastic carry bags when you buy groceries or vegetables or any other items. Use your own cloth bag instead.
- Use sponges and washable cloth napkins, dish towels and handkerchiefs instead of paper ones.
- Recycle all newspaper, glass, aluminum and other items accepted for recycling in your area. You might have to take a little trouble to locate such dealers.
- Set up a compost bin in your garden or terrace and use it to produce manure for your plants to reduce use of fertilizers.
- Try to lobby and push for setting up garbage separation and recycling programs in your localities.
- You could join any of the several NGOs that exist in our country or become volunteers. Organize small local community meetings to discuss positive approaches of pollution prevention.
- You cannot improve your world by not voting. You have the option to make a choice rather than complain later on.
- It is important that you do not get discouraged at the first sign of trouble. Do not dwell on the negative aspects. But take positive actions wherever you can to make the world a better place to live in.

Disaster management

The Indian subcontinent is very vulnerable to droughts, floods, cyclones, earthquakes, landslides, avalanches and forest fires. Among the 36 states and Union territories in the country, 22 are prone to disasters.

Floods

Increased rainfall or rapid snow melting causes more flow of water in the streams. This excess water flow in a stream covering the adjacent land is called a flood. Floodplain is defined in terms of a flood frequency. Floodplains are generally fertile, flat and easily formed.

Causes of flood

Construction of buildings in a flood plain ,Removing vegetation ,Paving roads and parking areas, Deforestation, Heavy rainfall ,Urbanization.

Effects of flood

- Erosion of top soil and vegetation
- Damage and loss to land, house and property
- Spread of endemic waterborne diseases
- Interruption of basic facilities of community such as highways, railways, telephone, electricity and day-to-day essentials
- Silting of reservoirs and dams

Flood control

- Construction of flood control dam
- Deepening, widening and straightening of streams
- Lining of streams
- Banning of construction of buildings in floodplains
- Converting flood-plains into wildlife habitat, parks, and recreation areas.

Landslides

Landslides occur when mass of earth material move downward. It is also called mass wasting or mass movement.

sudden landslide occurs when unconsolidated sediments of a hillside are saturated by rainfall or waterlogging.

Many landslides take place in coincidence with earthquakes. The most common form of landslides is earthquake induced landslides or more specifically rock falls.

Control measures for landslides

- Avoid construction activity in landslide occurring areas.
- Reducing slope of hilly side
- Stabilizing the slope portion
- Increasing plantation of deep-rooted vegetation on the slope.

1.Earthquakes

An earthquake occurs when rocks break and slip along a fault in the earth. Earthquakes occur due to deformation of crust and upper mantle of the earth.

Due to heating and cooling of the rock below these plates, movement of adjacently overlying plates and great stresses, deformation occurs.

Tremendous energy can build-up between neighboring plates.

If accumulated stress exceeds the strength of the rocks, the rocks break suddenly releasing the stored energy as an earthquake.

The magnitude of an earthquake is measured in Richter scale.

Effects of earthquake

Ground shaking ☐ Liquefaction of ground ☐ Ground displacement ☐ Landslides ☐ Flood

Control of earthquake

There is virtually no technique to control the occurrence of earthquake. However, certain preventive measures can be taken to minimize the damage.

- Minimizing development activity (especially construction, mining, construction of dams and reservoirs) in areas known to be active seismic zones.
- Continuously monitoring seismic activity using 'seismographs' and alerting people regarding any recorded disturbance in advance.

CHAPTER-6

SOCIAL ISSUES AND THE ENVIRONMENT

Introduction:

From Unsustainable to Sustainable Development

Man is part of the nature and he is bound to obey the laws of nature. He depends on his environment for basic things. More developmental activities are adopted in order to increase the quality of life. For that he uses the available resources. The Earth has limited supply of resources and renewable resources. These are to be managed in a scientific manner for availing the generations to come. Hence developmental activities are to be taken with more care about the environment and its protection. It brings benefits to all not only to the present generation but also for future generations.

Sustainable development:

Meeting the needs of the present without compromising the ability of future generation to meet their own needs.

Important components of Sustainable development:

Economic development Community development Environmental protection

Aspects of sustainable development:

Inter-generational equity-It states that we should hand over a safe, healthy and resourceful environment to future generation.

Intra generational equity: A technological development of rich countries should support the economic growth of poor countries and help in narrowing the wealth gap and lead to sustainability.

Approaches for sustainable development:

1. Developing appropriate technology
2. Reduce, Reuse and Recycle (3R approach)
3. . Providing environmental education and awareness
4. Consumption of renewable resources
5. Non-renewable resources should be conserved by recycling and reusing.
6. By population control we can make sustainable development.

Urban problems related to energy:

- i. Urbanization –Movement of human population from rural; areas to urban areas for want of better education, communication, health, employment etc.
- ii. Urbanization –Movement of human population from rural; areas to urban areas for want of better education, communication, health, employment etc.
- iii. Causes: Cities are the main centers of economic growth, trade transportation, medical facilities and employment.
- iv. Urban sprawl: The phenomenon of spreading of the cities in to sub-urban or rural areas is called urban sprawl.

Examples for energy demands: 1. Residential and commercial lightings. 2. Industries using large proportion of energy. 3. Usage of fans fridge, A.C, washing machines.

Solution for urban energy problems:

1. Energy consumption must be minimized in all aspects.
2. Public transportation should be used instead of motor cycles and cars.
3. Using of solar energy and wind energy.
4. Production capacity must be increased.

Water conservation

The original source of water is precipitation from the atmosphere. The water available on the earth may occur in all three stages as gas, liquid or solid. Temperature is the main factor in deciding the state of water. As a liquid, the water forms hydrosphere. About 75% of the Earth's surface is covered by the hydrosphere. The process of saving water for future utilization is called conservation of water.

Need for water conservation.

1. Better life style requires more fresh water.
2. Agriculture and Industrial activities require more fresh water.
3. As the population increases the requirement of water is also more.

Methods of water conservation

i) Rain water Harvesting ii) Watershed management

Rain water Harvesting

It is a technique of collecting and storing rain water for use in non-monsoon periods. In the present age, concrete houses, well-built roads, footpaths and well –concreted courtyards have left few open grounds. With the decrease in natural forest cover, increase in concrete jungles and the decrease in exposed earth; very little open ground is left for water to soak in and thereby increase the ground water table. So, artificial recharging of the ground water is extremely essential. It is done through rain water harvesting. For the purpose, rain water is collected at the roof top or in an open well and then carried down for immediate use or it is directed into the aquifer.

Rain water harvesting techniques

There are two main techniques for rain water harvesting:

1. Storage of rain water on the surface for future use
 2. Recharge of ground water
- Concept of rain water harvesting

Rain water harvesting involves collecting water that falls on roof of house during Rain and conveying water through PVC or Al pipe to a nearby covered storage tank.

Method of rain water harvesting

1. Roof top method: collecting rain water from roof of the building and storing in the ground. It is the low cost and effective technique for urban houses and buildings.
2. The rain water from roofs, road surfaces, play grounds is diverted into the surface tank or recharge pits.

Advantages: Rise in ground water level and minimizing the soil erosion and flood Hazards. Scarcity of water is reduced.

WATERSHED MANAGEMENT

Water shed (or) drainage basin: It is defined as land area from which water drains under the influence of gravity into stream, lake, reservoir (or) other body of surface water. Watershed management of rain fall and resultant run off is called watershed management.

Factors affecting watershed: 1. Overgrazing, deforestation, mining, construction activities affect and degrade watershed. 2. Droughty climate also affects the water shed.

Need or objectives of watershed management

1. To raise the ground water level.
2. To protect the soil from erosion by run off.
3. To minimize the risks of floods, drought and landslides.

Watershed management techniques
Trenches (pits) were dug at equal intervals to improve ground water storage. Earthen dam or stone embankment must be constructed to check run off water.

Farm pond can be built to improve water storage capacity of the catchment's area.

Resettlement and Rehabilitation of People

It is a well-known fact that both natural and human made disasters force people to move out of their land. For example. Tsunami in South Asia in December 2004, Latur and Gujarat earthquake, the Orissa super-cyclone and scores of floods and droughts in other parts of our country have rendered thousands of people homeless and jobless. Disasters, like the Bhopal gas tragedy in Union carbide factory, derailment of trains, are examples of human made disaster.

Control Measure

Firstly, strategies should be made for rehabilitation of thus displaced people are in the first place by way of preventive action. For instance, care is taken to build earthquake proof houses, gather advance information about cyclones and arrange for timely evacuation, build appropriate bunds in flood prone areas, maintain bridges that take regular up and down passing of trains/ road transport vehicles on them in order to avert likely disasters.

Secondly, advance preparation on the part of administration and local communities are made to face the consequences of sudden calamities. For both these remedial steps, the primary necessity is that of building awareness among the people in general and among administrative personnel in particular.

Thirdly, advance planning should be made in the cases of natural and human made calamities is however quite limited and in comparison, the Govt. we can certainly plan better in the cases of development projects which are planned in advance.

Fourthly the Govt. has developed many development projects to take care of people those who are affected by natural calamities. But the problem is that the in-charge should pay little attention to the processes of resettlement and rehabilitation of displaced people.

Fifthly, there are some institutional measures have been taken by the government by way of constituting committees at various levels. They exist on paper and their immediate response to the actual events is yet to come in any significant manner.

Finally, It is the responsibility of each human being and Govt. that they Should take some initiative relief measure for the disaster victim through resettlement and rehabilitation.

Environmental Ethics

It refers to issues, principles and guidelines related to human interactions with their Environment. Solution to environmental problems:

Reduce the waste matter and energy resources.

Recycle and reuse as many of our waste product and resources as possible. Avoid over exploitation of natural resources.

Minims soil degradation and protect the biodiversity of the earth. Reduce population and increase the economic growth our country.

Ethical guidelines on environmental protection:

1. The earth is the habitat of all living species and not of human beings alone.
2. Natural resources and energies are depleting fast. We must protect them.
3. Involve yourself in the care of the earth and experience nature.
4. Respect nature, you are a part of it.
5. Think of the global cause and act for local protection
6. Keep yourself informed about ecological changes and developments.
7. Observe austerity, reserve scarce resources for the future and the future generations.
8. We must be cooperative, honest, affectionate and polite to society and nature.

Climate:

It is the average weather of an area. It is the general weather condition, seasonal variations of the region. The average of such conditions for a long period is called climate.

Effects of climate change:

1. Small climate changes disturb agriculture which leads To migration of animals and human.
2. Climate change may upset hydrological cycle which results in floods and droughts in different parts of the world.
3. Global pattern of winds and oceans currents also gets disturbed by climate change.

Global warming:

Greenhouse gases in the atmosphere are transparent to light but absorb IR radiation. These gases allow sunlight to penetrate the atmosphere and are absorbed by the earth surface. This sunlight is radiated back as IR which is absorbed by gases. As a result, the earth surface and lower atmosphere becomes warm. This is called global warming.

Effects of global warming:

1. Sea level increases as result of melting and thermal expansion of ocean.
2. Many plants and animal species will have a problem of adapting. Many will be at the risk of extinction; more towering verities will thrive.
3. As the earth becomes warmer the floods and drought become more frequent. There would be increase in water-borne diseases.

Measures to check global warming:

CO₂ emission can be cut by reducing the use of fossil fuel. 2. Plant more trees. 3. Shifting from coal to natural gas. 4. Stabilize population growth. 5. Remove efficiently CO₂ from smoke stocks. 6. Removal atmospheric CO₂ by utilizing photo synthetic algae.

Acid rain

When fossil fuels such as coal, oil and natural gas are burned, chemicals like sulfur dioxide and nitrogen oxides are produced. These chemicals react with water and other chemicals in the air to form sulfuric acid, nitric acid and other harmful pollutants like sulfates and nitrates. These acid pollutants spread upwards into the atmosphere, and are carried by air currents, to finally return to the ground in the form of acid rain, fog or snow.

Effects:

Acid rain is known to cause widespread environmental damage.

1. Acid rain dissolves and washes away nutrients in the soil which are needed by plants. It can also dissolve naturally occurring toxic substances like aluminum and mercury, freeing them to pollute water or poison plants.
2. Acid rain that falls or flows as ground water to reach rivers, lakes and wetlands, causes the water in them to become acidic. This affects plant and animal life in aquatic ecosystems.
3. . Acid rain also has far reached effects on wildlife. By adversely affecting one species, the entire food chain is disrupted, ultimately endangering the entire ecosystem.
4. Acid rain indirectly affects plants by removing nutrients from the soil in which they grow.
5. Acid rain and dry acid deposition damages buildings, automobiles, and other structures made of stone or metal.

Solutions:

The best way to stop the formation of acid rain is to reduce the emissions of sulfur dioxide and nitrogen oxides into the atmosphere. This can be achieved by using less energy from fossil fuels in power plants, vehicles and industry. Switching to cleaner burning fuels is also a way out.

Ozone layer depletion:

Ozone is formed by the action of sunlight on oxygen. It forms a layer 20 to 50kms above the surface of the earth. This action takes place naturally in the atmosphere, but is very slow. The ozone layer in the upper atmosphere absorbs the sun's ultraviolet radiation, preventing it from reaching the earth's surface. This layer in the atmosphere protects life on earth from the dangerous UV radiation from the sun. In the 1970s, scientists discovered that chemicals called chlorofluorocarbons or CFCs, which were used as refrigerants and aerosol spray propellants, posed a threat to the ozone layer.

The destruction of the ozone layer is seen to cause increased cases of skin cancer and cataracts. It also causes damage to certain crops and to plankton, thus affecting nature's food chains and food webs. This in turn causes an increase in carbon dioxide due to the decrease in vegetation.

Nuclear accidents and holocaust

Energy released—during a nuclear reaction is called nuclear energy. Nuclear fission and Nuclear fusion are used to prepare nuclear energy. During nuclear accidents large amount of energy and radioactive products are released into the atmosphere.

Types of nuclear accidents: -

Nuclear Test- Nuclear explosions –release radioactive particles and radioactive rays into the atmosphere nuclear power plant accidents: nuclear power plants located in seismic vulnerable area may cause nuclear accidents which releases radiation.

Improper disposal of radioactive wastes: Drums with radioactive wastes, stored underground rust and leak radioactive wastes into water, land and air.

Effects of nuclear radiation

1. Radiation affects DNA in cells.
2. Exposure to low dose of radiation (100to 250 rds) people suffer from fatigue, vomiting ,and loss of hair.
3. Exposed to high radiation (400- 500 rds) affect bone marrow ,blood cells , natural resistance fail of blood clot.
4. Exposure to very high dose of radiation (10000rds) kills organisms by damaging the tissues of heart and brain.

Nuclear Holocaust: -Destruction of Biodiversity by nuclear equipment's and nuclear bombs is called nuclear holocaust.

Effects of nuclear holocaust.

Nuclear winter, nuclear bombardment will cause combustion of wood , plastics , forests etc.

Case study: nuclear holocaust in Japan

In 1945 two nuclear bombs were dropped in Hiroshima and Nagasaki in Japan. About 100000 people were Killed and the cities were badly destroyed. This explosion emitted forceful neutrons and gamma radiation. Radioactive Strontium liberated in the explosion replaced calcium in the bones .Large scale bone deformities occurred in the people of these cities.

Water (prevention and control of pollution) Act.1974.

This act provides for maintaining and restoring the sources of water. It also provides for preventing and controlling water pollution.

Features of water act.

- This act aims to protect the water from all kind of pollution and to preserve the quality of water in all aquifers.
 - The act further provides for the establishment of central board and state boards For prevention of water pollution.
 - The states are empowered to restrain any person from discharging a pollutant (or) sewage or) effluent into any water body without the consent of the board.
 - The act is not clear about the definition of pollutant, discharge of pollutant Toxic pollutant.
- State pollution control board
The consent of this board is needed
- To establish any industry or any treatment and disposal system or any extension or addition which likely discharge or trade effluent into a stream or well or river or on land.
 - To use any new or altered outlet for the discharge of sewage.
 - To begin to make any new discharge of sewage.
 - Act also empowers the state board to order closure or stoppage of supply of electricity, water or any other service to the polluting unit.

Air prevention act 1981

- This act was enacted in the conference held at Stock Holm. It envisages the establishments of central and State control boards to monitor air quality and pollution control.
- Important features:
- The central board may lay down the standards for quality of air.
- The central board co-ordinates and settle the disputes between state boards.3.The central board provides technical assistance and guidance to state boards.
- The state boards are empowered to lay down the standards for emission of air pollutants from industries or other resources.
- The state boards are to examine the manufacturing processes and control equipment for for the prescribed standards.
- The direction of central board is mandatory on state boards.
- With out the consent of the central board operation of an industrial unit is prohibited in heavily polluted area.
- Violation of law is punishable with imprisonment for three months or fine of Rs 10000 or both. This act applies to all pollution industries. This act empowers the state board to order closure of any industrial unit or stoppage of water supply or stoppage of electricity.

Public awareness

In order to conserve our environment each and every one must be aware about our environment problems and objectives of various environmental policies at natural and local level.

Objectives of public awareness:

- 1.To create awareness among rural and city people about ecological Imbalance, local environmentand technological development.
- 2 To organize meetings, tree plantation programs, group discussion on development, exhibitions.
3. To focus on current environment problems and situations.
4. To train our planners, decision makers, politicians and administrators.
5. To eliminate poverty by providing employment that over comes the basic environmental issues.

Methods to create environmental awareness

1. Environmental education must be imparted to the students in schools and colleges.
2. Media like TV Radio and cable network can educate the people on environmental issues through Cartoons, documentaries, street plays.
3. Cinema about environmental education should be prepared and screened in theatres compulsorily .These films may be released with tax free to attract the public.
4. All the newspapers and magazines must publish the environment related problems.
5. Special audio visual and slide shows should be arranged in public places.
6. Voluntary organizations like NCC, NSS, and ROTRACT Club should be effectively utilized for creating environmental awareness.
7. Arranging competitions like story and essay writing painting competition on environmental issues for student as well as public. Attractive prizes should be awarded for the best effort.

CHAPTER-7

HUMAN POPULATION AND THE ENVIRONMENT

Population: - Group of individuals belonging to the same species which live in a given area at given time.

Population density: - Number of individuals of the population per unit area ® per unit volume.

Parameters effecting population

Birthrate (OR) Natality:- Number of live births per 1,000 people in a population in a given year.

Death Rate (OR) Mortality:- Number of deaths per 1000 people in a population in a given year

Immigration:- It denotes the arrival of individuals from neighboring population.

Emigration:- It denotes the disposal of individuals from the original population to new areas.

Population Growth : Results from the difference between the rate of birth and death.

Causes:

1. Due to decrease in death rate and increase in birth rate.
2. Availability of antibiotics, immunization increased food production, clean water and air, decreases the famine related deaths and infant mortality.
3. The poverty and illiteracy lead controlled growth of population.
4. Child Marriages
5. People's superstitions. People believe that it is because of God's grace.

Variation of population among Nation:

At present the world's population has crossed 6 billion. Less developed countries (Africa, Asia, S.A) have 80% population while developed countries have only 20%. In most developed countries like USA, Canada, Australia population increases by less than 1%. But in less developed countries the population increases by more than 1% / year. Kenya is the fastest population growing countries in the world. When 20 million are residing. China & India's population was above 1000 million in 2000 years. Its share is 1/3 of the world population. Europe and N.H. accounts for 14% of world population.

Population Explosion:

The enormous increase in population due to low death rate and high birth rate is called as population expansion.

Cause of population explosion:

- Invention modern medical facilities, reduces the death rate and increases birth rate, which lead to population explosion.
- Increase of life expectancy is another important reason for population explosion. Eg:- In 1956, the average life expectancy of the human beings was 40 years. But now it is 61 years.
- Illiteracy is one of the reasons for the population explosion.

Family welfare programmed

Family welfare programmed was implemented by Govt. of India as a voluntary programmed. It is a policy of growth covering human health, family welfare children and women's right.

Objectives:

1. Slow down the population explosion by reducing fertility.
2. Pressure on the environment, due to over exploitation of natural resources is reduces.

Family planning Programme

If provides educational and clinical services that help couple to choose how many children to have and when to have them. Family planning programme provides information on birth spacing birth control and health care for pregnant woman and infants. It also reduced the number of legal and illegal abortions per year and decreased the risk of death from pregnancies.

Objectives:

1. Reduce infant mortality rate to below 30 / 1000 infants
2. Achieve 100% registration of births, deaths marriage and pregnancies.
3. Encourages late marriages and late child bearing.
4. Encourages breast feeding.
5. Enables to improve woman's health education, employment.
6. Constrain the spread & Aids / HIV.
7. Prevent and control of communicable diseases.

Fertility control methods:

1. Traditional methods: It includes taboos and folk medicine.
2. Modern methods: It includes birth control techniques like mechanical barriers, surgical methods, chemical pills and physical barriers to implantation. More than 100 contraceptive methods are on trial.

Family planning programmed in India:

1. In 1952 India started family planning programme.
2. In 1970 Indian govt. forced FP campaign all the over country.
3. In 1978 govt. legally raised the minimum age of marriage for men from 18 to 21 and for women 15 to 18 years.
4. In 1981 census report showed there is no drop in population. Hence funding for FP programme has been increased.

Environment & human Health

Healthy person:- Physically fit person without suffering any disease is called a healthy person.

Disease:- Harmful changes in the body's condition by nutritional, biological, chemical (or) psychological factors are called diseases.

Preventive measures:

1. Always wash your hand before eating.
2. Cut short and clean your nails systematic.
3. Drinking chemically treated and filtered water.
4. Eat food always in hot condition.
5. Wash the vegetables and fruits with clean water before cooking.
6. Avoid plastic containers and Al vessels.
7. Do physical exercise to have proper blood circulation.

Human Rights

Human rights are the fundamental rights possessed by human beings irrespective caste, nationality, sex & language.

The aim of Govt. is to ensure happiness to the entire citizen with equal rights. Under the Indian constitution the following fundamental rights have been guaranteed to human beings.

Human rights to freedom

Every citizen has the freedom to express his view freely. Citizen can assemble at any place to express their views. Freedom to form unions (or) associations. Freedom to slant any profession. Indian Constitution

Indian constitution provides for civil, social, cultural, educational and political rights. Article 14 – equality before law.

Article -15 Prohibits discrimination on the ground of race, religion caste, sex (or) place of birth. Article 16 Provides equal opportunity for all citizens in regarding to employment.

Article 19 Provides for freedom of speech and expression, forming association and union. Article – 20 Protection from connection except in accordance with the law of the land.

Article – 22 – lays down the rights of a person in custody. Article – 24 – prohibits exploitation of labor children.

Article – 25 – grantees freedom to profess, practice and propagate a religion of one's choice.

Value education

Education is nothing but learning through which knowledge about a particular thing can be acquired with the help of our knowledge and experience we can identify our value to understand ourselves and our relationship with other and their environment.

Types of Education:

Formal Education:- (In this all-learning process are self-related). All people will read write, will get good jobs and take with any problem with the help of formal education.

Value Education:- It is an instrument used to analyses our behavior and provide proper direction to our youth. It teaches the youth the distinction between right & wrong, to be helpful loving, generous and tolerant.

Value based environmental education

It provides knowledge about the principle of ecology, fundamental of environment and biodiversity. It creates sense of duty to care for natural resources and to manage them in sustainable key.

Objectives:

1. Improve integral growth of human being.
2. To create attitudes and improvement towards sustainable life style.
3. To increase awareness about our national history, cultural heritage, constitutional rights, national integration.
4. To understand (about the our) natural environment in which how land, air and water are interlinked.
5. To know about various living and non-living organism and their interaction with the environment.

Role of IT in Environment

IT plays a vital role in the field of environment education. IT means collection, processing, storage and dissemination of information. The internet facilities, information through satellites, www and geographical information provides up to date information on various aspects of environment, weather.

Application of computers in the field of Environment & human health:

1. Unknown parameters can be stimulated by computer techniques .2.EIA(Environmental Impact Assessment) problems can be analyzed3.Inventories of emission sources are compiled and maintained
4. Net-work analysis, statistical analysis and the status of environmental pollutions can be highlighted
5. Comprehensive administrative system can be developed by using computer network techniques.
6. Remote sensing-Graphical Interface System are useful for coral reef mapping and ocean resources. They are also useful to access the loss of biodiversity/hot spots etc.

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