

GOVT. POLYTECHNIC, JAGATSINGHPUR

CIVIL ENGINEERING DEPARTMENT

**LEARNING MATERIAL OF ENVIRONMENTAL
STUDIES**

3RD SEMESTER

FACULTY NAME – SOUMYA PRAKASH SUTAR

* Definition

→ The word 'environment' is derived from the French word 'environ' meaning encircle or surroundings.

→ The environment consist of both biotic and abiotic substances i.e., air, water, plant, sunlight, animals, temperature etc.

→ Environment can be defined as collective term of all external forces, influences and conditions which affect the life, nature, behaviour and the growth, development and maturity of living organism.

Classification of Environmental Education :-

Newman (1981) classified the environmental education as follows:

Environmental Studies :-

The interaction of the biotic components among themselves and together with the abiotic components goes by the name of environmental study.

Environmental Engineering :-

→ The knowledge of basic civil engineering subjects and various technologies and engineering are needed for the built world.

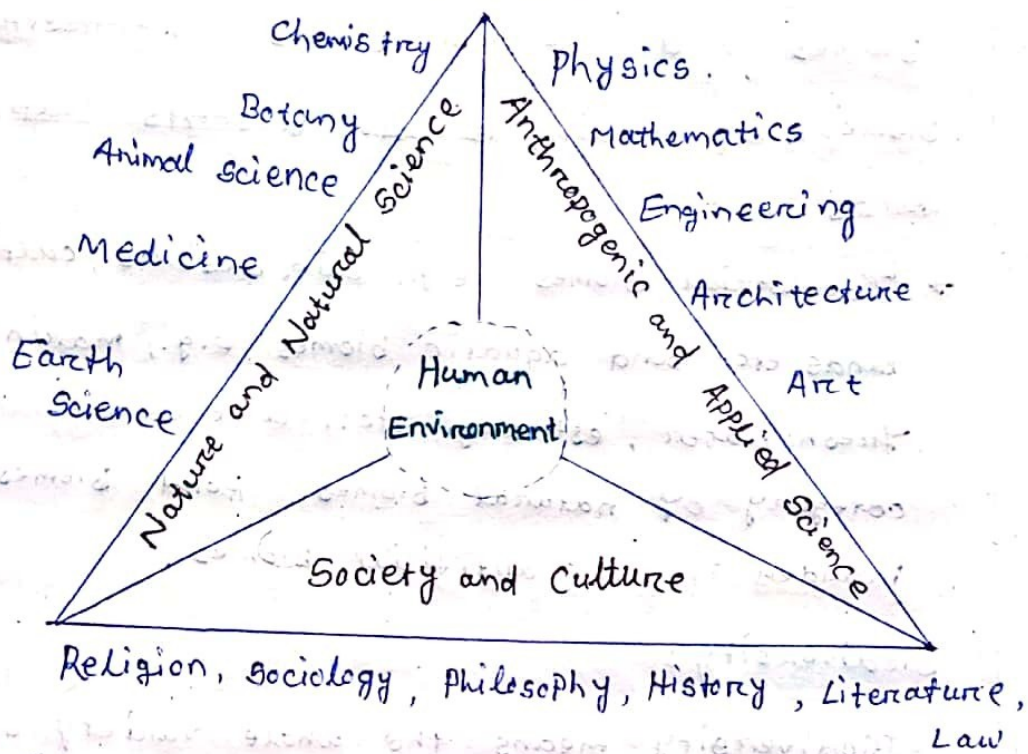
→ That is why the subject under study is more specially goes by the name of environmental engineering and technology.

Environmental Science :-

- It is highly interdisciplinary but includes various basic and applied fields, such as natural sciences, humanities, and social sciences.
- Thus, it follows that the science of ~~environ~~ environmental studies is a multi-disciplinary science because it deals with various branches of studies like chemistry, physics, life science, medical science, agriculture, public health, sanitary engineering etc.
- It deals with the study of environmental conditions that affect the human beings and other organisms with regards to nature, health, employment, laws, politics, ethics, economics, and above all, science, technology and resources conservation and management.

Environmental Chemistry :-

- It deals with the chemical phenomenon taking place in the environment. The chemical phenomenon include the chemical composition, structure, reactions, properties, transports and effects of chemical species, such as air, water and soil.
- It deals with the harmful effect of these species on the living organism particularly human beings and also the impact of humans on the environment.



Relationship Betⁿ Human Environment and various Science

* Scope of Environmental Studies :-

Both the living and non-living objects contribute to the scope of this study in different fields, such as follows:

Natural Resources :-

This constitutes the living components like plants, animals, etc. and non-living components, such as air, water, soil, forest, mineral, food, energy, sunlight, atmosphere, climate, nutrients etc.

Ecosystem :-

→ The system formed by the interaction of a community of organisms with their physical (abiotic) environment is called ecosystem.

→ A part of a large ecosystem is called a **Biome**. Biome cover huge areas and are characterised by their climate and the types of plant and animal existing

→ Mainly two types of biomes are: Natural Biomes, and Artificial Biomes. Terrestrial Biomes, e.g., rain, ~~forests~~, ~~deserts~~, cultivated lands etc.

→ Terrestrial Biomes, e.g., rain, deserts, cultivated lands etc. and aquatic biomes, e.g., marine, fresh water, estuary, etc., come under the category of natural biomes. Pond Biomes are included in the artificial biomes.

Biodiversity :-

Biodiversity means the whole variety of life on earth. It includes genetics, species, ecosystem and landscape diversities.

Pollution :-

The pollution is manifested in various forms such as ~~there~~ air, water, soil, ~~and~~ noise, radioactive, marine, magnetic, thermal, solid waste, electronic waste, economic system, political system, e-pollution, etc.

Conservation of Natural Resources :-

These include conservation of animals and plants in their natural habitat (i.e., in-situ conservation) and conservation of animals and plants ~~year~~ away from their natural habitat, such as in zoos, and sanctuaries, respectively (i.e., ex-situ conservation).

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Social, Ethical and Aesthetic Problems :-

The environmental studies can also be made for the following problems: agriculture, economic growth, green revolution, global warming, green house effect, rain water harvesting, acid rain, diseases, ozone hole, industrialisation, urbanization, consumerism, etc.

Other Problems :-

Various issues e.g., weather effects, climatic changes, flood disaster, earth-quake disaster, cyclone disaster, etc., gives scope of environmental studies.

*Importance of Environmental Studies:

→ The objective of the environmental studies is to examine various factors which lead to pollution of air, water, food, soil, etc., or cause environmental damage.

→ It is therefore necessary to create awareness about the environment, pollution and related harmful effects on health.

The requirements of good environment as follows:

Pure Air :-

The air should be free from the harmful gases and suspended matters. Since we get air from the atmosphere, it cannot be cent percent pure.

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→ The acceptable limits of various constituents for maintaining quality of air are the following:

Sulphur dioxide (SO_2) : $30 \mu g/m^3$

Carbon monoxide (CO) : $1000 \mu g/m^3$

Nitrogen dioxide (NO_2) : $30 \mu g/m^3$

Pure Water :-

Bacteria and pollutant free water should be used for drinking purpose. The acceptable values of various parameters of water are follows:

pH value : 7 ; acidity : 4 ppm

Hardness : 19 ppm,

Turbidity : 5 to 10 ppm on silica scale

Odour intensity : threshold number should be below 1.

Pure Food :-

Food should be pure and palatable and should not be adulterated.

In addition to maintaining a good environment, environmental studies have become important for the following aspects:

Increased Pollution :-

Human activities cause the air, water, soil and noise pollution. It is of much importance to find out the cause of such pollutions and effective suggestions for their reduction and prevention.

Global Environmental Issues :-

Environmental issues like global warming, ozone depletion, acid rain, marine pollution and biodiversity are threatening the survival of mankind on earth. Environmental studies are of much significance to tackle these issues with great efforts.

* Public Awareness :-

→ Increasing growth of population and urbanization and industrialisation contribute towards air pollution, water pollution, land (soil) pollution and food pollution.

Since we are facing various challenges, it is of much importance to make the public aware of these challenges so as to act eco-friendly.

Some of these challenges are

Growing Population :-

Population is growing at the rate of 2.11% every year. It puts considerable pressure on the natural resources and hampers in the development. Hence, the greatest challenge before us is to limit the population growth.

Poverty :-

The vast majority of our people are dependent on the natural resources for their basic needs of food, fuel, shelter and fodder.

→ Environmental degradation adversely affects the poor who depend on the resources of their environment. Thus, these are the greatest challenge before us.

Air and Water Pollution :-

As air and water are the essential components for the survival of the living organisms, it is a great challenge for solving the air and water pollution problems.

Agricultural Growth :-

There is agricultural growth in the high yielding varieties. But due to this, the physical structure of the soil and nature of the soil have been spoiled. In view of this, the people must be acquainted with the methods to sustain and increase agricultural growth without damaging the environment.

Land Degradation :-

Water and wind erosion causes land degradation. Pasture lands are overgrazed by livestock. Such degradation is to be avoided.

Reduction of Genetic Diversity :-

The rapid industrialization and urbanization causes deforestation. This results in the decrease of wild genetic stocks and hence the loss of genetic diversity. Remedial measures are to be taken to check the decreasing genetic diversity.

Impact of Urbanization :-

Because of industrialisation, urbanization is growing rapidly. Hence, a major challenge is to cope with the rapid urbanization.

Ch-02 } -! Natural Resources :-

The natural resources can be defined as the things/materials of the nature, that can be put to some use by human beings for their growth, development, comfort and other necessities are called as "Natural Sources".

E.g., :- Air, water, soil, forest, animals, minerals, metals, energy and other substances are some examples of natural resources that are utilised by human beings.

Types of Natural Resources :-

All the natural resources can be ~~defined~~ divided into two categories :-

- (i) Exhaustible Natural Resources
- (ii) Inexhaustible Natural Resources

(i) Exhaustible Natural Resources :-

→ These are soils, forests, water, coal, Petroleum, natural gas, minerals etc. These are consumed or exhausted through continuous use or misuse.

→ Exhaustible natural resources can be further divided into two categories :-

- a) Renewable Natural Resources
- b) Non-renewable Natural Resources

(ii) In-exhaustible Natural Resources :-

These resources are those which can not be exhausted through continuous use or misuse e.g., air and sunlight.

Renewable Resources :-

→ The natural resources are consumed / exhausted through continuous use and can be recovered by very hard efforts taken up for long periods are called Renewable Resources, for e.g. soils, forests, groundwater.

→ In other words we can say that all renewable resources are replenished through natural cycles or manually.

→ For example oxygen in air is replenished through photosynthesis.

→ Forest is maintained themselves and manually.

→ Similarly fresh water is available through cycles & manually too.

→ The natural resources are useful to human society in one way or other. Hence we should ensure a ~~world~~ continuous yield of useful plants, animals and materials by establishing a balanced cycle of harvest and renewal.

Non-Renewable Resources :-

→ Non renewable resources are not replenishable or we can not get back our coal and petroleum reserves in our life time, if ones they are consumed completely.

→ Examples are :- metals (iron, copper, zinc etc), coal, oil deposits, minerals, stone, mineral, salts (phosphate, nitrates, carbonates) etc.

→ Minerals are often called the 'stock' resources, because their new materials can only be extracted from the earth's crust once.

→ Coal, petroleum and natural gas are called as 'FOSSIL FUELS' because they are formed from dead remains of plant and animals buried in the earth long long ago. They are burnt to give off energy.

→ Minerals, rocks, salts and chemicals etc. are termed as 'abiotic resources' as biological activity is not involved in their formation.

*Mineral Resources :-

→ Minerals are naturally occurring elements or compounds that have been formed through slow inorganic process.

→ Mineral is a naturally occurring substances of definite chemical composition and identifiable physical properties.

→ Minerals are non-renewable substances.

Types of Minerals :-

1. Metallic Minerals

Ferrous alloy :- e.g - Iron, aluminium, lead, zinc, copper.

Non-Ferrous

e.g. - titanium, antimony, arsenic, lithium

2. Non-metallic Minerals - Graphite, mica, asbestos, lime stone, sand stone, ruby, fire clay

3. Mineral Fuels - e.g. - coal, natural gas, petroleum

This is used to provide energy.

→ Minerals needs to be extracted from earth's interior. This process is known as mining, mining operation occurs through four stages.

- 1) Prospecting - searching minerals
- 2) Exploration - Assessing size, shape, location, economic value of deposit.
- 3) Development - work of preparing access to deposit, so that minerals can be extracted from it.
- 4) Exploitation - extracting minerals

Environmental Effect of ^{from mines} Extracting Minerals!

- 1) Deforestation
- 2) Extinction of species
- 3) The heavy earth-moving machinery and blasting cause problem of noise, vibration.
- 4) Rapid depletion of high grade mineral.
- 5) Forced migration of animals.
- 6) Wastage of upper soil layer and vegetation.
- 7) Ozone depletion.
- 8) Soil erosion
- 9) Green house gas increases
- 10) Environmental pollution
- 11) Natural hazards
- 12) People related with mining effect by dust & poisonous gas leads to skin and lung diseases.

13) Dust and toxic gases indirectly affect air, humidity, temperature.

14) Deforestation and climate results poor rainfall and affects plants, animals.

Mineral Resources of India:-

→ India has sufficient quantities of iron, aluminium, copper, lead, zinc ores.

→ Iron minerals are found in sufficient quantity in our country. About $\frac{2}{3}$ rd of iron deposits lies in Orissa & Bihar.

→ India has world's largest deposit of coal.

→ Next to Russia, India has largest supply of manganese. This mining areas are:-

Madhy Pradesh, Maharashtra, Bihar, Orissa area

→ Chromite deposits are found in Bihar, Andhra Pradesh, Uttarakhand.

→ India produces $\frac{1}{3}$ rd of world's mica. These are found in Bihar, Andhra Pradesh, Rajasthan.

→ Petroleum deposits are found in Assam & Gujarat.

- Panna diamonds belt is only diamond producing area in our country, which covers district of Panna, Chhattrapur in Madhya Pradesh
- Bauxite deposit are found in Bihar, central Tamilnadu, U.P., Karnataka.

* Forest Resources :-

- Scientist estimate that India should ideally have 33% of its land under forest.
- Today we have only about 12%.
- Thus we need not only to protect existing forests but also to increase our forests.

Use of Forest Resources :-

- Reduce the rate of surface run-off water
- Prevent flash floods and soil erosion.
- Prevent effects of draught.
- Maintain CO_2
- Maintain local climate condition.
- Maintain soil nutrient
- Absorption of solar-heat during evapo-transpiration.

Local Use:-

- Fuel, wood and charcoal for cooking.
- Timber - household articles and construction.
- Fiber - weaving of ropes, ~~rope~~ nets.
- food, Fruits
- Medicinal plants.

Deforestation:-

Deforestation means cutting of trees by man for commercial and other purposes.

Effects of Deforestation :-

- Desertification
- soil degradation and soil erosion
- Loss of vegetation cover.
- Destruction of natural habitat and loss of life.
- changes in climatic condition.
- Environmental pollution.
- Damage to ecosystem.
- Reduction in soil moisture.

- The pattern of rainfall has changed in deforested areas.
- Cause global warming.

Control of Deforestation :-

- Prevention of human settlement in forests areas.
- Prohibition of setting up agriculture into forest lands.
- Controlled mining in forests areas.
- Control on over grazing in forest areas.
- Control on construction of large dam in forest areas.

Case Study :-

- It is need to include local communities in forest management.
- In 1972, an arrangement held between local community and forest department called JFM (Joint forest community).
- JFM issued new guideline in 2000. It says, 25% of income from area must go to local community.

Water Resources :-

While 67% of earth's surface is covered by water, only less than 2.7% of water is freshwater in form of ice caps and glaciers. Only less than 0.7% is available for human use.

Over utilization of water :-

1) Ground water Over utilization :-

→ Ground water constitute about 9.8% of total fresh water.

→ Lowering of water Table -

Excessive use of ground water resulting in rapid depletion of groundwater in various region leading to lowering of water table and drying of well.

→ Ground Subsidence :-

It occurs when ground water withdrawal is more than its recharge rate. It results in sinking of land surface which damage to building.

ii) Surface water Over utilization: -

→ It occurs in the form of stream, rivers, lakes, ponds, wetland.

→ A rapid rise in population, expansion in industry and agriculture has increased. So the use of water has increased 4-8% per year.

→ Agriculture use maximum water.

→ Rest are used in domestic, municipal supplies industries.

Floods: -

→ Floods have been a serious environmental hazards from centuries.

→ Deforestation causes flood, that kills people, damage crops and destroy homes.

→ Rivers change its course during floods and tons of ~~variable~~ valuable soil is lost to the sea.

→ As the forest are destroyed, rain water run off down the mountain side causes soil erosion.

→ Floods are caused by both natural as well as human made. Due to heavy rain or blocking of free flow of river ^{due} to landslide causes flood. ~~Man made causes are~~

Man-made causes are deforestation, over grazing, construction activities.

Droughts :-

- The condition of dryness for prolonged period is called drought. It results when average rainfall for an area drops below normal.
- Human activities like deforestation, over grazing, mining causes desertification, thus increases the chance of drought.
- The problem of drought can be solved by increasing content of air moisture, the amount of precipitation.
- Dry farming technique and water conservation scheme also helpful.

DAM - Benefits and Problems :-

~~Benefits~~ :-

→ ~~Hydro~~ etc

Benefits :-

- Hydro-electricity generation.
- Flood control and soil protection.
- Irrigation during dry periods.
- water supply from area of excess to area of low water.
- Fishing,

Problems :-

- Fragmentation and transformation of rivers.
- Serious impact on ecosystem.
- Displacement of people, animals.
- Water logging and salinisation of surrounding land.
- Dam project also lead to lowered nutritional status when highly productive fields are flooded.

* Food Resources :-

- Food is essential for growth and development of living organism. Nutrients are available from plants & animals.

World Food Problem :-

- World's food production has increased three times during last 50 years, but there is rapid population growth. About 40 millions people die every year due to malnutrition.
- According to estimate about 300 million people are undernourished in India.
- Food production in 64 of 105 countries is lagging behind population growth.
- Food insufficiency can be divided into two categories.

Under-nourishment - people who receive less than 90% of their minimum diet intake on long-term are considered under-nourishment.

Mal-nourishment - Occurs to nutrition imbalance, lack of vitamins, proteins.

Impact of Over-grazing :-

→ It occurs when grazing surpasses the carrying capacity of land. The carrying capacity is maximum population that can be supported by system on sustainable basis.

Followings are main impact of over grazing on crop production. -

- a) Overgrazing removes vegetal cover of soil. It reduces human content. As a result more water is lost from ecosystem.
- b) Due to loss of vegetal cover of soil, there is chance of soil erosion.
- c) Overgrazing affects composition of plants population and its generation. Many invasive plants grow in over grazed area.

Effect of Modern Agriculture :-

- Modern agricultural practice has both positive and negative effects.
- It is based upon technologies like use of improved seeds, chemical fertilizers, pesticides.
- Intensive farming have reduced fertility and productivity of soil.
- Use of chemical fertilizer contaminate ground water with nitrate.
- The presence of excess nitrate in drinking water is dangerous for human health and may be dangerous for infants. Nitrate react with haemoglobin and damage the oxygen transport by blood. This condition is called bluebody syndrome.
- Intensive irrigation is bringing underwater soluble salt to soil surface and increases salinity of soil.
The large area of fertile land becomes saline and water logged due to excessive irrigation.
- when single species crops grown every year, fertility of land reduces, because soil fertility is maintained by diverse contribution by a wide range of plant and animal species.

Fertilizer - Pesticide Problem :-

- Fertilizer are used to supply nutrient to trees. So food production will be more.
- Excessive use of fertilizer increases level of nitrates in ground water.
- Use of phosphoric fertilizer causes accumulation of phosphorous in soil. when erosion occurs it may transfer to water bodies, affecting aquatic life.
- To control insects, pests, we use pesticides, but it effect human body if we eat that food. It causes cancer, birth defect, parkinson's diseases.
- Application of excess pesticides affect soil fertility.
- Excessive use may poison food.
- It may damage important soil microorganism.

* Land Resources :-

→ It includes hills, valleys, plains, wetland, riverbasin.

Land Degradation :-

→ Due to increasing population, the demands for producing food increases. Hence there is more pressure on limited land resources which are getting degraded due to over exploitation.

→ 56% of total area of country is suffering due to land degradation.

→ Causes of degradation of land -

soil erosion

water logging

salinization

contamination of soil with industrial waste.

Soil Erosion :-

→ It refers to loss of superficial layer of soil due to action of wind, water, ~~human~~ human factor.

→ It has been estimated that more than 5000 million tonnes topsoil is being eroded annually.

→ It results in loss of fertility.

→ It is basically 2 types

i) Geological Erosion

ii) Accelerated Erosion

→ Various factors which affect soil erosion include soil type, vegetation cover, slope of ground, soil mis-management.

→ Wind is also responsible for land erosion through saltation, suspension, surface creep.

Prevention of Soil Erosion/soil Conservation

→ Conservational till farming, contour farming

→ Wind breaks.

→ Strip cropping.

→ Organic farming

→ Terrace farming

→ Crop rotation

Desertification :-

→ Desertification is process by which potential of arid or semi-arid falls.

→ It leads to conversion of irrigated crop land to desert.

→ It is characterized by devegetation, depletion of ground water, soil erosion, salinization.

Causes of Desertification :-

→ Deforestation

→ Over grazing

→ Mining

Land slides :-

→ It is sudden collapse of large mass of hill side.

→ It mostly occur — i) On steep slopes

ii) where drainage is problem

iii) On benches

Factors causing Land slides :-

Natural factor — i) Excessive rainfall

ii) Forest fire

iii) Rapid temperature change

iv) Earth quakes.

Manmade factor — i) Mining Earth

ii) Underground excavation

iii) Pumping and draining groundwater levels

iv) Huge area of mountain are cut during construction of roads. It make mountain slope weak resulting in landslide.

* Role of Individual in Conservation of Natural Resources :-

→ Every human being should use resources wisely so that it gives maximum benefit to present generation as well as future generation.

Conservation of water :-

- i) Continuing running of water taps should be avoided while washing.
- ii) Install water saving toilets.
- iii) Water leakage in pipe should be repaired.
- iv) Drip irrigation and sprinkle may be practised.
- v) Rain water harvesting.

Conservation of Energy :-

- Solar cooker may be used.
- We can use electric vehicle
- Make habit of switching lights, fan when not in use.
- Share car journey to minimize use of petrol.
- minimise air conditioner to save energy.

Conservation of Soil :-

- Don't throw kitchen waste and make compost.
- Don't use strong flow of water to irrigate.
- Avoid over irrigation of agricultural field to prevent water logging and salination.
- Use of organic compost.

Sustainable Agriculture :-

- maintain soil fertility.
- make optimum use of fertilizers, pesticides.
- Save grains in storage to minimize the losses.
- Adopt post harvest technologies.

Equitable use of Resources for Sustainable life style :-

- There is a big gap in consumers between developed and developing countries.
- More developed countries constitute only 22% of world's population but use 88% of natural resources.

On other hand less developed countries constitute 78% world's population and use only 12% of natural resources.

- There is a huge gap between rich and poor. In this age rich have gone richer and poor is becoming more poor. This leads to unsustainable development.

The solution to this problem is to have more equitable distribution of resources and income.

- For equitable use of natural resources more developed countries have to lower down their level of consumption. So that these resources can be shared by poor people.

→ There is need of equitable use of resources for sustainable development of mankind.

Spectator
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Ecology :-

- The ^{term} ecology is derived from Greek word 'oikos' meaning 'house' and 'logy' meaning 'study of'.
- So ecology is study of home of nature. It is defined as scientifically study of interaction of organism with each other and with their environment.

Ecosystem :-

- It is structural & functional unit of nature where living organism interact among themselves and also with surroundings physical environment.
- It also includes plants, trees, fish, bird, water.
- Every thing in ecosystem is dependent on each other.

General Characteristics of Ecosystems :-

- Ecosystem is a structural and functional unit of living and non-living components of environment interacting with each other to produce a stable system.
- Ecosystem is considered as the sum total of biological community and its associated

Physical and chemical components of the environment with interactions.

→ The interaction result in continuous production, consumption and exchange of material between the living and non-living components of the environment following cyclic processes.

→ Ecosystems undergo changes in their biotic and abiotic components continuously. A change in any one component of the ecosystem cause changes in all the components of the ecosystem.

→ The function of the ecosystem depends on the energy flow and cycling of chemical elements through and within the ecosystem.

→ The nature of ecosystem depends on the species biodiversity of the ecosystem.

→ The ecosystem can be disturbed by human activities and the most adverse effect of the disturbance is the loss of biodiversity.

→ The complexity of an ecosystem decides the energy requirement of ecosystem. More complex is the ecosystem, less is the energy requirement.

→ The ecosystem are characterized by a wide variety of biodiversity of species. The species are biotic components including producers, consumers and decomposers.

Structure (or Components) of Ecosystems:-

The structure of ecosystem means that how the biological community (i.e., the living organisms with their population, life history, production etc.) and the biotic components, such as water, soil, nutrients, etc. are arranged with respect to climatic conditions (e.g., temperature, light, humidity etc.) in ecosystems. ~~On the basis~~

→ Every ecosystem has two major components:

- i) Biotic or living components
- ii) Abiotic or non-living components

1) Biotic Components :-

→ Biotic or living components of all ecosystems include all forms of life, e.g., flora and fauna.

→ On the basis of their nutritional level (or trophic level) they can be classified into two types :

1) Autotrophic components.

2) Heterotrophic components.

1) Autotrophic Components :-

→ These are self-nourishing organisms including green plants, algae and photosynthetic bacteria.

→ The autotrophs are also known as producers because they produce their own food.

→ These producers take radiant energy from the sun and convert it into chemical energy which is used by plants for their growth and development. They use carbon dioxide as carbon source for food.

Heterotrophic Components :-

- These include all living organism which cannot prepare their own food but depend on ~~an~~ autotrophs directly or indirectly for food.
- They are also known as consumers.
- They utilise organic matter as carbon source for food. Animal belong to this category.
- The heterotrophs (consumers) are further classified into two groups:
 - a) Macro Consumers
 - b) Micro Consumers

a) Macro Consumers :-

These depend on other communities for their food. According to their nature of food they can be classified as:

(i) Primary Consumers :-

These feed on green plants and are called herbivores (plant eaters). These include insects, rabbit, goat, cow, deer, rodents etc.

(ii) Secondary Consumers :-

These survive on primary consumers and are called carnivores (animal eaters). ~~any~~ Dog, cat, frog, crow, wolf, fox, snake, lizard etc.

(iii) Tertiary Consumers :-

They depend on secondary consumers. They survive as well as secondary consumers. Lion, tiger, vulture, hawk, leopard, man belong to this group.

(b) Micro Consumers :-

These are also known as saprotrophs (i.e., decomposer community). These include bacteria, fungi, flagellates and actinomycetes. They are divided into two groups :-

(i) Parasitic

(ii) Saprophytic

(i) Parasitic :-

They get their food from living organism. They cause diseases which finally leads to death.

(ii) Saprophytic :-

These are decomposers. They feed on organic compounds of dead plants and animals. They absorb some of the decomposition products and release nutrients (i.e., inorganic substances) to the soil and atmosphere. They play a very important role in biogeochemical cycles in ecosystem.

Abiotic (Non-living) Components :-

The non-living part of an ecosystem is called the abiotic component which includes inorganic and organic substances as well as the physical or climatic factors, available in atmosphere, hydrosphere and lithosphere.

(i) Chemical factors :-

These includes organic and inorganic substances.

Inorganic :-

This includes water, minerals, gases etc. The elements, such as C, N, O, P, S, K etc. form the inorganic constituents and form the nutrients or raw materials for the green plants.

Chlorophyll is the green pigment and takes part in photosynthesis. It is an important inorganic substance.

→ The amount of inorganic substances like P, S, C, N, H, etc., present in the environment of an ecosystem, at any given time is called the standing state or standing quality.

Organic :-

Proteins, carbohydrates, fats, lipids, ~~humus~~ ^{humus}, amino acids, etc. are the organic components present in the dead animal and plants, and also in the excreta of the animal in the ecosystem.

→ These are involved in the biogeochemical cycles by bacteria and fungi in which bacteria etc., convert organic compounds into inorganic form which are re-used by the plants. Bacteria and fungi thus link the biotic and abiotic components of the ecosystem.

ii) Physical Factors :-

Light, moisture, temperature, humidity, rainfall, wind and soil constitute the physical factors or the climatic regimes which govern the interaction between the biotic and abiotic components in the ecosystem.

Functions (Process) of Ecosystem :-

Functions of an ecosystem mean the strong interaction between the biotic and abiotic components of the ecosystem helping the biotic community to survive.

The following six functions of ecosystem :-

1) Energy Flow :-

It regulates the flow of energy from one trophic level to other irreversibly.

2) Nutrient Cycling :-

It regulates the rate of nutrient cycles i.e., the recycling of mineral nutrient in different abiotic components like atmosphere, hydrosphere and lithosphere and

then back to biosphere.

3) Control :-

It regulates the modification of the environment by the organisms and vice versa, e.g., the nitrogen fixing by bacteria is said to be "environment regulation by organism" and photoperiodism ~~and photoper~~ is the "organism regulation by environment".

4) Environmental Gradient :-

The ecosystem fixes limit of tolerance for each organism towards various factors of environment.

5) Food Chain & Food Web :-

Food prepared by the producer (green plants) is consumed by primary consumer, which in turn consumed by secondary and tertiary consumer at different trophic levels either through straight path (food chain) or through by-pass path (food web).

6) Bio-diversity :-

The ecosystem regulates the species diversity to acquire a stable system (i.e., wider the variety of organism the greater is the stability)

Food Chain :-

→ The transfer of food energy in the ecosystem from one group of organisms to another group through a series of steps is called food chain.

→ The organisation and pattern of feeding in ecosystem is called trophic structure.

→ Each specific stage of food chain is called trophic level.

e.g.:-

1) Phytoplankton → water flows → small fish
(pond system) → Big fish.

2) Grass → Grasshopper → Mouse → Owl

3) Grass → Rabbit → fox → wolf → lion
(grass land ecosystem)

Characteristic of Food Chain :-

→ 1st trophic level → Producer

→ Small herbivores consume plants & are eaten by large carnivores.

→ The transfer of energy from lower trophic to higher trophic level decreases.

Two types of Food Chain :-

a) Grazing Food Chain :-

→ This type of food chain starts from green plant to herbivores then ends at carnivores.

→ There is a loss of energy at each level through respiration, excretion.

b) Detritus Food Chain :-

It starts from dead organic matter (i.e., dead animals, plants and fallen leaves etc.) and goes to detritus feeding organism (i.e., detritivores e.g., bacteria, soil nites, worms, fungi, etc.) and on to their predators. The ecosystems like mangrove and estuarine follow this food chain which do not depend on solar energy but depend on the influn of organic matters produced in other systems.

Examples :-

i) Dead organic matter → Bacteria → Protozoa
→ Rotifers.

ii) Dead plants/fallen leaves → soil nites
→ Insects → Lizards.

iii) Dead organic matter → Detritivores → predators.

Food Web :-

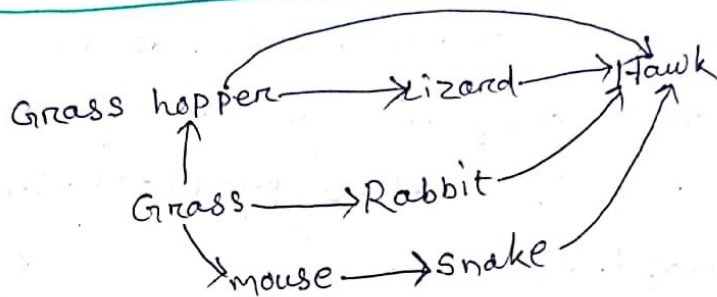
→ Web means "network", such as spiders web. The inter-connection of different individual food chains through different types of organism is called Food web.

→ In other words, a food web consists of a number of linear food chains.

→ In a food web, it is seen that some consumers feed on a single species and most consumers have also multiple food source.

- Food web shows the food pattern of energy flow among biotic community and abiotic community of the ecosystem.
- Some examples of food webs are given below:

Terrestrial Food Webs :-

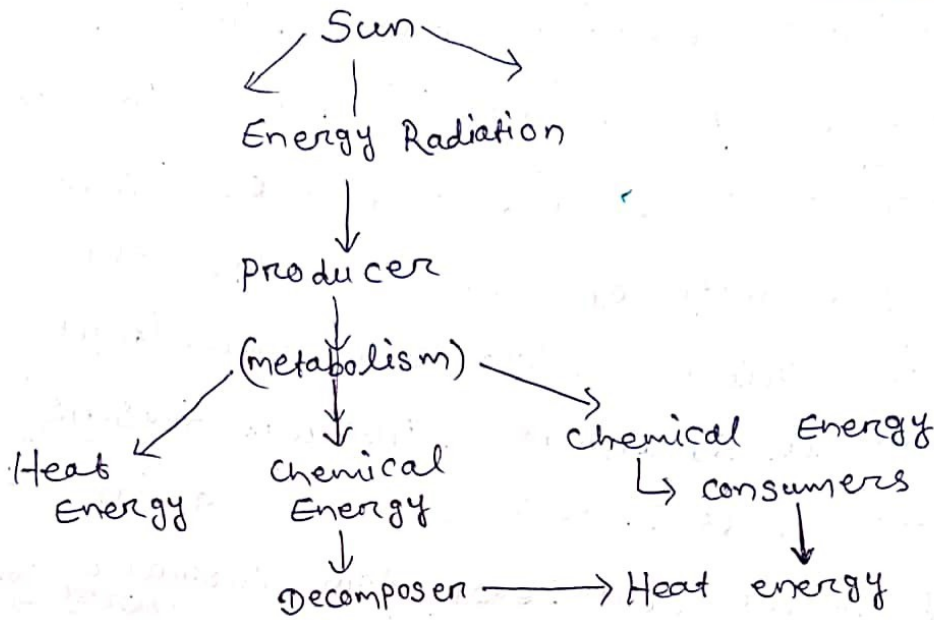


Energy flow in Ecosystem :-

- Sun is primary source of energy for all ecosystem of earth.
- Sun energy flows from producer sun to plants and then to consumers.
- Sun energy is transformed to chemical energy by photosynthesis.
- 1% - 5% of total sunlight falling on green plants is utilised in photosynthesis.



- There is no 10% flow of energy from producers to consumer because of loss only 10% of energy transferred from one trophic level to other.
- Energy can not recycle in ecosystem, it can flow in one way.



Types of Forest Ecosystem :-

Depending on the climates, rainfall, temperature and other factors, forest may be classified as :-

Tropical Rain Forest :-

- Such forests are seen in equatorial regions such as in central and south America, South east Asia and north-west Australia. Both
- Both temperature and humidity are high and constant.
- The annual rainfall exceeds 1500 mm and average annual temperature exceeds 18°C.
- Following are the characteristics of these forests :-

- * Most diverse communities (tree species and animal life).
- * Warm and humid climate.
- * Broad-leaved and tall plants.
- * Insects and invertebrates found in large numbers.

Animals found in these forests are monkeys, bats, frogs, lizards, chameleons, tropical birds and carnivorous animals.

The rate of leaching makes the soil in these forests useless for agriculture purpose.

Forest (or Savannas Tropical seasons) :-

→ These forests are found in plains of Africa, South-east Asia, Australia, central and ~~east~~ south America and some parts of India.

→ The rainfall is seasonal but high (annual rainfall is about 1000 mm to 1500 mm). The characteristics of these forests are:

- * Alternate dry and wet seasons.
- * Coarse grass and scattered trees (teak).
- * Warm climate.

Animals like elephant, zebra, giraffe, and kangaroos (in Australia only) are present.

Sub-tropical Rain Forest :-

→ Such forests is found in north America, Europe, Eastern Asia, and Chile.

→ Annual rainfall is about 750 mm to 1500 mm and annual average temperature is between 10°C - 20°C . These forests are characterised by

* Moderate climate.

* Broad-leaved fall deciduous trees (which shed their leaves in fall and grow new foliage in the spring).

* Hard wood trees which are suitable for quality furniture and building furniture and building materials.

* Birds and insects found in large numbers.

Animals like rabbits, squirrels, frogs, lizards, snakes etc., mammals like bears, deers etc. and vegetarians like oaks, beeches, maples, chest nuts etc. are found in these forests.

Temperature Shrub forest :-

-> This is also known as mediterranean shrub forest found in south Africa, south Australia, Chile and coasts of California.

-> The rain is less and falls in winter only.

-> The temperature is moderate due to cool

o moist-air of oceans.

This forest is characterised by.

* Dry climate with moist air.

* Broad-leaved ever green vegetation with fire adapted resinous plants, such as rubber.

* Chaparral, miniature woodland dominated by dense shrubs of 2 to 5 meters height.

Animals like reptiles and small mammals are found.

Taiga or (Boreal) Forest :-

→ These are found in east-west band across North America, Europe and Asia just below 60° N latitude.

→ The rainfall varies from 100 mm to 800 mm and the average annual temperature ranges from 6°C in the winter to 20°C in the summer.

- Taiga forests are characterised by,
- * Cold climate due to high altitudes and high latitudes.
 - * Dense stands of relatively small trees.
 - * Dominated by coniferous (especially, pines, spruces, firs, cedars, larches and hemlocks) which are the important source for making paper pulp and lumber.
 - * Presence of numerous lakes.

Animals: * Birds like owls, eagles, migratory birds

* Large mammals like deer, wolves, bears, elk or moose and pumas.

* Small rodents like squirrels and rabbits.

Small carnivores like foxes.

Fires, storms and outbreaks of insects are common in the taiga forests.

Coniferous forest :-

→ Such forests are adjacent to the tundra region, North America and Eurasia.

→ These are the cold regions with high rainfall and strongly seasonal climate with long winter and fairly short summer.

→ These are characterised evergreen spruces, firs and pines and epiphytic mosses. Reptiles and small mammals are found.

Aquatic Ecosystem :-

In aquatic ecosystems plants, animals live in water. It is either fresh water marine water.

→ Fresh water ecosystem are divided into lentic & lotic.

Lentic (stationary) → Lake, Pond

Lotic (flow) → stream, river

Pond Ecosystem :-

→ mainly pond ecosystem has water only in monsoon.

→ when a pond begins to fill during rains it's life form such as algae and microscopes animals, insects, snails, worm.

→ As pond fill in monsoon a large no. of food chains are formed.

Algae → microscopic animals → small fish

→ Big fish → Kingfishers, herons.

→ Aquatic insects, worm feed on waste material excreted by animals and dead plants.

Marine Ecosystem :-

→ The marine environment of seas and oceans is occupying 70% of earth surfaces.

→ Ocean play important role in regulating many biogeochemical and hydrological cycles thereby regulatic earth climate.

→ The biotic components of ocean are

Producers :-

→ mainly Phytoplanktons.

→ Microscopic seaweeds. (Brown and red algae)

Consumers :-

→ Herbivores like fish, molluscs.

→ Carnivores like shod, herring.

Decomposers :-

Bacteria, fungi.

Estuaries Ecosystem :-

→ Estuaries are located where river meets the sea.

→ It is water bodies where the flow of fresh water from river mixes with salt water transported from ocean.

Characteristics :-

- It is a semi-enclosed coastal body of water with one or more rivers or streams flowing into it.
- It has a free connection with open sea.
- Salinity range varies from 0-35 ppt.
- Estuaries are highly productive zone, because it receives high amount of nutrients from fresh and marine water.
- Around 60% of world's population living along estuaries and the coasts.

Lake Ecology :-

→ Any body of standing water, generally large enough in area and depth is known as large lake.

→ ~~There~~³ zones in a lake

→ (a) Littoral zone: with shallow water

→ (b) Open water zone :- beyond the littoral zone - where water is quite deep.

→ (c) Benthic (Bottom) → floor of lake.

→ On the basis of nutrient content, lake

is 3 types

(i) Oligotrophic (very low nutrient)

(ii) Meso (medium nutrient)

(iii) Eutrophic (High nutrient)

Ecological Pyramid :-

The graphical representation of trophic structure showing the trophic level is called ecological pyramid.

The pyramid consists of no. of horizontal bars. The length of each bar represents the total number of individual at each trophic level.

The steps of trophic levels are expressed diagrammatically in pyramid.

Producers are at base of pyramid and top carnivores are at top of pyramid.

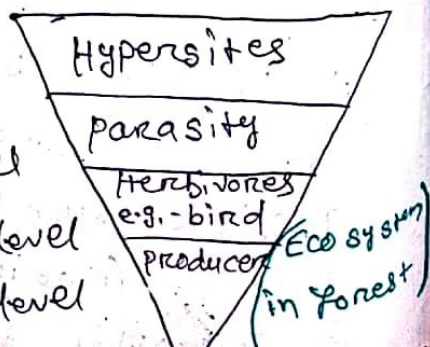
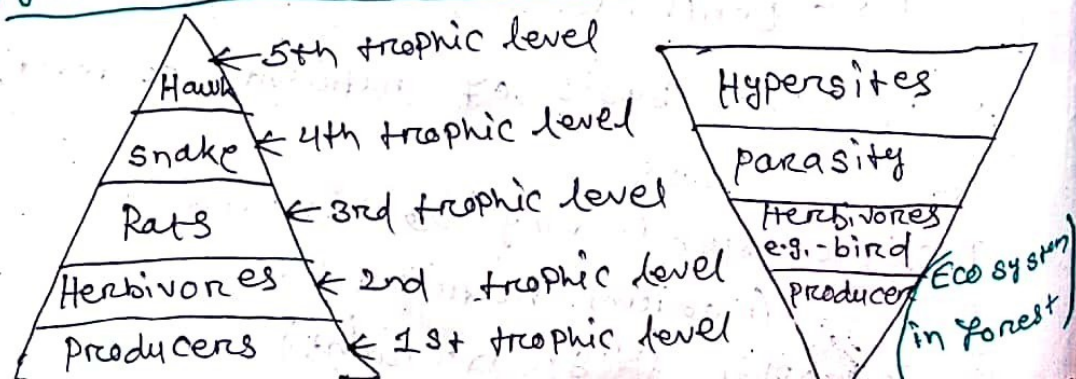
It is 3 types,

1) Pyramid of no. :-

This shows the no. of organism in each trophic level. It is expressed on no. per unit area.

It is difficult to count all organism so it is less effective.

Pyramid of no - upright :-

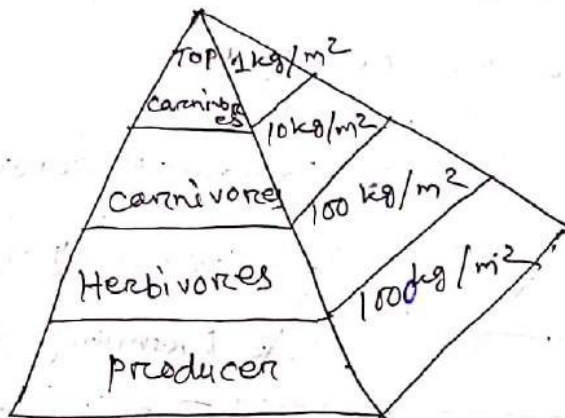


2) Pyramid of Biomass :-

This shows total dry weight of all organism at each trophic level at particular time.

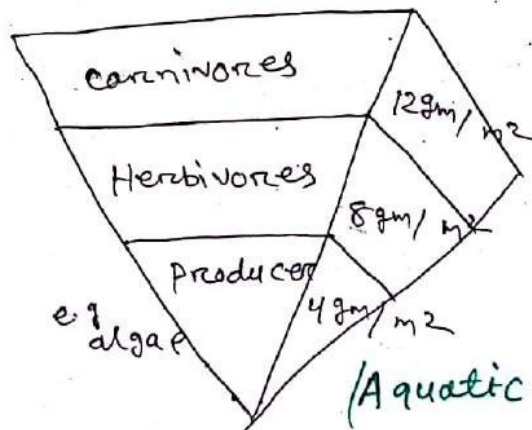
Biomass is measured in g/m^2

Pyramid of Biomass - upright



(Land system)

Pyramid of Biomass Inverted :-



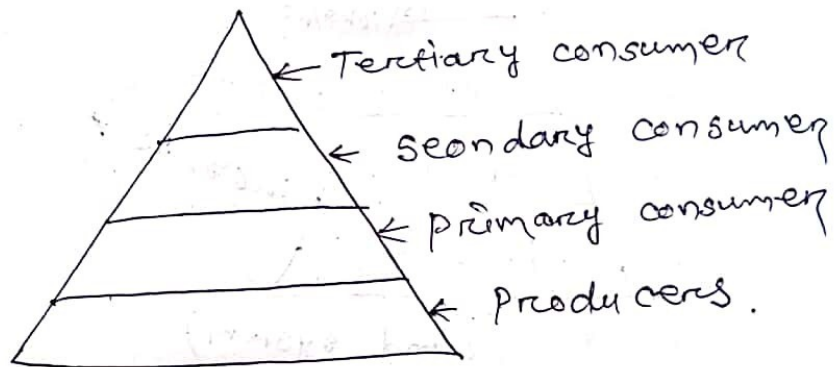
(Aquatic Ecosystem)

3) Pyramid of Energy :-

This shows the total amount of energy flows to the successive trophic levels.

Usually 10% of energy flows to successive trophic level.

Energy pyramid is always upright.
More energy is available at producer level. The trapped radiation energy flows in the food chain from producers to carnivores, decreasing at successive trophic level. The pyramid of energy is expressed in calories per unit ~~area~~ area ~~per~~ per year.



Ecological Succession :-

→ In an ecosystem, one species may succeed another. In other words, newer species may succeed older species, i.e., older species are replaced by newer species.

→ The process of gradual change in the conditions of physical environment leading to the change in the species structure of an ecological (a biological) community (i.e. replacement of one species by the other) over space and time is called ecological succession or ecological development.

→ There are two main types of succession: primary and secondary.

→ Primary succession is the series of community changes which occur on an entirely new habitat which has never been colonized before.

→ For example, a newly quarried rock faces or sand dunes.

→ The establishment of a new biotic community is generally slow.

→ Before a biotic community of diverse organisms can become established, there must be soil.

→ Depending ^{mostly} on the climate, it takes natural processes several hundred to several thousand years to produce fertile soil on bare rock.

→ Secondary succession is the series of community changes which take place on a ~~pre~~ previously colonized, but disturbed or damaged habitat.

→ For example, after felling of trees in woodland, land clearance or a fire.

→ Since some soil or sediment is present, succession is faster than primary succession.

Series:-

→ Succession is directional. Different stages in a particular habitat succession can usually be accurately predicted.

→ These stages characterised by the presence of different communities, are known as 'series'.

Climax:-

→ The community developed at the end of succession is called climax vegetation or climax community.

→ Succession will not go any further than the climax community. This is the final stage.

→ At any time during primary or secondary succession, natural or human induced disturbances (fire, deforestation) can convert a particular stage of succession to an earlier stage.

→ For example Grass ecosystem are an early stage of succession in regions where the mature ecosystem are forests. However grass ecosystem are climax ecosystem in grassland regions, where there is not enough rainfall to support a forest. Desert ecosystems are climax ecosystems where is not enough rainfall.

Introduction :-

→ Biodiversity is the total variety of life on our planet. "Total no. of races, varieties of species i.e. the sum total of various types of microbes, plants, animals present in a system is referred as Biodiversity."

→ All to harvey it refers to "The variety and variability among living organism and the ecological complexes in which they occur."

Genetic, Species & Ecosystem Diversity :-① Genetic :-

→ Within any given species, there can be several varieties, strains or races which slightly differ from each other in size, shape etc. Such diversity in the genetic make-up of a species is termed as the genetic diversity.

→ This difference between individual organism arise from variation in the genetic material possessed by all organism and passed on to successive generations and from environmental influences.

→ This serves as the raw material for both evolution and natural selection.

② Species Diversity :-

- It refers to "the no. of different kinds of organisms found at a particular place and how it varies from place to place."
- A community in which there are different species are more diverse comparing to one species having more individuals.

③ Ecosystem Diversity :-

- It depends on the availability of abiotic resources and conditions of the environment.

Ex - A small pond constitutes an ecosystem and possesses a set of flora and fauna differ from a river which is another type of ecosystem.

- Other examples of ecosystems are forests, grass-lands, lakes, wet-lands etc. These represents diverse ecosystems each with a characteristic biotic community.

* Biogeographical Classification of India :-

- India is recognized to be uniquely rich in biodiversity. Here almost all the biogeographic zones of the world are represented.

→ According to a recent classification by the wild-life Institute of India, the country is classified by 10 broad biogeographical zones:

i) Trans-Himalayan Zone :-

→ It spreads over an area of about 1,86,000 sq. km.

→ It has the richest wild sheep and goat community in the world. Also the snow leopard is found here.

ii) Himalayan Zone :-

→ It extends from north-west region of Kashmir to the east upto NEFA (North-East Frontier Area).

→ It spreads over an area about 3,47,000 sq. km.

→ It comprises of 4 biotic provinces — north-west, west, central and east Himalayas.

→ Altitudinally there are 3 zones of ~~vegetation~~^{flora} found here i.e., sub-montane, temperate or montane zone and the alpine zone.

iii) Desert Zone :-

→ This zone comprises of 3 biotic provinces i.e., Kutch, Thar, and Ladakh.

→ In north-west desert region the climate is characterized by very hot and dry summer and cold-winter. Rainfall is less than 700 mm and plants are mostly xerophytic.

→ The Ladakh region has sparse vegetation and is a cold desert region.

IV) Semi-Arid zone :-

→ There are semi-arid areas adjoining the north-west desert. It comprises of Madhya Pradesh, Chhatisgarh, parts of Odisha and Gujarat.

→ The forests in this region are thorny, mixed deciduous and sat type.

V) Western Ghats Zone :-

It comprises the Malabar coast and western Ghats mountains of India extending from Gujarat to the Cape Comorin in south.

→ The rainfall is heavy and vegetation is

4 types

- Tropical moist evergreen forest
- Sub-tropical or temperate evergreen forests
- mixed deciduous forests.
- Mangrove forests.

VI) Deccan peninsular zone :-

→ It comprises of 5 biotic provinces i.e., Deccan plateau, Central plateau, Eastern plateau, Chhota Nagpur Plateau, and Central Highlands.

→ It is a semi-arid region, lying in the rain-shadow of the western Ghats.

vii) The Gangetic plain :-

- The gangetic plain extending upto Himalayan foot-hills. This region comprising of Uttar Pradesh, Bihar and West Bengal.
- It is the most fertile region and distinctive type of vegetation is found here.

viii) The North-East India :-

- It is one of the richest flora regions in the country.
- It receives the heaviest rainfall with Cherrapunji as more than 10,000 mm.
- Dense tropical evergreen forests found here.

ix) The Island :-

The Island of Lakshadweep in the Arabian sea, Andaman and Nicobar Islands in the Bay of Bengal have a wide range of coastal vegetation like mangroves, beach forests etc.

x) Coast :-

- India has ~~coast~~ coastline. Here mangroves vegetation is found.

* Values of Biodiversity :-

→ Biodiversity is very valuable for the survival of human being. Many plants and animals including wild life are very important and can be used directly or indirectly by human being.

→ The values can be divided as

(I) Direct values

- Consumptive value
- Productive value

(II) Indirect values

- Social values
- Ethical values
- ~~Basic~~ values
- Aesthetic values
- Option values

(a) Consumptive values :-

- These value includes goods which are consumed locally by man.
- various tribal societies fully depend on forests for their habitation and livelihood.
- They use tubers, roots, fruits, seeds, meat etc, as their food and also wood as fuel.

(b) Productive values :-

- These values includes products that are derived from the wild and sold in commercial markets both national as well as international markets.
- Bamboos, grasses, cones, oils, gums, drugs, spices, honey, wax etc are forest products that have high commercial values.

→ Some plants also have medical properties
ex - cinchona for the treatment of malaria,
Brahmi for repairing loss of memory.

© Social values :-

→ Biodiversity has various social values attached with different societies. Goods and services provided by ~~the~~ eco-systems to our society include - provision of food, fuel and fiber.

→ provision of shelter and building material.

→ Purification of air and water.

→ Control of pests and diseases.

→ Stabilization and moderation of earth's climate.

→ Live stock breeds, medicines and other products etc.

© Ethical values :-

→ Ethical values believes that humanity is part of nature and we are just one species among others. All species have an inherent right to exist.

→ Religions also have also impact on natural resources. Ex - Buddhist perception of nature is based on different practices and ~~thought~~ approaches than that of Christian belief, though both are consistent with conserving biodiversity.

② Aesthetic values :-

- Aesthetic value means biodiversity is an important quality of landscape beauty.
- Many species of birds, animals, flowering plants are appreciated for their beauty.
- millions of people enjoy hiking, camping, picnics, ~~picnics~~, fishing, wildlife watching etc. based on nature.
- Contact with nature can also be emotionally and psychologically restorative.

③ Option values

- The option value refers to the possibility of a natural resources having some value in the future.
- It is a person's willingness to pay to preserve the ~~an~~ option of having an irreplaceable resource available for future use.

Ex - There are several plant species which are edible and superior than those which are currently in use, like katempe a plant found in W. Africa, produces proteins, that are 1,600 times sweeter than sucrose.

Biodiversity at global, National and local levels :-

(i) At Global Level :-

- The present geological era is perhaps the richest in biological diversity. About 2.1 million species have been identified till date while many more species are believed to exist.
- Invertebrate animals and plants make the most of the species. About 70% of all species are invertebrates while 15% are plants.
- Mammals comprise a small number of species.
- ~~of~~ of all the world's species, only 10-15% live in North America and Europe.
- The centres of greatest biodiversity tend to be in the tropics. Because -
 - Tropical areas receive more solar energy
 - warm temp. and high humidity provide favourable environmental conditions for many species.
 - It has more stable climate etc.

(ii) At national Levels :-

- India is very rich in biodiversity due to its geographical situation and climate.
- About 1,15,000 species of plants and animals have been identified in India. In fact the country has been recognized as one of the world's top 12 mega diversity nations.

→ In flora the country has 15% of the known world plants.

→ In fauna nearly 75,000 animal species, 80% of which are insects.

→ Hundreds of new species may be present in the country awaiting discovery.

The western Ghats are the treasure house of species diversity. It is estimated that almost $\frac{1}{3}$ rd of Indian animals have taken in western Ghats of Kerala alone.

(iii) At Local Level :-

→ The biodiversity at local level can be well understood by demarcating the points, places and zones rich in biodiversity.

This can be studied by -

- * Richness of species at a given place.
- * physical characteristics of habitat and vegetation in particular area.
- * change in species composition across with habitats.
- * Based on climate, geographical, ecological and other processes.
- * Rate of change across conditions.
- * Temp. of that region etc.

Thus local areas are well affected in heterogeneous and homogenous habitats.

India as a Mega Diversity Nation :-

→ Mega diversity covers the broad frame of biodiversity but emphasizes more on species richness, threatened species and endemic species.

→ There are 12 megadiversity nations and India is one of those.

→ Biodiversity has 3 aspects - genetics, species and eco-system. India is uniquely rich in all these 3.

→ The country has a rich heritage of biodiversity from tropical rain forests to alpine vegetation and from temperate forests ~~biogeographical~~ to coastal ~~area~~ wetlands. Almost all the biogeographical regions of the world are presented here in India.

Features of India's Biodiversity :-

→ India has 2 major realms - Palaearctic and the Indo Malayan and 3 biomes.

→ It has 10 biogeographic regions.

→ It ~~has~~ is one of the 12 centres of origin of cultivated plants.

→ There are 2 hotspot extend into India i.e., the western Ghats and the Indo Burma region.

→ It has 26 recognised endemic centres that are home to nearly a third of all the flowering plants.

→ It has 5 world heritage sites and 12 biosphere reserves. Further, there are 88 national parks and 490 sanctuaries in India.

Based on a survey India has a large amount of Fauna and Flora. In plants angiosperms, ~~bry~~ bryophyta and pteridophyta are in rich amount and in ~~am~~ animals, arthropoda are high.

India is also rich in various crop species and varieties of rice, pea, mango, turmeric, ginger etc. are found and it ranks 7th in world agriculture.

India is also rich in marine biodiversity along the coastline.

— 0 —

endangered and endemic species

- ≡ **Extinct species** is no longer found in the world.
- ≡ **Endangered or threatened species** is one whose number has been reduced to a critical number. Unless it is protected and conserved, it is in immediate danger of
- ≡ **Vulnerable species** is one whose population is facing continuous decline due to habitat destruction or over exploitation. However, it is still abundant.

The important **endangered species** are:

- ≡ Tortoise, Green sea Turtle , Gharial, Python (Reptiles), Peacock, Siberian White Crane, Pelican, Indian Bustard (Birds), Lion-tailed Macaque, Capped mokey, Golden monkey (Primates), (medicinal plant), Sandal wood tree, etc

Endemic species of India-

- ≡ Species that are found only in a particular region are known as endemic species. Almost 60% the endemic species in India are found in Himalayas and the Western Ghats.

- ≡ Endemic species are mainly concentrated in:

North-East India

North-West Himalayas

Western Ghats and

Andaman & Nicobar Islands

THREAT TO of BIODIVERSITY

Extinction or elimination of a species is a natural process of evolution. During evolution, species have died out and have been replaced by others. The process of extinction has become particularly fast in the recent years of civilization. In this century the human impact has been so severe that thousands of species are becoming extinct annually.. Over the last 150 years the rate of extinction has escalated more dramatically.

Following are the major causes and issues related to threats to biodiversity:

1. Loss of habitat:

Destruction and loss of natural habitat is the single largest cause of biodiversity loss. Billions of hectares of forests and grasslands have been cleared over the past years for conversion into agriculture lands, pastures, settlement areas or development projects. These natural forests and grasslands were the natural homes of thousands of species which perished due to loss of their natural habitat. The unique rich biodiversity of the wetlands, estuaries and mangroves are under the most serious threat today. Sometimes the loss of habitat is in installments so that the habitat is divided into small and scattered patches, a phenomenon known as habitat fragmentation. There are many wild life species such as bears and large cats that require large

territories so subsist. With the current rate of loss of forest habitat, it is estimated that 20-25% of the global flora would be lost within few years.

2. POACHING

Illegal trade of wildlife products by killing prohibited endangered animals i.e. poaching is another threat to wildlife. Despite international ban on trade in products from endangered species, smuggling of wildlife items like furs, hides, horns, tusks, live specimens and herbal products worth millions of dollars per year continues. The trading of such wild life products is highly profit making for the poachers who just hunt these prohibited wild lives and smuggle it to other countries mediated through mafia.

3. MAN-WILDLIFE CONFLICTS

It is discussed about the need to preserve and protect wildlife. However, sometimes we come across conflicting situations when wildlife starts causing immense damage and danger to man and under such conditions it becomes very difficult for the forest department to pacify the affected villages and gain local support for wildlife conservation. Instances of man animal conflicts keep on coming to lime light from several states in our country. In Sambalpur, Orissa 195 humans were killed in the last 5 years by elephants. The man-elephant conflict in this region has arisen because of massive damage done by the elephants to the farmer's cotton and sugarcane crops.

Causes of Man-animal conflicts:

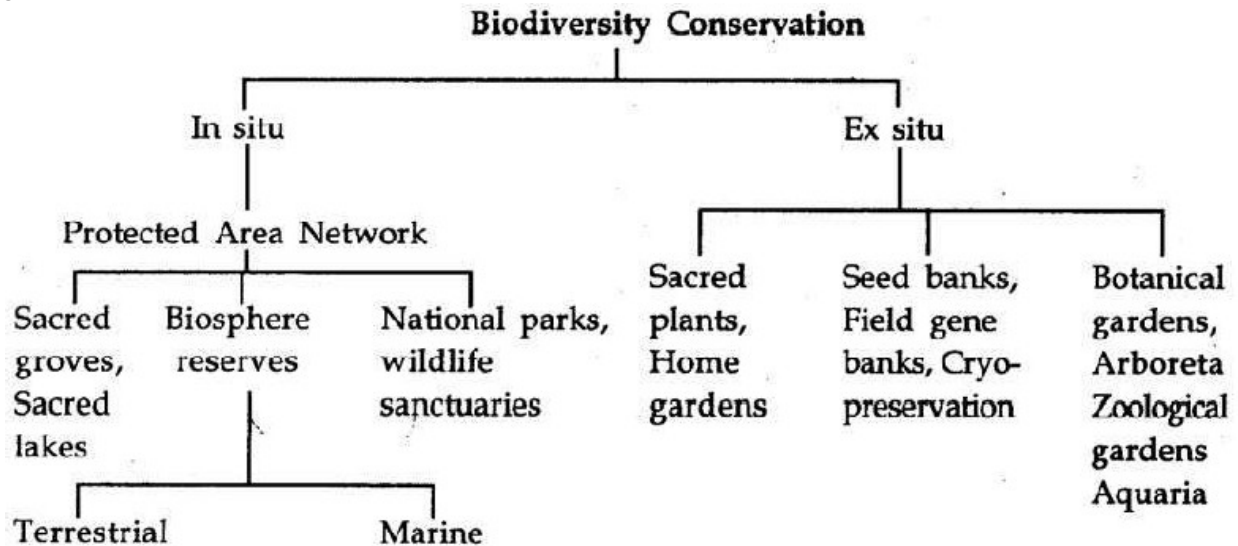
1. Dwindling habitats of tigers, elephants, rhinos and bears due to shrinking forests cover are compelled to move outside the forests and attack the field or sometimes even humans. Human encroachment into the forest areas has rendered all forest living animals to trespass the borders of human civilizations. This is because the conflicts between man and the wildlife have increased since it is an issue of survival of both.
2. Earlier, forest department used to cultivate paddy, sugarcane etc. within the sanctuaries when the favourite staple food of elephants i.e. bamboo leaves were not available. Now due to lack of such practices the animals move out of the forest in search of food. It may be noted that, one adult elephant needs 2 quintals of green fodder and 150 kg of clean water daily and if it is not available, the animal strays out.
3. Very often the villagers put electric wiring around their ripe crop fields. The elephants get injured, suffer in pain and turn violent.
4. Earlier there used to be wild-life corridors through which the wild animals used to migrate seasonally in groups to other areas. Due to development of human settlements in these corridors, the path of wildlife has been disrupted and the animals attack the settlements.

D ifferent ways of biodiversity conservation-

There are two approaches to biodiversity conservation:

a) *In situ* conservation: In situ conservation (within habitat): In-situ conservation, the conservation of species in their natural habitats, is considered the most appropriate way of conserving biodiversity. Conserving the areas where populations of species exist naturally is an underlying condition for the conservation of biodiversity. This is achieved by protection of wild flora and fauna in nature itself e.g. Biosphere Reserves, National Parks, Sanctuaries, Reserve Forests etc

b) *Ex situ* conservation (outside habitats): *Ex-situ* conservation literally means, "Off-site conservation". It is the process of protecting an endangered species of plant or animal by removing part of the population from a threatened habitat and placing it in a new location, which may be a wild area or within the care of humans. While *ex-situ* conservation comprises some of the oldest and best known conservation methods, it also involves newer, sometimes controversial laboratory methods. Ex situ conservation, using sample populations, is done through establishment of gene banks, which include genetic resources centres, zoo's, botanical gardens etc.



#

ENVIRONMENTAL POLLUTION

Any physical, chemical or biological change in environment that impairs the usefulness of the environment is called environmental pollution. It is an undesirable change in environment that harmfully affects living organisms.

Air pollution is the resultant of direct or indirect change in physical, chemical and biological characteristics of atmosphere, which mainly results from gas emission from industry, thermal power station, automobile and domestic combustions, etc.

Air pollutants

- ≡ "Air Pollutant" can be defined as any solid, liquid or gaseous substance present in the atmosphere in high concentration more than prescribed limits that may be harmful to the living creatures.
- ≡ Pollutants can be classified as primary and secondary pollutants.
- ≡ Primary pollutants are carbon dioxide, nitrogen oxides, sulphur dioxide, carbon monoxide and CFC which are emitted into the atmosphere directly.
- ≡ Secondary pollutants are acid rain and ozone, photochemical smog. These are not emitted directly.

Sources of air pollution

The sources of Air pollution are natural and man-made.

1. Natural sources

The natural sources of air pollution are volcanic eruptions, forest fires, thunder storms, cyclones, fog, biological decay, photochemical oxidation, deposition of dead matters, vegetation and animals etc. Radioactive minerals present in the earth's crust are the sources of radioactivity in the atmosphere.

2. Man-made sources

Man-made sources include industry, thermal power stations, industrial units, vehicular emissions, automobiles, farming practices, domestic equipments, nuclear weapons and tests, etc.

#

Major primary pollutants produced by human activity-

→ Oxides of sulphur-

SO₂ is produced by volcanoes and in various industries. coal and petroleum produces it while combustion.

→ Nitrogen oxides-

NO₂ is emitted from high temperature combustion and also produced during thunderstorm.

→ Carbon monoxide-

It is produced from incomplete combustion of fuel, natural gas, coal, wood. Vehicular exhaust is major source of CO₂.

→ Volatic organic compound(VOC)-

Theses are divided into methane and nonmethane types.

Methane is green house gas and responsible for global warming. Nonmethane type VOC are benzene, xylene, toluene.

→ Particulates matters-

Human activities such as burning fossil fuels generating aerosols (mixture of particulates and gas).

Secondary pollutants are produced by following processes-

Particulate are generated from primary pollutants form photochemical smog. Particles of coal, dust, SO₂, CO form the nuclei around which other chemical collect to form smog. Smog is fog made darker and heavier by smoke and chemical fumes.

Effects of air pollution

1. Exposure to NO₂ causes respiratory illness.
2. Nitric oxide and carbon monoxide can combine with haemoglobin to reduce oxygen carrying capacity of blood. Excess CO causes headache, paralysis.
3. These pollutants affect plants by entering through stomata. Particulate pollutants affect the photosynthetic activity which may damage the plants and can affect productivity.
4. Air pollutants can enhance the acidity of water resources therefore can adversely affect aquatic life.
5. Mercury from combustion cause nerve, brain damage.
6. Cadmium particulates causes cardiovascular disease.

Prevention and control of air pollution

Steps to control and prevention of air pollution

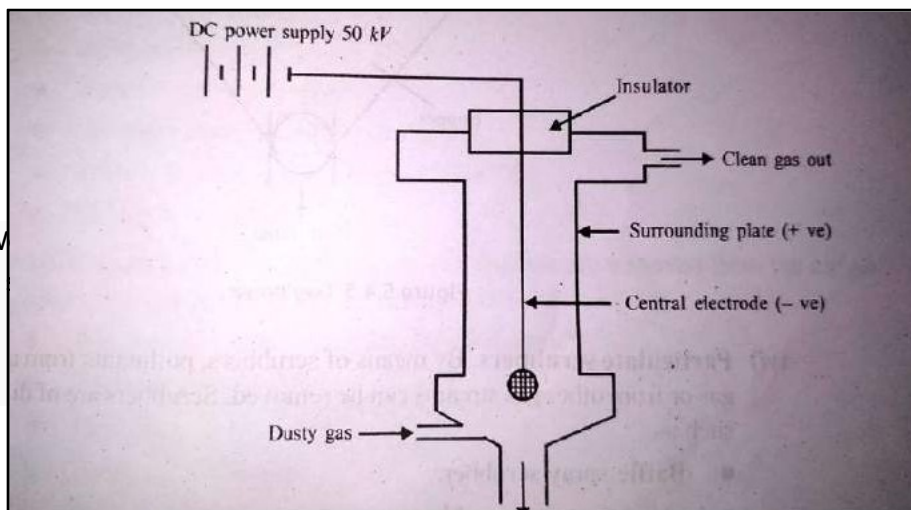
- Engineers should consider the possibility by changing the manufacturing process.
- Controlling air pollution at source
- Industries should be located away from residential area.
- Use CNG (compressed natural gas) as an alternative fuel.
- Control devices: The following items are commonly used as pollution control devices by industry or transportation devices.
 - Filtration-Particulate matters are passed through filters and collected in filters.

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1. Mechanical process-sudden change in direction of gas causes particles to separated. Gravity settling in which velocity of carrier gas is reduced so that particles settle in chamber.
2. An electrostatic precipitator (ESP)-It is defined as a filtration device that is used to remove fine particles like smoke and fine dust from the flowing gas.

Working principle of electrostatic precipitator

It consists of two sets of electrodes: positive and negative. These electrodes are vertically placed and are alternate to each other. The negative terminal of high voltage DC source is used to connect the negative electrodes and the positive terminal of the DC source is used to connect the positive plates. To ionize the medium between the negative and the positive electrode, a certain distance is maintained between the positive, negative electrode . There are plenty of free electrons as the electrodes are ionized which interact with the dust particles of the gas making them negatively charged. These particles move towards positive electrodes and fall off due to gravitational force. Now the gas is free from the dust particles as it flows through the electrostatic precipitator and discharged to the atmosphere .



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Noise Pollution

Noise can be defined as undesirable sound in wrong place at wrong time. Sound at undesirable level creates pollution because it causes discomfort to the people. There are two basic properties of sound i.e. loudness and frequency. Loudness is strength of sensation of sound perceived by individual and is measured in terms of decibel, whereas frequency of sound defined as number of vibrations per second and measured as hertz (Hz).

Human ear is sensitive to frequency between 20-20000 Hz. whereas best range of hearing is 2000-10000 Hz

Sources of noise pollution

Major sources of noise pollution are industries, transportation, and community, religious and cultural activities. Loudspeaker and amplifiers used in different occasions is another source of noise pollution

Effects of noise pollution

a) physiological effects-

1. Noise pollution is harmful to body and mind. It causes irritation and headache. It may cause number of physiological disorder like neurosis anxiety, insomnia, vomiting, dizziness, behaviour and emotional stress.
2. At high level of 150 dB, hearing impairment can be caused.
3. Loud sound can cause increase in secretion of many hormones of pituitary gland.
4. Our optical system is affected. Impairment of night visions, decrease in colour perception are caused by loud noise.
5. Loud noise causes decrease output of blood flow from heart, cause blood pressure to fluctuate. Heart beat is affected.

b) psychological effects-

1. Noise reduces mental capability.
2. It interferes with sleep so causes distress and emotional disturbance.

c) Hearing loss-

People working in noisy place such as factory, industries etc. often suffer from temporary loss of hearing.

Long exposures to louder noise may cause shift in threshold of hearing. So a person cannot hear low sound

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Control of noise pollution

- Eliminate the noise at source–
This can be achieved by replacement of noisy rattling devices at source .
- Control the noise transmission level using sound absorbers and acoustic tiles-
Sound can be absorbed by porous materials .So using this material sound pollution can be reduced.
- Using self precaution measures such as ear plugs and earmuffs.
- Keeping residential free from noisy industries, busy highways, aerodromes
- Taking strict measure to govern the noise level in sensitive areas like schools, hospitals, etc
- Noise control methods in industries–
Excessive noise is produced from various machines , petrol and diesel engines, electric motors pumps. We have to use necessary noise control measures to reduce noise.

Water pollution is referred as a presence of foreign substances or impurities which can contribute to health hazards by lowering water qualities and making it unfit for use.

Sources of water pollution

Main sources of water pollution are

- ⌘ Pollution due to decaying of plants , animals and organic matter in water bodies
- ⌘ Addition of soil-silt washings, insecticides, herbicide and fungicides are agricultural sources can be water pollution.
- ⌘ Ore washing, inert suspended solid and soluble toxic materials.
- ⌘ Sewage obtained from domestic premises, institutions and industrial buildings are main sources of pollution of water incities.
- ⌘ Industrial Effluents are one of the important agents of water pollution.
- ⌘ Accidental leakage of chemical or petroleum products also contributes towards water pollution.
- ⌘ Ground water pollution with arsenic, fluorides and nitrites which are poisonous in nature are posing serious health problems.
- ⌘ Major point sources of water pollution are industries, power plants, underground coal mines, offshore oil well setc.

Water pollutants

Major water pollutants are

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- ↵ Organic pollutants: Water carrying organic pollutants have decreased level of oxygen and such organic pollutants promote disease causing agent.
- ↵ Inorganic pollutants: Inorganic pollutants include inorganic salts, metallic compounds, trace elements and organ metallic compounds.
- ↵ Thermal pollutants: Main source of thermal pollutants are coal water plants, nuclear water plants and other industrial process.
- ↵ Sediments
- ↵ Radioactive materials

Effects of water pollution

1. Sewage is an excellent medium for growth of pathogens which are responsible for spread of many diseases.
2. Water pollution makes the drinking water unfit for domestic use. Industrial effluents have harmful effect on living organism and can lead to death.
3. Radioactive substances present in the water may cause cancer, eye, cataract and DNA breakage; it may also destroy biological immune system.
4. Sediments reduce the light penetration in water which lowers the photosynthetic activity of aquatic plants.
5. Toxic substances observed into tissues from polluted water can cause injuries leading to death of the plant.
6. Eutrophication: It is the ecosystem response to the addition of artificial or natural substances, such as nitrates and phosphates, through fertilizers or sewage, to an aquatic system. One example is the "bloom" or great increase of phytoplankton in a water body as a response to increased levels of nutrients. Negative environmental effects include hypoxia, the depletion of oxygen in the water, which induces reductions in specific fish and other animal populations. Eutrophication can be human-caused or natural. Untreated sewage effluent and agricultural run-off carrying fertilizers are examples of human-caused eutrophication. However, it also occurs naturally in situations where nutrients accumulate (e.g. depositional environments), or where they flow into systems on an ephemeral basis.

Prevention and control of water pollution

It is said that prevention is better than cure. Strict legislation can help to reduce water pollution and policy maker should formulate strategies to prevent water pollution sources. Following measures can help to control water pollution

- ↵ Prevent generation of pollutants at first place. Control the pollutants to minimise its effects on water pollution.
- ↵ Domestic and industrial waste water should be disposed off only after treatment.
- ↵ Enforce pollution control laws strictly.
- ↵ Use treatment plants to clean discharged industrial waste water and utilise it for irrigation purpose.
- ↵ Discourage excess use of pesticide and insecticide.
- ↵ Water bodies should be regularly cleaned of aquatic weed and wild plants
- ↵ Create public awareness regarding water pollution

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Afforestation will help to reduce the pollution and water erosion

Use methods of biological nitrogen fixation to improve soil health and adopt integrated pest management to m

Thermal Pollution

Thermal pollution, also known as heat pollution, is releasing of heat in air or water causing undesired changes to environment. It can be both natural as in case of forest fires and heat from volcanoes, or it can be from manmade sources.

Sources of thermal pollution

There are several discrete sources of Thermal Pollution

1. **Thermal Power Plants-**

In thermal plants, heated coils are cooled with water from nearby river and discharge hot water to receptor waterbody hence increase temperature of waterbody

2. **Industries-**

Industries generating electricity require huge amount of cooling water for heat removal. Textiles, paper, sugar industries release heat in water.

3. **Release of domestic sewage-**

Domestic sewage is discharged into rivers, lakes. Normally this sewage having higher temperature than receiving water. Hence increase in temperature of receiving waterbody.

4. **Nuclear Sources-**

Nuclear power plants, nuclear experiments discharge a lot of heat. Emission from nuclear

Effects of thermal pollution

1. Solubility of oxygen has inverse proportionality relationship with temperature. That is, with increase in temperature of water bodies, oxygen content of water decreases. Dissolved oxygen is essential component for survival for aquatic life.
2. Increase in water temperature has harmful effect on population of aquatic species who are sensitive to temperature changes. Thus, adversely affecting balance of the aquatic ecosystem.
3. Changes in metabolic rates of aquatic animals.
4. Variation in reproduction rates
5. Effects on bacteria-
Effecting bacteria which include melting of cell fats, coagulation of body protein
6. Destruction of organism in cold water which is used for cooling purpose as they trapped into condenser and are killed by thermal shock
7. Increase vulnerability to disease

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↗ Increase in toxicity

Control of thermal pollution

Cooling towers-

Water from water body affected is directed pumped towards the cooling tower having condensers, usually with temperature control. After bringing water temperature to desired level, it is returned to the source. Use of condenser makes this method expensive.

Cooling ponds-

These are the most cost effective way to tackle thermal pollution. In this method, heat of heating effluents on surface of the water is dissipated in atmosphere.

Artificial lake-

These are the man made bodies of water. Effluents are discharged into the lake and heat is gradually lost to the atmosphere through evaporation.

Spray ponds-

In spray ponds, water is sprayed in cooling ponds with help of spray nozzles to convert it into droplets which provide more surface area to transfer heat efficiently.

Marine Pollution refers to degradation of marine ecosystem by discharge of pollutants in large water bodies, in particular the sea and the oceans.

Marine Pollution

Sources of marine pollution-

1. Addition of pollutants to sea by rivers flowing into seas.
2. Addition of pollutants due to human activities such as industrial activities, agriculture practices and tourism along coastline.
3. Over exploitation of aquatic resources such as excessive fishing in particular region can adversely affect marine ecology.
4. Mining of minerals at coast affecting the marine ecological system.
5. Testing of atomic weapons, space crafts, missiles and other radioactive waste are dumped in seas causes marine pollution.
6. Marine pollution is caused by oil drilling in seas.
7. Ships which carry toxic substance, lubricants oils, fuels, other chemical from one place to other, sometimes by accident or leakage pollute marine water.

Effects of marine pollution -

1. Marine pollution affects food chain.
2. Oil of sea also affects sensitive aquatic organisms like phytoplankton, zooplankton, fish, birds. Thousands of birds are killed every year when they use marine water

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- a) Plastic materials when dumped into sea, animal take it through their food in stomach .It causesulser.
- b) Detergents mix with sea causes high mortality of marinelif.
- c) Heavy metals (like lead,mercury),oils,acids mix with sea causes threat to marinelif.

C o n t r o l o f m a r i n e p o l l u t i o n -

- Dumping of oil ,hazardous and toxic substances into sea,should be banned.
- Drainage,sewage ,effluents from industris shouldnot be discharged into rivers which join sea.
- Ships should have certain facilities for reducingpollution.
- Effective steps should be taken to check leakage in ships andoiltankers.
- Nuclear activities in sea should beminimized.
- Developing no fishing zones in areas where aquatic life has been adversely affected due to excessivefishing.
- Checking addition of toxic waste to rivers flowing into seas.
- Banning mining activities in and around coastal regions and on seabed.
- Minimizing human activities in coastal regions adjoining areas sensitive marine ecosystem such as coralreefs.

S oil pollution is contamination of upper layer of earth's crust by chemicals or other toxic s ubstances that lead to either reduction in fertility of soil in terms of crop production or whose a ddition results in detrimental effects to soil microorganism, insects, plant life and organism who c onsume those plants.

S o u r c e s o f s o i l p o l l u t i o n

- ≡ IndustrialWastes.
- ≡ Improper Use of fertilizers, insecticides, pesticides,etc.
- ≡ Urban waste consisting of solid waste andsludge
- ≡ Mining anddeforestation
- ≡ Disposal of coalash
- ≡ Disposal of medicalwaste
- ≡ Water logging andwetlands
- ≡ RadioactivePollutants

E f f e c t s o f s o i l p o l l u t i o n

1. Industrial effluents containing toxic chemicals dumped on land cause soil pollution and enter in food chain, which has adverse effect on human health.
2. Solid waste dumped on land cause disruption in everyday life and destroys natural beauty of thelandscape.

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- 7.18 Dumped waste and organic waste give rise to foul odour.
- 7.18 Pathogenic bacteria cause diseases like cholera.
- 7.18 Biomagnification: Biological magnification also known as bioamplification, is the increase in concentration of a substance that occurs in a food chain. Biological magnification refers to the process whereby certain substances such as pesticides or heavy metals move up the food chain, work their way into rivers or lakes, and are eaten by aquatic organisms such as fish, which in turn are eaten by large birds, animals or humans. Bioaccumulants are substances that increase in concentration in living organisms as they take in contaminated air, water, or food because the substances are very slowly metabolized or excreted. There is good evidence that DDT, DDE, PCBs, toxaphene, and the organic forms of mercury and arsenic do biomagnify in nature. e.g. endosulphon banned in some states due to overuse on cashew nut plantations.

Control measures of soil pollution

Industries should be banned from dumping toxic chemicals on agricultural land and proper disposal methods should be used. Government should support systems – air, water and soil. It is always convenient to discuss radioactive pollution separately because its nature of contamination is different from other types of pollution. Its effects are also of special kinds. Public awareness should be organized. Solid waste from trees and grass should be grown to check soil erosion.

Sources of nuclear pollution

- ⇒ Source of energy of Sun and other stars is nuclear energy (nuclear fusion reaction taking place in their cores). They are primary source of energy.
- ## **Nuclear Hazards**
- ⇒ Natural emission of radiation from radioactive isotopes, such as Uranium, thorium, potassium-40 present in earth's crust.
 - ⇒ Mining, processing and extraction of radioactive ores.
 - ⇒ Use of radioactive isotopes in nuclear reactors.
 - ⇒ Problem associated disposal of nuclear waste from nuclear reactors.

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7. Accidental leakages in nuclear power plants and other nuclear facilities.

Effects of nuclear hazards

1. Effects of nuclear hazards are prolonged and can haunt civilizations for year and can have adverse effect on generations to come.
2. Exposure to nuclear radiations can affect genetic make-up by breaking the chemical bonds that hold the DNA together. Thus the effect can be transferred to future generations.
3. Damage to cell-membranes, nuclei, chromosomes
4. Damage to central nervous system, loss of sight, inactivation of bone marrow activity resulting in blood cancer.
5. Nuclear explosion and nuclear weapons can cause mass destruction to life and property on a scale unprecedented in history of mankind.
6. Nuclear hazards are transferred in food chains from bottom to top with transfer of nuclear elements from prey to the predator.
7. Continuous exposure to radiation can lead to cancer.

Nuclear hazard control

- i. Nuclear Power plants and research facilities should be set up after careful evaluation in less inhabited areas.
- ii. Nuclear Power Plants must be carefully designed to minimize risks of leakage.
- iii. Strict vigilance bodies should be constituted and laws should be enforced to ensure nuclear safety.
- iv. Summits and conferences must be organized to facilitate the evolution and exchange of new research and ideas in field of nuclear safety.
- v. Efficient nuclear waste disposal mechanism should be evolved.
- vi. Preventive measures must be taken to minimize risks associated with occupation connected to processing of nuclear material.
- vii. Disarmament of nuclear weapons must be strongly advocated in International Diplomacy

ROLE OF AN INDIVIDUAL IN PREVENTION OF POLLUTION

The role of every individual in preventing pollution is of importance because if every individual contributes substantially the effect will be visible not only at the community, city, state or national level but also at the global level as environment has no boundaries. A small effort made by each individual at his own place will have pronounced effect at the global level.

Help more in pollution prevention than pollution control.

- ↗ Use ecofriendly products.

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- ↯ Cut down the use of chlorofluorocarbons (CFCs) as they destroy the ozone layer. Do not use polystyrene cups that have chlorofluorocarbon (CFC) molecules in them which destroy ozone layer.
- ↯ Use the chemicals derived from peaches and plums to clean computer chips and circuit boards instead of CFCs.
- ↯ Use CFC free refrigerators.
- ↯ Reduce your dependency on fossil fuel especially coal or oil.
- ↯ Save electricity by not wasting it when not required because electricity saved is electricity generated without polluting the environment.
- ↯ Adopt and popularize renewable energy sources.
- ↯ Improve energy efficiency. This will reduce the amount of waste energy, i.e. more is achieved with less energy.
- ↯ Promote reuse and recycling wherever possible and reduce the production of wastes
- ↯ The solid waste generated during one manufacturing process can be used as a raw material for some other processes.
- ↯ Use low phosphate, phosphate-free or biodegradable dish washing liquid, laundry detergent and shampoo. This will reduce eutrophication of water bodies.
- ↯ Use organic manure instead of commercial inorganic fertilizers.
- ↯ Do not put pesticides, paints, solvents, oils or other harmful chemicals into the drain or ground water. Use only the minimum required amount of water for various activities.

SOLID WASTE MANAGEMENT-

The waste materials which has been rejected for further use and which can neither readily escape into the atmosphere nor can be transported by water intostreams are called solid waste.

All the discarded solid materials from municipal, agriculture and industrial activities are included in the solid waste

Some of these effects are described below:

1. The stray animals and scavengers invade the garbage dumps of roadside. It results in harming aesthetic beauty of the surroundings.
2. Flies and mosquitoes breed on the choked drains and ugly pits through solid wastes. These flies and mosquitoes than contaminate food and water. In turn, diseases like diarrhoea, amoebic dysentery, bacillary dysentery, malaria, dengue etc. results.
3. Bad odours pollute the air as a result of decomposition of organic solid wastes.
4. Rats living in solid waste dumping sites rapidly multiply in number and may cause plague and other diseases.

various steps to control solid waste management-

There are three major steps involved in the proper management of solid waste, which also include the municipal solid waste (MSW). They are:

1. Collection and Segregation
2. Transportation
3. Disposal.

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1. Collection and Segregation of Waste:

- The first step in the management of waste is the collection of waste. The accumulated waste heaps should be sorted out in different types before transportation. We should collect the similar types of waste in different waste bins
- The municipal waste has biodegradable and non-biodegradable wastes. The non-biodegradable wastes include plastics, used metal cans and other items, broken glass and china clay pieces, etc.
- The wastes should be segregated at source as different types of waste need to be disposed of in different manner. It is more profitable and economical to segregate the waste at the source.
- The segregation of waste into different categories is an essential step in the disposal of solid waste, as each category of waste is disposed of differently according to their nature and level of toxicity.

2. Transportation of Waste:

- ⇒ From the places where the waste has accumulated or collected, the local agencies engaged in the management of the municipal waste, should carry away the collected waste in trolleys or vans to the place of disposal.
- ⇒ The liquid waste from the kitchen and toilets should be transported to the disposal and treatment plants through the sewer lines.
- ⇒ To reduce the risk of exposure of biomedical waste to the public and to the environment, rigid containers should be used for transporting the colour coded bags to the disposal site.

3. Methods of Waste Disposal:

- ⇒ The common methods used for disposal of solid waste in different parts of the world are **open dumping, landfill, composting, drainage, incineration, recycling and reuse.**

Dumping:

In most of the underdeveloped and developing countries, the waste materials are dumped in open grounds, away from the city or town, and left to decompose. This conventional, inexpensive and widely used method of waste disposal has several disadvantages. It is harmful for the environment as well as for humans and other living organisms. If these wastes are absorbed in the soil, they can easily pollute the groundwater.

Landfill:

- ⇒ It is now a widely used method for municipal solid waste disposal. In this method, the landfills are covered with earth, so that insects do not enter these landfills. The wastes are then left to decompose.
- ⇒ A number of physical, chemical and biological reactions take place and a variety of toxic gases, such as carbon dioxide, methane, ammonia and hydrogen sulphide, are released.
- ⇒ The landfills are generally far away from residential areas. This method has the following advantages:
 1. There is no pollution of air, as the landfills are covered by earth.
 2. The health hazards are few, as the mosquitoes and rats do not breed.
 3. It is free from fire hazards.
 4. It is most suitable for non-biodegradable waste,

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Composting:

≡ Composting is a natural biodegradation process in which the biodegradable solid wastes can be converted into nutrient-rich manure in the presence of micro-organisms.

≡ Composting can be done either in the presence of atmospheric air (aerobic composting) or in the absence of atmospheric air (anaerobic composting).

≡ The aerobic composting is more common in our country, due to the ease with which it can be practised. However, it is less economical and leads to emission of greenhouse gases.

It has the following advantages:

1. It enhances the soil nutrients, such as nitrogen and phosphorus.
2. It enhances the water retention capacity of the soil.
3. It increases the fertility of soil by adding humus.

Incineration-

In this method, combustible waste is burnt at high temperature leaving ash and non-combustible (eg. broken glass, metals, etc.) which are disposed in landfills.

The ashes produced can be used as aggregate for low grade concrete. The pathogen in waste are destroyed in this process.

Pyrolysis-

This is the method of combustion of waste in the absence of oxygen. In this process end products are tar, charcoal etc.

SOCIAL ISSUE AND THE ENVIRONMENT

Man is social animal .Man and society are interrelated. Social issue refers to man's activities in physical environment i.e air, water, soil, minerals. These issues are :

- ⌘ Sustainable development
- ⌘ Conservation of energy resources
- ⌘ Rain water harvesting
- ⌘ Global warming
- ⌘ Acid rain
- ⌘ Ozone layer depletion
- ⌘ Environmental related laws

Sustainable development :

Human activities such as industrialization, urbanization,deforestation are cause of environmental damage. Environmental changes and development are two face of coin and cannot be stopped and we have to follow a middle path i.e sustainable development .

The development that meets the need s of present and would meet the needs of future generation is referred to as sustainable development .Development in social,economic,and ecological status of society refer to sustainable development.

Needs of sustainable development-

- ⌘ To link development with conservation of natural resources for our future generation
- ⌘ To develop alternative product instead of scarce resources. We can use solar energy ,bio gas in place of fossil fuels.
- ⌘ To conserve biodiversity
- ⌘ To avoid exploitation of natural resources and utilize in economic term

Approach to sustainable development-

- ⌘ To promote environmental education and awareness
- ⌘ Three 'R' approach-Three 'R' means reduce,reuse,recycle. We should reduce the excessive use of natural resources and use again and again .Recycle the materials for future use.
- ⌘ Appropriate technology should be developed which use less resources and produce minimum waste.
- ⌘ To utilize resources as per carrying capacity of environment
- ⌘ There should be equal distribution of natural resources among people of developing and developed countries.

Urban problems related to energy-

- ↯ Due to huge requirement of energy in production center, industries and other farming areas ,energy problem arises. The main cause are:
- ↯ Increase use of energy for domestic and commercial purpose
- ↯ Huge industries demand
- ↯ Non renewable resources are decreasing
- ↯ Increasing transport means
- ↯ Growing of population

Following actions to solve energy related problem-

- ↯ To control urbanization
- ↯ Use of renewable energy resources like solar energy, windpower, biomass
- ↯ Creating awareness
- ↯ Minimize transmission loss

W A T E R C O N S E R V A T I O N -

Water conservation means managing water properly i.e using carefully and economically ,protecting water resources .

Strategies of water conservation-

- ↯ Careful means to conserve water -
 1. Domestic conservation-Water leakage and continuous flow of water should be avoided.
 2. Agriculture conservation-Required amount of water should be spent.
 3. Industrial conservation-By recycling water in thermal power plant by cooling towers ,water can be conserved
- ↯ Sustainable water utilization-
 1. Domestic water consumption should be restricted to minimum
 2. The quality of water should be maintained within desired

limits How Water conservation is made -

- ↯ Construction of dams
- ↯ Interlinking rivers
- ↯ Rainwater harvesting
- ↯ Recycling and reuse of water
- ↯ Adopting drip irrigation in croplands

R a i n w a t e r h a r v e s t i n g -

Rain water harvesting may be defined as a method of collecting and storing the local surface runoff and conserving it for later use.

The main objectives of rain water harvestings are:

- ↵ To restore supplies from aquifers due to over exploitation
- ↵ To store excess water for future use
- ↵ To improve physical and chemical quantity of ground water
- ↵ To reduce storm water runoff and soil erosion
- ↵ To increase hydrostatic pressure to prevent or stop land subsidence
- ↵ To rehabilitate existing traditional water harvesting structure like village ponds, tanks.
- ↵ To prevent salinity ingress in coastal area
- ↵ To recycle industrial and urban waste etc

METHODS OF RAIN WATER HARVESTING-

Following methods are adopted.

- ↵ **Collection devices:** Storage tanks made of earth materials, pottery, polyethylene or ferro - cement tanks are used for harvesting rain water. These tanks should be either above or below the ground. These tanks should be covered to avoid contamination from man, animal etc. and to prevent evaporation.
- ↵ **Micro catchment water harvesting:** In this method, the surface runoff from a small catchment area and stored in the roof zone of adjacent infiltration basin. The basin is protected by planting trees, bushes.
- ↵ **Macro-catchment water harvesting:** In this case, the surface runoff from a large catchment or hill slope catchments is stored or carried to the cropping area.
- ↵ **Rooftop rain water harvesting:** In this method, the rain water from roof tops, constructed courtyards and other location is stored in huge storage tanks /ponds constructed underground for future use.

WATERSHED MANAGEMENT-

Watershed mean an area of land that catches rain and snow and drains or seeps the water into stream ,river, lake or ground. Protecting and maintaining surface water quality and quantity is known as watershed management.

Since watersheds are under constant threats due to flood and soil erosion,watershed management is necessary to improve total yield and quantity of surface water by means of land treatment. Excessive runoff, flood, salinisation should be prevented.

Methods of watershed management-

- ↵ Agriculture farming should be done as it reduces surface runoff
- ↵ Cultivation along the slope is done for conservation of soil
- ↵ Conservation tillage is done in which crops can grown with minimal cultivation of soil
- ↵ Forestation should be done

- ↵ Preserve the water to recharge the aquifers
- ↵ Strip cropping is done
- ↵ Agro forestry-this involves planting trees/shrubs in the farm. The trees can shade soil and reduces soil temperature.
- ↵ To promote soil binding plants like vertex.
- ↵ Terracing is done as terrace reduces erosion

R ESETTLEMENT AND REHABILITATION OF PEOPLE-

When some major projects involving construction of dams, mines, refineries, river valley projects , reservoirs ,the population settled in those area have to be removed to alternate places. This is called resettlement .Also due to natural calamities like earthquake, landslides, volcanoes ,the problem of resettlement arises.

Problems arises due to resettlement -

- ↵ Community structure is broken and cultural identity at that place is lost
- ↵ Social networks are disturbed. In some cases tribal people undergo trauma because they donot adapt new environment.
- ↵ Tradition is weakened.

Economical problems-

- ↵ Source of income is lost
- ↵ Many people die due to starvation.

Educational, psychological, environmental problems-

- ↵ Education is hampered.
- ↵ Resettlement in new place gives rise to trauma
- ↵ Resettled people face greater problem for their livelihood.

Planning of resettlement and rehabilitation-

The affected people should be given proper choice for their resettlement and rehabilitation. The govt. of India should take proper care of displaced people. Adequate compensation, social infrastructure, job opportunities, civic amenities and religious and cultural benefits should be given. Proper facilities such as developed road, water supply, electricity, schools, health centres , worship place, community center, shops should be give in rehabilitated area.

C ASE STUDIES-

- ↵ TEHRI DAM-Because of construction of tehri Dam on the Bhagirathi river in India,100000 people lost their homes and lands. Displacement and resettlement of these people were planned in

early 1979 but resettlement is yet to complete. Tehri dam displaced stills awaits rehabilitation and compensations.

- ⌘ Sardar sarovar project-This project led to displacement of 10000 people in madhyapradesh. In maharashtra 33 villages are likely to be submerged by project.These affected people would be resettled as per action plan prepared by narmada control authority.

ENVIRONMENTAL ETHICS-

The issues, principles, guidelines relating to human interaction with their environment is called environmental ethics. Environmental ethics deals with human obligation towards environment and living beings.

ISSUES-

- ⌘ concentration of CO₂ and other harmful gases in the atmosphere increases due to burning of fossil fuels
- ⌘ industrialization, urbanization causing decrease of quality of environment
- ⌘ depletion of natural resources
- ⌘ pollution increases

Consequences-

- ⌘ Green house effect
- ⌘ Acid rain
- ⌘ Ozone layer depletion

CLIMATE CHANGE

Climate is average weather of an area or environmental factors of an area. Climate is influenced by light, temperature, humidity, wind etc. Thus the changes in environmental condition of an area over long period of time is called climate condition. Changes in atmosphere condition may resulting serious problems green house effects depletion of ozone layer .

1 .G LOBAL WARMING-

Global warming which is also referred to as climate change, is the observed rise in the average temperature of the Earth's climate system. The average temperature is 15 degree c.

Many chemical compounds found in the Earth's atmosphere act as "greenhouse gases." These gases allow sunlight to enter the atmosphere freely. When sunlight strikes the Earth's surface, some of it is reflected back towards space as infrared radiation (heat). Greenhouse gases absorb this infrared radiation and trap the heat in the atmosphere.

These greenhouse gases are water vapor, carbon dioxide, methane, and nitrous oxide, chlorofluorocarbons, hydrofluorocarbons. In absence of green house gases the temperature of earth

would be -15 degree c. Due to increase in greenhouses gases excessively by human activity the average temperature of earth increases .This is called **green house effect**.

≡ Natural Causes of Global Warming: -||

- i. rotation of the sun that changes the intensity of sunlight and moving closer to the earth
- ii. greenhouse gases
- iii. Volcanic eruption.

≡ Human Influences on Global Warming: -|| industrial revolution ,Mining , Deforestation causes increase in concentration of green house gases.

≡ Effects: -||

- i. Average temperature of the earth will go on rising above the normal temperature causing tremendous changes in climate and weather, forestation, natural resources etc.
- ii. The existing ecosystem will be imbalanced.
- iii. This may lead to melting of glaciers and polar ice caps which consequently, will result in to flooding of many costal low lying areas, submergence of many islands & cities near to ocean.
- iv. The excess of CO₂ will result in to respiratory disorders and suffocation.
- v. Warming may be more in higher latitude than in tropics. The temperature rise in temperature regions is anticipated to be more than the average global temperature but less in tropics.
- vi. There may be alteration in hydrological cycle also.

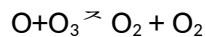
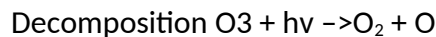
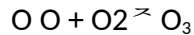
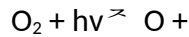
≡ Remedial measure (Control) of Global Warming

- ⌘ Reduce transport sector emissions by less and smart driving.
- ⌘ Promote use of renewable energy usage like solar, wind, tidal, biomass etc.
- ⌘ Technology should develop to prevent release of greenhouse gases in to the atmosphere.
- ⌘ Aforestation and reforestation should be undertaken at large scale. A single tree will absorb approximately one ton of CO₂ during its life time.
- ⌘ Avoid methane production from biomass decay through controlled combustion.
- ⌘ Reduce waste, prefer reusable products, recycle paper, plastics, metals etc. Finally, human should stop open burning such as burning dry leafs or burning garbage.

2. ozone layer depletion-

O zone formation-

In lower mesosphere, the atmosphere oxygen absorbs uv radiation and photodissociates into two oxygen atoms. These atoms subsequently combine with molecular oxygen of upper stratosphere producing ozone. This ozone layer strongly absorbs or blocks ultraviolet rays and so protect the life on earth.



o zone depletion-

The chemicals called chlorofluorocarbons or CFCs, which are used as refrigerants and aerosol spray propellants, became a threat to the ozone layer. The CFC molecules are virtually indestructible until they reach the stratosphere, where UV radiation breaks them down to release chlorine atoms. The chlorine atoms react with ozone molecules which break down into oxygen molecules, which do not absorb UV radiations.

Since the early 1980s, scientists detected a thinning of the ozone layer in the atmosphere above Antarctica. This phenomenon is now being detected in other places as well including Australia.

E ffects of ozone depletion-

- ⌘ Ozone depletion in the stratosphere will result in more UV radiation reaching the earth (290-320 nm). The UV radiations affect DNA and the photosynthetic chemicals. Any change in DNA can result in mutation and cancer. Cases of skin cancer (basal and squamous cell carcinoma)
- ⌘ Easy absorption of UV rays by the lens and cornea of eye will result in increase in incidents of cataract.
- ⌘ Melanin producing cells of the epidermis (important for human immune system) will be destroyed by UV-rays resulting in immuno-suppression. Fair people (can't produce enough melanin) will be at a greater risk of UV exposure.
- ⌘ Phytoplanktons are sensitive to UV exposure. Ozone depletion will result in decrease in their population thereby affecting the population of zooplankton, fish, marine animals, in fact the whole aquatic food chain.
- ⌘ Yield of vital crops like corn, rice, soybean, cotton, bean, pea, sorghum and wheat will decrease. Degradation of paints, plastics and other polymer material will result in economic loss due to effects of UV radiation resulting from ozone depletion.

3. ACID RAIN

Oxides of sulfur and nitrogen originating from industrial operations and fossil fuel combustion are the major sources of acid forming gases. In the atmosphere these gases are ultimately converted into sulfuric and nitric acids. These acids cause acidic rain. Acid rain is only one component of acidic deposition. Acidic deposition is the total of wet acidic deposition (acid rain) and dry deposition. Rain water is turned acidic when its pH falls below 5.6

Effects of acid rain :

- ↯ Acid rain causes a number of harmful effects. The effects are visible in the aquatic system even at pH less than 5.5.
- ↯ It causes deterioration of buildings especially made of marble e.g. monuments like Taj Mahal. Crystals of calcium and magnesium sulphate are formed as a result of corrosion caused by acid rain.
- ↯ It damages stone statues.
- ↯ It damages metals and car finishes. L
- ↯ Aquatic life especially fish are badly affected by lake acidification. L
- ↯ Aquatic animals suffer from toxicity of metals such as aluminium, mercury, manganese, zinc and lead which leak from the surrounding rocks due to acid rain.
- ↯ It results in reproductive failure, and killing of fish.
- ↯ It damages foliage and weakens trees.

Control of Acid Rain

- ↯ Emission of SO₂ and NO₂ from industries and power plants should be reduced by using pollution control equipments.
- ↯ Liming of lakes and soils should be done to correct the adverse effects of acid rain.
- ↯ A coating of protective layer of inert polymer should be given in the interior of water pipes for drinking water.

Nuclear Accidents and Nuclear Holocaust: Nuclear energy was researched and discovered by

man as a source of alternate energy which would be clean and cheap compared to fossil fuels. And although this did happen, along with the benefits of nuclear energy came its downfalls. In the short history of nuclear energy there have been accidents that have surpassed any natural calamity or other energy source extraction in their impacts. A single nuclear accident can cause loss of life, long-term illness and destruction of property on a large scale for a long period of time. Radioactivity and radioactive fallout leads to cancer, genetic disorders and death in the affected area for decades after, thus affecting all forms of life for generations to come.

The use of nuclear energy in war has had devastating effects on man and earth. The Hiroshima and Nagasaki incident during World War II, the only use of nuclear power in war in history, is one of the worst disasters in history. In 1945, the United States dropped atomic bombs in Japan over the towns of

Hiroshima and Nagasaki. These two atomic bombs killed thousands of people, left many thousands injured and devastated everything for miles around. The effects of the radiation from these nuclear bombs can still be seen today in the form of cancer and genetic mutations in the affected children and survivors of the incident.

THE AIR (PREVENTION AND CONTROL OF POLLUTION) ACT :

The Government passed this Act in 1981 to clean up our air by controlling pollution. Sources of air pollution such as industry, vehicles, power plants, etc. are not permitted to release particulate matter, lead, carbon monoxide beyond a prescribed level. To ensure this, Pollution Control Boards (PCBs) have been set up by Government to measure pollution levels in the atmosphere and at certain sources by testing the air.

The main objectives of the Act are as follows:

- (a) To provide for the Prevention, Control and abatement of air pollution.
- (b) To provide for the establishment of Central and State Boards with a view to implement the Act.
- (c) To confer on the Boards the powers to implement the provisions of the Act and assign to the Boards functions relating to pollution.

Powers and Functions of the Boards:

Central Board :

- ↯ The main function of the Central Board is to implement legislation created to improve the quality of air and to prevent and control air pollution in the country.
- ↯ The Board advises the Central Government on matters concerning the improvement of air quality and also coordinates activities, provides technical assistance and guidance to State Boards and lays down standards for the quality of air.
- ↯ It collects and disseminates information in respect of matters relating to air pollution and performs functions as prescribed in the Act.

State Pollution Control Boards:

- ↯ The State Boards have the power to advise the State Government on any matter concerning the prevention and control of air pollution.
- ↯ They have the right to inspect at all reasonable times any control equipment, industrial plant, or manufacturing process and give orders to take the necessary steps to control pollution.
- ↯ They are empowered to provide standards for emissions to be laid down for different industrial plants with regard to quantity and composition of emission of air pollutants into the atmosphere. A State Board may establish or recognize a laboratory to perform this function.

Penalties: Persons managing industry are to be penalized if they produce emissions of air pollutants in excess of the standards laid down by the State Board. The Board also makes applications to the court for restraining persons causing air pollution. Whoever contravenes any of the provision of the Act or any order or direction issued is punishable with imprisonment for a term which may extend to three months or with a fine of Rs.10,000 or with both ,and in case of continuing offence with an additional fine which may extend to Rs 5,000 for every day during which such contravention continues after conviction for the first contravention.

THE WATER (PREVENTION AND CONTROL OF POLLUTION) ACT

The Government has formulated this Act in 1974 to be able to prevent pollution of water by industrial, agricultural and household wastewater that can contaminate our water source.

The main objectives of the Water Act are to provide for prevention, control and abatement of water pollution and the maintenance or restoration of the wholesomeness of water.

It is designed to assess pollution levels and punish polluters.

The Central Government and State Governments have set up Pollution Control Boards that monitor water pollution.

Central Board function :

- ↯ It has the power to advise the Central Government on any matters concerning the prevention and control of water pollution.
- ↯ The Board coordinates the activities of the State Boards and also resolves disputes. The Central Board can provide technical assistance and guidelines to State Boards to carry out investigations and research relating to water pollution, and organizes training for people involved in the process.
- ↯ The Board organizes a comprehensive awareness program on water pollution through mass media and also publishes data regarding water pollution.

The State Boards function:

- ↯ It has the power to obtain information, keep records of flow, volume, and other characteristics of the water.
- ↯ They are given the power to take samples of effluents .The concerned board analyst is expected to analyze the sample sent to him and submit a report of the result to the concerned Board. The Board is required to send a copy of the result to the respective industry.
- ↯ The Board also has the power of inspecting any plant record, register, document or any material object, and can conduct a search in any place in which there is reason to believe that an offence has been conducted under the Act.

Penalties: These are charged for acts that have caused pollution. This includes failing to furnish information required by the Board, or failing to inform the occurrence of any accident or other unforeseen act. An individual or organization that fails to comply with the directions given in the subsections of the law can be convicted or punished with imprisonment for a term of three months or with a fine of Rs10,000 or both and in case failure continues an additional fine of Rs.5,000 everyday.

* Population Growth in India :-

→ As per information, the population of India in 1921 was about 25 crores, became 84 crores in 1991 and 102.7 crores in 2001.

→ With present growth rate of 1.7%, the population may cross 128 crores in 2021 and may become the most populated country in 2051 with an estimated population of about 151 crores.

Following factors favour the population growth of India.

- * Due to climate conditions, there is early marriage makes the reproduction span longer.
- * Adoption of birth control practice is not followed, particularly by poor people.
- * Poor and lower castes people want to grow the family size so that more earning members will earn more.
- * Due to improved sanitation and medical care, the death rate is reduced.
- * Moreover, the birth rate \gg the death rate and this favours the increased population.

The following chart illustrates the population growth:

<u>Region</u>	<u>Birth Rate</u>	<u>Death Rate</u>
World	22	9
Developed countries	11	10
Developing countries	25	9
Asia	22	8
Europe	10	11
Africa	38	14
North America	14	9
South America	24	

* Population Explosion :-

→ The rapid growth of population affects the present and future national and regional development. But, this is not only problem in the world today. The main problem is the population explosion.

→ Population explosion does not mean over-population or population density.

→ Population ~~explosion~~ explosion is a sudden ~~increase~~ increase in the rate of population growth that takes place in the second stage of demographic transition.

→ The population explosion is defined as an imbalance in which the population growth is

resources on the economic development.

Effects of Population Explosion :-

Population explosion has several effects on the human life. These are

* creates unemployment problems.

* Low standard of living.

* Environmental damage.

* Low per capita income.

* Lack of basic amenities like water supply, sanitation, education, medical care etc.

* Energy crisis, pressure on agriculture land, etc.

* Overcrowding of cities leading to creation of slums

* migration to urban area for better living and high crime rate.

* National Family Welfare Programme :-

It was named as National Family Planning Programme and was launched in 1952 in India.

Importance of F.W.P. :-

→ It plays important role in the nation's socio-economic development.

→ India has only 2.4% of world's ~~pop~~

→ India's population increasing 1.8 crores every year.

→ Family Welfare Service is made voluntary.

→ This programme was 100% centrally sponsored.

Organisational Set-up :-

1. Central Level :-

At central level central cabinet sub-committee is present. Next is population advisory council. Next level is central family welfare council.

→ The national Institute of Health and Family welfare which is situated in Delhi is the lead institute. It takes research and training in family welfare.

2. State Level :-

→ At state level the lead organization is Ministry of Health and Family Welfare.

→ At state level the work is organised by State Family Welfare Bureau. It has

3 wings

- Administrative wing
- Education and information wing
- Field operation and Education wing

3. District Level :-

→ At district level the work is organized by District Family Welfare Bureau.

→ It has also 3 wings.

→ Regional family welfare Training centres are present at some dists. These undertake training of medical officers & paramedical staff.

*/ Environmental and Human Health :-

Environment has a direct impact on the physical, mental & social health of human being.

→ If the environment is favourable to the individual then he/she can improve his/her physical and mental capacity.

→ On the other hand, if the environment is polluted it can affect the human health and leads to illness.

Thus protection and promotion of environmental health is one of the major global issues today. It includes following

- issues -
- Urban environmental Health
 - Water Quality & Health
 - Air Quality & Health

① Urban Environment & Health :-

- Environmental degradation is serious in crowded urban centres.
- In developing countries millions of poor people suffer from illness, accidents and crime due to changes in environment.
- Good housing & suitable physical environment leads to good mental & physical health.
- Environment plays important role in the violent behaviour of people which is seen in urban areas.

② Water Quality & Health :-

- Water quality has a great effect on public health.
- Due to pollution there are inadequate supplies of water.
- Acc. to research, 170 million urban people and 770 million rural people lack access to safe and adequate water supplies.
- This problem is more in urban areas due to 2 reasons
 - Failure to Pollution control
 - Inadequate sanitation and garbage disposal
- It is estimated that some and sufficient

③ Air Pollution & Health :-

- Air pollution is growing day by day throughout the world.
- Fossil fuels are the largest source of air pollution.
- Other urban air pollution is due to coal fired power stations, motor vehicles, domestic cooking and heating & industries.
- These affects to our respiratory system.
- Depletion of ozone layer, due to the release of CFC which causes skin cancer and cataracts.

④ Industrialization & Human Health :-

Industrialization has 2 types of impacts on human health, one is positive and another is negative.

- Positive impact is in some countries due to industrialization there is success in reducing mortality and improving health.
- Negative impact is due to this there is increase in amount of population.
- The chemicals released have caused various health issues.

⑤ Energy & Human Health :-

→ Energy is required for socio-economic development and has direct & indirect benefits for health.

→ 4 major health issues due to energy by WHO are, :-

- Urban air pollution from fossil fuel combustion and vehicles.
- Indoor air pollution from coal & biomass fuel.
- Accident prevention & control
- Possible consequence of climate change.

* Value Education :-

Introduction :-

→ Anything which satisfies a human need is called value.

→ In psychology it is defined as a dominate interest, motive or an attitude.

→ It is dynamic and used in different aspects i.e. psychologist in the sense of "psychic energy", sociologists in the sense of "use of time", energy and money.

Important values :-

① Religious value :-

- It is defined in terms of faith in God.
- In students life it is of least important.

② Social value :-

- It is defined in terms of charity, kindness, love and sympathy for other people.

③ Democratic value :-

- It is defined as respect all individuals avoiding their sex, language, religion, caste, colour, race and family status.

④ Aesthetic value :-

- It is defined as appreciation of beauty, dance, music, poetry etc.

⑤ Economic value :-

- It stands for desire for money and materials.

⑥ Knowledge value :-

- It stands for theoretical principles of an activity and discovery of truth.

- It is very important for students life.

⑦ Health value :-

It implies that keep our body in fit state so that we can do every duties and foundations.

* Aims and Values :-

→ The world is going through "value crisis" due to science and technology. So there is an urgent need to follow values. -

→ Aims are value commitments. But aims which arise from values should be justified philosophically and not based on blind beliefs.

→ The modern society should be inspired by values such as love, ethical and spiritual values.

→ Now methods are used to add value education in school curriculum.

* The Content and Methodology :-

Teaching is value oriented activity. So it is the duty of teachers to enable students to know various values.

Teachers are not trained about value education, but there are several strategies are available to teach values.

3 methods

- ① By having formal or informal dialogue.
- ② By giving some written exercises

→ During formal or informal dialogue values are known and students come to know that their judgements are correct or not.

→ Secondly value sheets are given. There are several questions written on the sheet.

→ 3rd method - In group discussion, some problems are given to the class. Students have to discuss the problems.

All the above strategies are to be adopted by several devices. For example, films, songs, letters, interviews etc.

These devices make the value education more interesting.

— 0 —

D iscuss the role of Information and Technology in e nvironment and human health.

Some of the important role that information technology plays in the field of environment and ecology are listed below:

- ⊛ Monitoring of environmental pollution through remote sensing. Weather forecasting through geographical information system (GIS) for agricultural production, water resource management etc.
- ⊛ Collaboration, communication and coordination among environmental scientists for decision-making.
- ⊛ Disaster management in calamity-hit areas by extracting information.
- ⊛ Biodiversity conservation for mapping and monitoring various natural resources flora and fauna.
- ⊛ Exploring the possible availability of crude oils, gold mines, metal ores, geothermal power sources etc. using Remote Sensing Information System (RSIS).

Some of the important role plays by the information and technology for a better human health are listed below:

- ⊛ Bioinformatics is used in Human Genome Project (HGP) to create a map of entire set of genes (genome) in the human cell by decoding the three billion units of human DNA.
- ⊛ Help and expert opinion can be obtained from expert doctors of any part of the world through telemedicine.
- ⊛ Information on health, epidemics and their prevention is maintained on web sites of World Health Organization. Health training is permitted using satellite communication system.
- ⊛ Dates of immunization and sanitation programmes are transmitted to public using television, computers, satellite communication etc.

QUESTION BANK

ENVIRONMENTAL STUDIES

UNIT1: THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Short answer type question (2 marks)-

1. Define environment.
2. What are components of environment?

Long answer type question.

1. Discuss the scope and importance of environmental studies.
2. Discuss the need of public awareness to protect our environment.
3. Environmental study is multidisciplinary in nature. Explain.

UNIT2: NATURAL RESOURCES

Short answer type question (2 marks)-

1. What are natural resources? Classify them.
2. What are renewable resources?
3. What are non-renewable resources?
4. Write any two effects of mining.

Long answer type question.

1. Write an essay on natural resources.
2. Explain deforestation .Describe its effect and control measure.
3. What is equitable use of resources for sustainable life?
4. Write role of individuals in conservation of natural resources.
5. Write shorts notes on
 - ≡ Conflicts over water with case study
 - ≡ Dam's benefit and problems
 - ≡ Effect of over grazing
6. Describe the impact of modern agriculture practices on environment.
7. Write about availability of minerals in India. Explain the effects of mineral mining on environment.

UNIT3:ECO SYSTEM

Short answer type question (2 marks)-

1. What is ecosystem?
2. What do you mean by decomposers ?

3. What is ecology?
4. What is food chain?
5. What is ecological succession?

Long answer type question.

1. Illustrate energy flow diagram.
2. Explain structure of ecosystem
3. What do you mean by food chain & food web?
4. Explain ecological pyramid.
5. Write about ecological succession & its different kinds.
6. Write about terrestrial ecosystem.

UNIT4: BIODIVERSITY & ITS CONSERVATION-

Short answer type question (2 marks)-

1. Define biodiversity.
2. What do you mean by endangered species?
3. Define aesthetic value.
4. What is poaching of wildlife?
5. What is in-situ conservation of biodiversity?

Long answer type question.

1. Discuss the different types of biodiversity.
2. Discuss the various threats to biodiversity.
3. Explain biodiversity at global, national & local level.
4. Explain different values of biodiversity.
5. What is conservation of biodiversity? Describe in-situ & ex-situ conservation of biodiversity.

UNIT5: ENVIRONMENTAL POLLUTION-

Short answer type question (2 marks)-

1. What is environmental pollution?
2. What are primary & secondary air pollutants?
3. What are the effects of air pollution on human health?
4. Write any two effects of noise pollution.
5. What is solid waste?
6. What is photochemical smog?

7. What is the major drawback of nuclear power generation?

Long answer type question.

1. What is air pollution? Describe the cause, effects & control measures.
2. Write short notes on biomagnifications.
3. What are 3R?
4. What are water pollutants? Discuss their effects and methods to control them.
5. What are main source of thermal pollution? Discuss its effects & and methods to control to them.
6. What precautionary measures should be taken during earthquake?
7. Write role of individual in prevention of pollution.
8. Explain source of solid waste and solid waste management.

UNIT6: SOCIAL ISSUES & THE ENVIRONMENT –

Short answer type question (2 marks)-

1. What is sustainable development?
2. What is watershed?
3. What are green houses gases?
4. What is global warming?
5. Write about urban problems related to energy.
6. What is environmental ethics?

Long answer type question.

1. Write short note on global warming and its effects?
2. Discuss rain water harvesting and its advantages.
3. What do you mean by resettlement and rehabilitation of people?
4. Write short note on ozone layer depletion.
5. Write short note on acid rain.
6. Describe air (prevention and control) Act 1986.

UNIT7: HUMAN POPULATION & THE ENVIRONMENT –

Short answer type question (2 marks)-

1. Discuss population growth in India.
2. What are objectives of value education?
3. What are major reasons for population growth?
4. Write effects of population explosion.

Long answer type question.

1. Write short note on
 - a. mortality
 - b. natality
 2. What is population explosion? Discuss its Indian scenario.
 3. Write notes on value education.
 4. What are family welfare programme? How it is useful in population control?
 5. Write the role of information technology in environmental studies.
-