JHARSUGUDA ENGINEERIN SCHOOL,JHARSUGUDA

DEPARTMENT OF CIVIL ENGINEERING

Lecture Notes

On

Environmental Studies(Th-5)

(Exclusively for 3rd Semester Civil Engineering Diploma Students

Under SCTE&VT,Odisha,Bhubaneswar)

Prepared By

Sri Amit Kumar Sahu, Sr Lecturer (Civil)

Sri Soubhagya Mohanty, PTGF

JES,Jharsuguda

24.09.19

CHAPTER - 1
ENVIRONMENT STUDIES

What is environment :-

→ environment is the sum of all social, economical, biological, physical and chemicals factors, which constitude the surroundings of leaving organism (man).

→ Human being is creater and moulder (change) of the environment.

→ environ (surrounding)

→ environment is derive a franch word environner, which means surrounding.

→ Human being is able to modified the environment, but is immidiate needs much more than any other organism.

→ since from the beginning of human civilization man started interfering with the environment so day by day, it is getting polluted and destroyed.

→ So the natural system in which can exists along with all other species, must be maintained in a healthy & functional steps.

Scope and Importance:-

The basic components of the environment are:-

a. Atmosphere (air)
b. Hydrosphere (water)
c. Lithosphere (Rock & soil)
d. Biosphere (living)

→ From the environment we get food to it, water to drink, air to breath and all necessities of day to day life.

→ It is now universally realised an any future developmental activities, has to be basing upon its impact on the environment.

→ Environmental pollution, deforestation, soil erosion, population explosion, global warming are disturbing the eco-system and threatening the existance of life

→ According to Zansch 1970 environmental science attance to solve the major environmental problems with the help of inter disciplinary and transdisciplinary approaches.

It means the inter knowledge of all the disciplines such as math, physics, chemistry, biology, zology, computer science, Medical science and bi-technology as well as social sciences like economics sociology environmental problem.

so environmental science has a wide scope and it is very important for the survivar of a healthy environment.

Need of public awareness:- Dt 29.07.19

→ There has been immense impact (both) of humen on its environment, due to the scientific and industrial revolution in this recent years.

→ since man has failed to realise that any new development distorbes the balance of the ecosystem, so public awareness is very necessary.

→ Individuals collectively make a society.

→ so if the opinion of the individual will change than only the Government policy can be properly implimented.

Ex:- polythene.

→ Ex:- Govt has banned the littering and uses of polythene, but due to lacks of public awareness people are still using polythene.

→ the first general public awareness worlds created has global level 1992 at earth summit in Rio du generlo (brazil).

→ Then the first public awareness, was selected on environment and its development.

CHAPTER-2
NATURAL RESOURCES

What is Natural resources:-
the things or materials of the nature which can be used by human beings for their growth, development and comfort etc are called as natural resources.

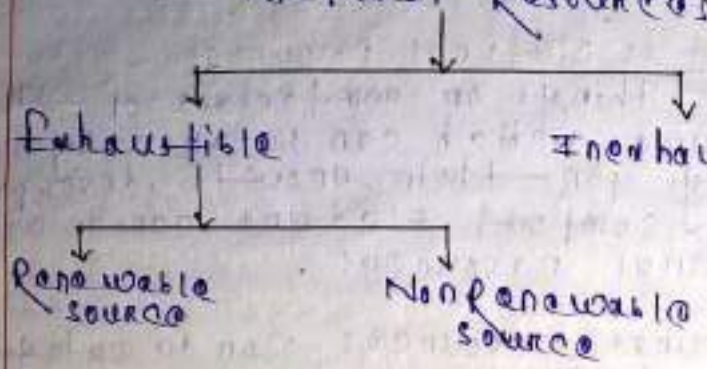
Natural resources can be categorise into two:-
Exhaustible resources
Inexhaustible resources

Exhaustible resources:-
This sources are exhausted or finish after continous uses or consumptions.

Ex:- soil, fossile fuels, water, minerals etc.

Inexhaustible Resources:-
This resources are not exhausted or finish after continous uses or consumptions.

- Natural Resources



Exhaustible resources can be divided into two types.

1. Renewable resources
2. Non-renewable resources

Renewable Resources:-

→ The natural resources which are exhausted through continuous use and can be recovered by sum efforts taken for a long period are called as renewable resources.

→ Ex:- soil, forest, groundwater etc.

→ Renewable resources are recovered to through natural cycles or manually.

→ For example of oxygen in the air is replenished/recovered by photosynthesis of plants or trees.

Non-renewable resources:-

→ This resources can not be recovered after getting exhausted.

Ex:- coals, petroleum, natural gases, minerals etc.

→ Coal and petroleum and natural gas are known as fossile fuels which are formed from the dead remaining of the leaving organism is a non-renewable resources.

→ As it can not be recovered back by the human being.

Dt. 21 07 19

Natural Resources & Its associated problems:-

→ In past years, man was not so advanced and he was satisfy with whatever he was getting from the nature, due to his limited needs. so there was a complete balance among all the components of the nature.

→ But at present due to enlimited needs of human being the consumption and misuse of natural resources has increased a lot.

→ so the nature balance has been distorb and so many problems are occurring in due to over exploitation of natural resources.

→ The problems which has arises are!
a. Lowering of water label.
b. Extinction of wild animals
c. soil erosion.
d. floods
e. climate change
f. Interruption of water cycle.
g. Loss of aquatic plant / animals.
h. ozone layer depletion.
i. Global warming
j. Acid rain
k. Various diseases etc.

Forest Resource! -

→ India contains almost 60% of major forest types.

→ Its forest types includes - tropical rainforest in north-east and desert of Gujarat and Rajasthan, it also include mangroves forest in west-Bengal and odisha, alpine forest in Himalaya regions etc.

Deforestation! -

→ Deforestation is the loss and continous degradation of forest habited, due to natural or human related causes.

→ the human caused deforestation are due to agriculture, organisation, mining and petroleum extraction etc.

→ The natural deforestation are due to can be due to forest fires, volcano eruption, tsunami and cyclones, desertification, glaciation.

→ UNRISD (United Nations Research institute of social development)

→ First divided the degradation of forest quality like, density, structure of trees, ecological service provided if and biomass can also be defind as deforestation.

→ Deforestation can also be measured by calculating the change in land use and the change in land cover.

Land use! -

→ In this method the deforestation can be measured by the measuring the change in forest land used.

→ In this method the area which is designated or recognised as forest as considerd for the calculation even through the forest is actually not present.

Land cover:-

→ In this method deforestation is measured by percentage of forest covered on a particular area.

→ This method is used to measured deforestation is large area.

→ For example: satellight pictures can be taken to find out the forest cover in a large area.

Causes:-

Present:-

→ The present causes for deforestation are the demand for farmland, fuel wood and petroleum extraction, other than this the major causes for deforestation are organisation and mining.

→ slash-burn technique are still use in sum of the places for clearing the land for cultivation.

Pre-historic:-

→ Deforestation has been practice by human sin thousand years ago.

→ The starting of mesolithic are fire are used by human to clear the lands for agriculture.

→ They also collected fine woods and many types of forest products from the forest which gradually decreased its quality.

Pre-Industrialisation:-

→ Before industrialisation period pond and harbor and ponds faith an measure role in business.

→ Due to sitting of the ponds along the southern coast of asia minor and coastal syria during the last centuries of BC (before craised), Many lands imerge into reverse basin.

so the people made their settlement they required more lands which eventually play to deforestation.

→ So the people made their settlement away from the raven basin costal area gradually

→ Due to the shifting of their settlement they required more lands which eventually play to deforestation

19.08.19

Environmental effect of deforestation:-

1- Atmospheric pollution:-

→ Trees or plants removes carbon-dioxide from the atmosphere during the process of photosynthesis. In this process it releases oxygen as the by product.

→ so due to deforestation oxygen table decreases and carbondioxide table increases in a particular area.

→ This increasing carbondioxide can also cause green-house effect & increases the temperature of that area.

2- Wildlife:-

→ Forests are reach in biological diversity which means different types of wildspecies leave in forest.

→ Deforestation can cause destruction of their habitat. Due to this wildlife populations ship and extinction may occure.

Hydrological cycle & water resources:-

→ Forest can effect the hydrological cycle in no. of significant waves.

→ The roots of the trees creates micropores in the soil, this increase infiltration of water and thus maintain the ground water table.

→ Trees also helps in precipitation or condensation of water vapours, which leads to rain formation.

→ The litter & organic residue of the forest changes the soil properties and increases the water holding capacity of the soil.

Soil erosion:-

→ Deforestation increases the rate of soil erosion, as it reduces the protection of soil from tree litters. Tree roots are also responsible for holding the soils which reduces the surface runoff.

Landslides:-

→ Tree roots bind the soil together and it also keep the soil in the place by binding it with underlying bedrock.

→ so the removal of trees from steep slopes increases the risk of landslides, which is very dangerous for the near by leaving people.

Case study:-

Joint forest Management (JFM):-

→ In 1972 one informal arrangement betn the local people & forest department is started to maintain the the quality of the forest.

→ It was started in Mednapur dist of West bengal.

→ Under JFM scheme forest protection committee was formed by including local community members to participate in restoring & protecting the local forest.

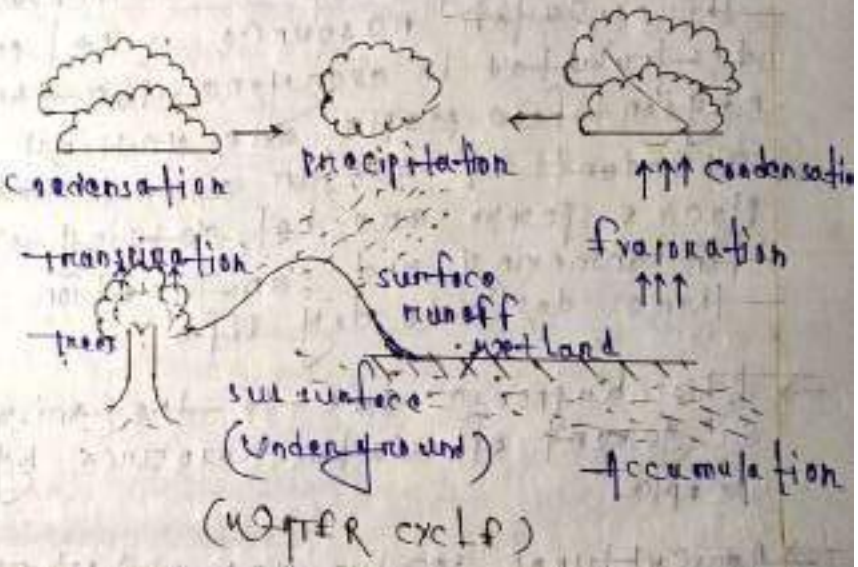
→ In 1988 the ministry of environment & forest is given important for JFM scheme & revised it.

→ The local communities are allow to take benifits from the forest other than the timber extraction.

Water Resource

→ 71% of earth surface is covered with water but only 3% of that is fresh water. From this 3%, 2% is present as ice-caps in polar region.

→ only 1% of this water is available in rivers, lakes, ponds etc.



(WATER cycle)

→ The above diagram source the water cycle in which clouds are form due to transpiration & evaporation, & this clouds precipitate and return to the earth surface in the form of rain.

→ Due to this precipitation reverse, Lakes etc are formed and fresh water taste is maintained.

Mismanagement & pollution of water resource :-

→ Due to the human population explosion the need of water to fulfill everyone need is increasing, this water resource is not properly distributed in everyone for this reason few people are getting abundant of water and in many places people are not getting water for drinking and sanitization in there day to day life.

→ This happense due to the mismanagement of water resource by the people

→ Agricultural sector are mainly responsible called the pollution of surface water due to accessive use of chemicals, fertilizers, insecticides etc.

→ there are many ways farmer can use organic fertilizers and increase the production with less use of water resource.

Industrial - Resource :-

→ Industries are mainly responsible for river.

→ This industries take place plenty of water.

→ public awarness need to be developed to put pressure on the industries so that they will stop releasing liquid waist to the river directly - also the water in take by the industries need to be limited.

dt. 11.09.19

Flood :-

→ Flood is caused by over flowing of the river banks, due to having rainfall.

→ the wetlands are the nature flood control system.

→ Due to the deforestation in wetlan river water comes towards the land area and causes flood.

→ this flood can damage crops, kill people and destroy there home so it effects the economy of a particular area.

Drought :-

→ In most arid regions the rain is unpredictable.

→ It leaves to a period of severe scracity of water.

→ Drought is an unpredictable climate condition which occurs due to failure of one or more monsoons in a particular region.

→ Due to drought farms, industries or urban areas, specially gets affected which uses a plenty of water.

Cause :-

→ Deforestation is the main cause of drought. When forest cover is removed water directly flows into the river without infiltrating into the ground.

→ In some area during monsoon session adequate amount of water is available. This water are misused the people and their not conserving.

During the non-monsoon period, they face the drought condition.

Water for agriculture & power generation :-

→ In, India the increasing demand for water in agricultural field and for generating electricity is mostly fulfiled by using the dam projects.

DAM :-

→ Dams are created by storing or conserving a large amount of water in a particular area, which can be used later for irrigation, for industrial supply & in urban areas.

→ Dams provide year round supply of water for domestic used & provides extra water generating for agricultural

→ this plant is used for hydro-power generation.

Disadvantage :-

This dams creates several environmental problems like :

→ they alter (change) the river flow direction & also destroy the wet lands, etc.

→ It destroy the life of local people and the habitat of wild life.

→ The emission of green house gases from the reservoir, due to rotting of vegetation & carbon influxes pollute the environment.

Cast story :-

Sardar sarovar project this is a Multi purpose dam project built in the Narmada River Valley. It has impacted millions of people lives - who have residing in that valley - the farmer who were present in the down stream get benifitted but the tribal folks, farmers, fisherman etc who were leaving in the valley, lost their home land & livelihood.

Dt 22.09.19

Mineral Resource :-

→ A mineral is a naturally occuring substance with definite chemical composition and identifiable physical property.

→ This mineral are form over a period of millions of years in the earth's crust.

→ The process of extracting minerals & there ores from the earth is interior is known as mining.

→ An ore is a mineral or combination of minerals available in impure form, from which useful substance can be extracted.

→ Ex :- Bauxite is an ore of aluminium mineral.

Mining

- → Prospecting → searching for minerals
- → Exploration → Assessing the site, shape location & economic value of the mineral.
- → Development
- → Exploitation

Mining is done through four stages

Development → preparation or setup of the acess so that minerals can be extracted.

Exploitation → extraction of the minerals from the mine

→ If present days many sophisticated instrument like GIS (Geographical information system) are used to survey & study the minerals present in earth cross.

→ There are two types of mines available :

1- surface Mines (open-cast)

2- Underground Mines (deep Mines)

Mine safety :-

→ Mining is a hazzardous process, so the safety of the mine occurs is very important.

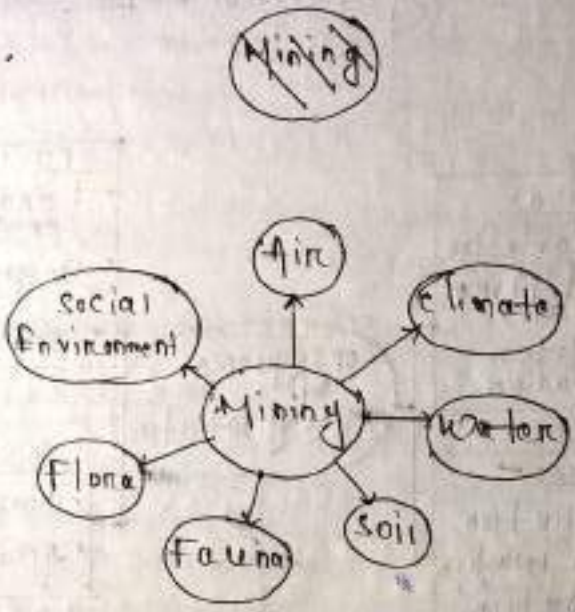
→ surface mines are less dangerous then the underground mines, In underground mines rock & roof may fall, flood may occur, Ventilation may get closed for this reason underground mines are very dangerous.

→ In coal mines fire hakard may occure.

→ The dust produced in mining operation is injurious to health & cause a lot lungs deases "Black lungs"

→ In dinamite explosion the p. fumes are produce which are also very dangerous for the mine workers.

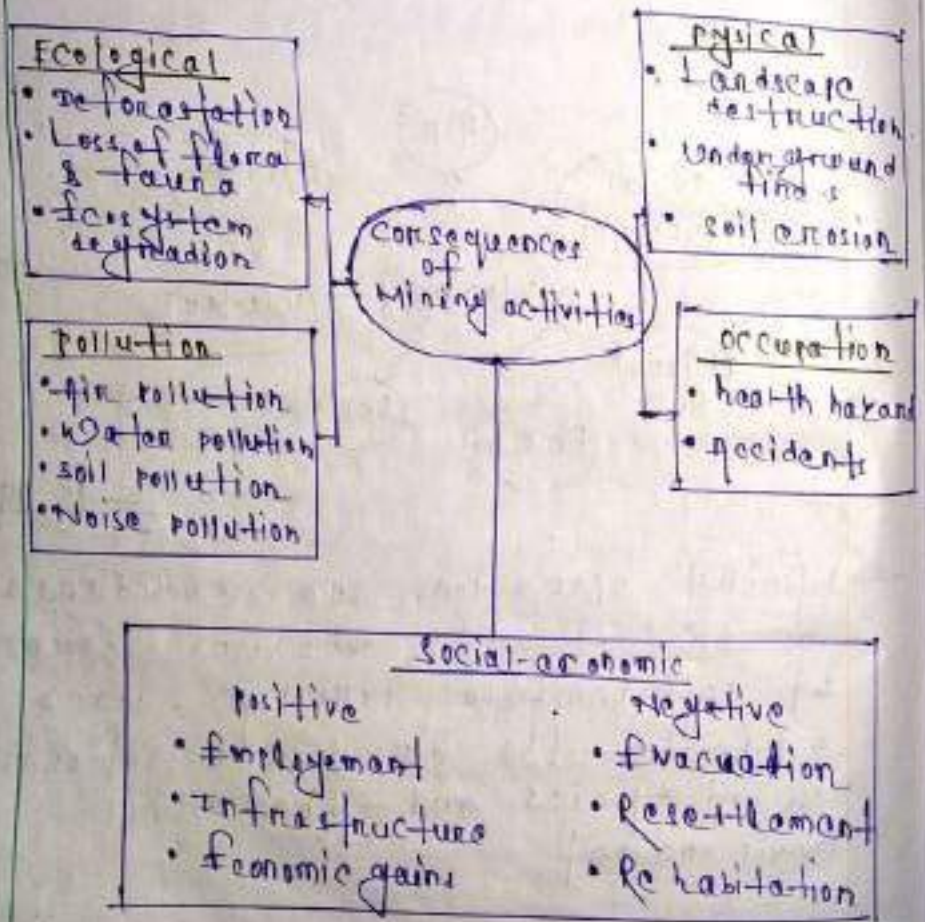
Environmental Effects :-



D: 18.09.19

→ Mining operations are considered as one of the measure source of environmental pollution, since it effects the air water, forest, wild species and the social environment.

→ the extraction of minerals from the lithosphere has many side effects such as it pollutes the water & near by land. the industry develop due to this mining, damage the near by environment.



Case study:-

→ Sariska Tiger Reserve Rajasthan

→ This tiger reserve present in Rajasthan. The forest department of Rajasthan have leased the land for mining, but the local people of Sariska tiger reserve area protest against it. They also filed a PIL in supreme court as a result of which supreme court banned the mining in the reserve area.

chapter- 2

Df. 23.09.19

Food Resource:-

→ Food which is neccessary for all leaving organism generally consist of proteins, carbohydrad, enzymes etc. minerals etc.

→ Today our food entirely depends on agriculture, animal husbandry & fishing.

→ All through our country food production has increased by almost 50% in past few years, it is not sufficient as the population is also growing in the same rate.

→ Since the land and water resources are limited therefore it is required to increased the productivity and sum steps should be taken to reduce the population growth.

→ Due to this intensive agriculture to increase the productivity, we gradually damage the environment, some of which are list at below.

overgrazing:-

→ Can occur when a particular area like:- grassland is under continuous grazing. over grazing

→ Due to this overgrazing plant leaf areas are reduced so sun light directly heats the ground and gradually that area becomes dry.

→ overgrazing also increases soil erosion. Due to this fertility of the soil decreases.

→ Due to overgrazing the plants become weak and the root length reduces day by day for which in filteration of surface water to the underground is blocked.

→ overgrazing can be reduce by rotational grazing which means a particular area is left after grazing it so that again the plant can grow in that area.

→ Also different types of grass or fodders can be harvested to fulfilled the demand of animal food.

(i) Effects of modern agriculture.
(ii) Damage to soil
(iii) Contamination of water.
(iv) Fertilizer
(v) Pesticides

Effects of modern agriculture:-

→ To increase the productivity in agriculture sector many techniques are use which has negative consiquences on the environment.

(i) The impact of modern agriculture technique on the environment are described below.

(i) Due to intensive agriculture it causes soil erosion in the forest land. Due to erosion the surface soil get remove which generally contents the organic matter, plant nutrients etc.

so fertility of the soil it decrease due to erosion of surface soil.

(ii) Contamination of water:-

→ If farming various things like manure fertilizer, pesticides are used.

→ surface runoff cane is all this things in to the strings bays, reservoirs etc and contaminate the water bodies.

→ this thing can also infiltrate to the ground contaminate the ground water.

(iii) Effect of the Fertilizers:-

→ When the nutrients are lost from the soil then farmers use fertilizers to increase the productivity. generally 3 major nutrients are applied to the farm i.e. Nitrogen, phosphorus, & potassium.

→ Nitrogen is readily lost as it is solluable water and contaminate the ground water. this Nitrogen mixed water is not acceptable for drinking.

→ phosphorus is not readily soluable in water and present tightly with the soil particle. this phosphorous mixed soil when get eroded. It goes into the water bodies. when it may cause excessive growth of aquatic plants. Due to this the lakes reservioun become choked with algae & offensive odour may come out.

→ potassium is not hazardous for the environment.

→ pesticides are readily used in farms to get rid of different types of pets and insects which may damage the crops.

→ these pesticides are poisonous, chemicals which can contaminate the water and kill the aquatic animals. this pesticides can also harm for human beings if it is consumed with the crops/foods.

Dt. 30.09.19
Monday

(iv) Pesticides:-

→ one drawback to this is that pesticides generally kill not only the pest of concern, but also a wide range of other organisms including beneficial insects and other pest predators.

→ once the effect of the pesticide wears off, the pest species is likely to recover more rapidly than its predators because of differences in the available food supply.

→ the increasing pesticide use is the development of resistance in pest species. The individual pests that survive pesticide applications continue to breed, gradually producing a population with greater tolerance to the chemicals control pest populations.

→ Accumulate in animal tissues, causing water contamination, fish kills, and decline of some bird populations.

Waterlogging:-

→ another problem associated with excessive irrigation on poorly drained soils is waterlogging.

→ the irrigation water eventually raises the water table in the ground. the upper level of the ground water found beneath.

→ the raised water table results in the soils becoming waterlogged. when soils are waterlogged, air spaces in the soil are filled with water. and plant roots essentially suffocate - lack oxygen. waterlogging also damages soil structure.

Salinity:-

crop production is limited because of salinity or alkalinity or both.

→ three class of saline & alkali soils are recognized. they are -

1. Saline soils:-

→ exchangeable sodium percentage is less than 15 and the pH is less than 8.5.

→ the soluble salts mainly consist of chlorides and sulphates of sodium, calcium and magnesium. Because of the white encrustation due to salts. the saline soil is also called white alkali.

2. Non-saline alkali or sodic soils:-

→ Alkali soils have an exchangeable sodium percentage of more than 15 and a pH greater than 8.5.

→ Such soils have low infiltration rate and the physical condition is unfavourable. Because of high alkalinity resulting from sodium carbonate, hence the term black alkali is frequently used to designate the non-saline alkali soil.

3. Saline-alkali soils:-

This group of soils is both saline and alkali. Also the exchangeable sodium percentage is greater than 15.

The pH, however, is likely to be less than 8.5.

* The soil salinity or alkalinity or both have many adverse effects,

1- causing low yields of crops or crop failure in extreme cases.

2- the limiting of the choice of crops, because some crops are sensitive to salinity or alkalinity or to both.

causes of salinity:-

(i) During the periods of higher than average rainfall, the soluble salts are leached from the more permeable high-lying areas to the low-lying areas, where, if the drainage is restricted, salts accumulate on the surface as water evaporates.

(ii) In the coastal areas, the ingress of sea-water induces salinity in the soil.

Reclamation:-

(i) The salts need to be leached below the root-zone and not allowed to come up.

(ii) The commonly used amendment is gypsum.

(iii) The number and frequency of leaching, the quantity of gypsum to be added and the techniques involved vary from region to region depending upon the clay mineralogy of the soils, the intensity of the problem.

chapter

Energy resources :-

(i) Energy is needed by all living organisms and vegetations for biochemical reactions of their cells. It is a power which is needed in one form or other for work done.

(ii) Long before most of the power available to human society was limited to solar energy trapped by green plants which produced organic matter.

(iii) Biological oxidation of the organic matter provided fuel to muscle power. The fire was the first form of known energy used for cooking, heating purpose.

Growing Energy Needs :-

For every activity to be performed required energy in the form of heat, light, electricity and even food.

Energy sources (Renewable & Non-renewable sources of energy) :-

There are following two types of energy sources to meet the requirement :

1. Renewable or non-conventional or inexhaustible energy sources :-

→ These sources are continuously replenished by natural processes.

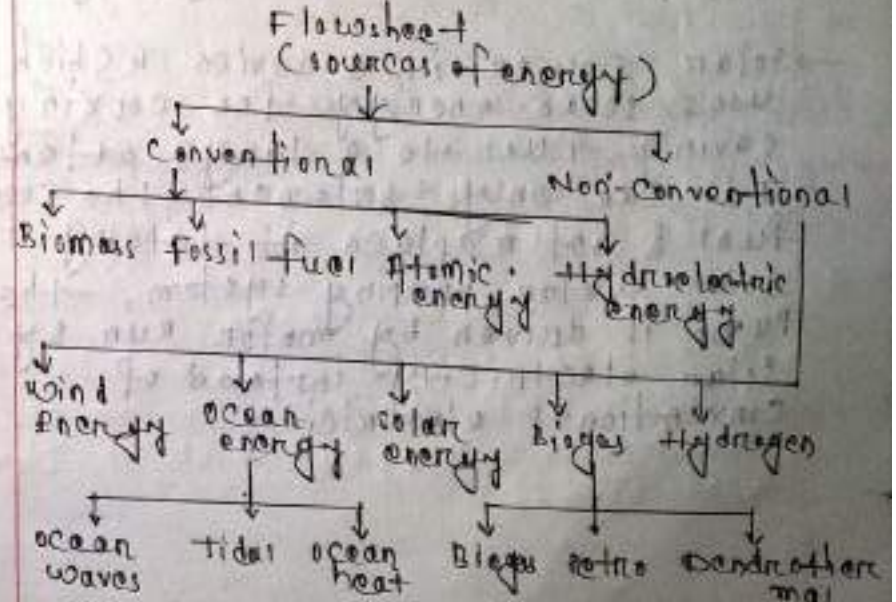
→ For example, solar energy, wind energy, bio energy, hydropower etc.

2. Non-renewable or Convention or exhaustible energy sources :-

→ Examples of this are coal, petroleum, natural gas and nuclear power.

→ These are traditional source available to us.

→ In addition to commercial fuels, coal oil - natural gas and power India consumes large.



(i) solar energy :-

→ solar energy is the most readily available and free source of energy since prehistoric times in a most primitive manner.

→ solar thermal energy is used for cooking, heating, drying, timber seasoning, distillation, electricity generation, cooling, refrigeration, cold storage etc.

→ solar photovoltaic uses sun's heat to produce electricity for lighting home & building, running motors, pumps, electric appliances, lighting streets, village electrification, powering of remote telecommunication & railway signals etc.

→ solar cooker is a device which uses solar energy for cooking saving fuel to a large extent. It can only supplement the cooking fuel & not replace it totally. In solar water pumping system, the pump is driven by motor run by solar electricity instead of conventional electricity.

solar electricity Generation :-

solar photovoltaic (PV) :-

→ Photovoltaic is the technical term for solar electric, photo mean "light" and voltaic means "electric". PV cells are usually made of silicon, an element that naturally releases electrons when exposed to light.

→ Amount of electrons released from silicon cells depend upon intensity of light incident on it.

→ The silicon cell is covered with a grid of metal that directs the electrons to flow in a path to create an electric current.

→ This current is guided into a wire that is connected to a battery or DC appliance. Typically, one cell produces about 1.5 watts of power. Individual cells are connected together to form a solar panel or module, capable.

Solar water pumps:-

→ In solar water pumping system, the pump is driven by motor run by solar electricity instead of conventional electricity drawn from utility grid.

→ It converts the solar energy into electricity, which is used for running the motor pump set.

(ii) Wind energy:-

→ The basic wind energy conversion device is the wind turbine. These turbines are generally of two types - vertical axis wind turbines and horizontal axis turbines depending upon the rotation of axis.

→ Wind electric generators (WEG) convert kinetic energy available in wind to electrical energy by using rotor, gearbox and generator.

1. Vertical-axis wind turbines:-
In which the axis of rotation is vertical with respect to the ground (and roughly perpendicular to the wind stream).

2- Horizontal-axis turbines:-
In which the axis of rotation is horizontal with respect to the ground (and roughly parallel to the wind stream).

→ Illustrates the two types of turbines and typical subsystems for an electricity generation application.

(iii) Hydro energy:-

→ Potential energy of falling water, captured and converted to mechanical energy by water-wheels, powered the start of the industrial revolution.

→ Wherever sufficient head or change in elevation could be found, rivers and streams were dammed and mills were built. Water under pressure flows through a turbine causing it to spin. The turbine is connected to a generator which produces electricity.

(iv) Bio energy:-

→ Biomass is a renewable energy resource derived from the carbonaceous waste of various human and natural activities.

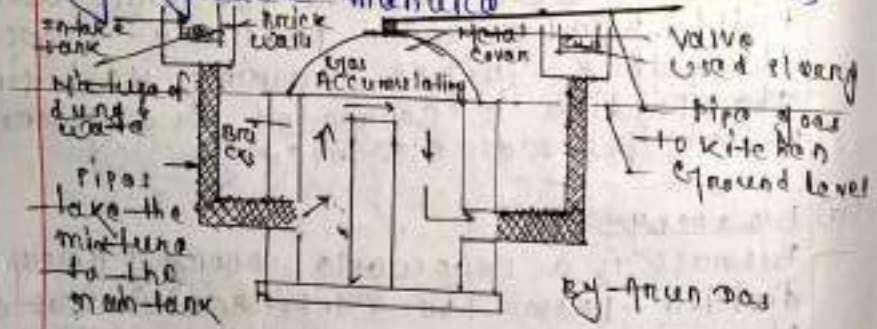
→ It is derived from numerous sources, including the by-products from the wood industry, agricultural crops, raw material from the forest, household wastes etc.

Application:-
Bio energy is being used for cooking mechanical applications, pumping power generation.

Some of the devices:-
Biogas plant / gasifier / Lennon gasifier engine pump sets stirling engine pump sets produce gas / biogas based engine generation sets.

Biogas plants:-
→ Biogas is a clean and efficient fuel, generated from cow-dung human waste or any kind of biological materials derived through anaerobic fermentation process.

→ Biogas is a safe fuel for cooking & lighting. By-product is usable as high-grade manure



A typical biogas plant has the following components:-
→ A digester in which the slurry (during mixed with water) is fermented in an inlet tank for mixing the feed and letting it into the digester, gas holder / dome in which the generated gas is collected, outlet tank to remove the spent slurry, the distribution pipe lines to transport the gas to the kitchen and a manure pit, where the spent slurry is stored.

→ Biomass can be converted directly into liquid fuels. Biofuels for our transportation needs (cars, trucks, buses, airplanes & trains) the two most common types of biofuels are ethanol & Biodiesel.

(v) Hydrogen energy:-
→ Hydrogen is a clean fuel & energy storage medium for various applications. Hydrogen can be produced by biological conversions of various organic effluents like distillery, starch etc.
→ Hydrogen contained in metal hydrides can be used in vehicles.

(vi) Tidal & ocean energy:-

Tidal energy:-

Tidal electricity generation involves the construction of a barrage across an estuary to block the incoming & outgoing tide.

The head of the water is then used to drive turbines to generate electricity from elevated water in the basin as in hydro electric dam.

Ocean Energy:-

Ocean energy draws on the energy of ocean waves, tides or on the thermal energy stored in the ocean.

The seen warms the surface water a lot more than the deep ocean water, and this temperature difference stores thermal energy.

The ocean contains two types of energy thermal energy from the sun's heat and mechanical energy from the tides & waves.

(vii) Geothermal energy:-

The term Geothermal energy is based on the core of the earth, which is very hot & it is possible to make use of this geothermal energy.

These are area containing volcanoes, hot springs, geysers, & methane, under the water in the oceans & sea.

Geothermal energy, which is derived from high temperature geothermal fluids, can be utilized for power generation & thermal applications like greenhouse cultivation, space heating & cooking.

(viii) Chemical sources of energy:-

Fuel cells electrochemically produce direct current (DC) electricity through a reaction between hydrogen & oxygen. Such cells are electrochemical devices that convert the chemical energy of a fuel directly and very efficiently into electricity (DC) & heat, thus doing away with combustion.

The most suitable fuel for such cells is hydrogen or a mixture of compounds containing hydrogen.

A fuel cell consists of an electrolyte sandwiched between two electrodes. oxygen passes over one electrode & hydrogen over the other, & they react electrochemically to generate electricity, water and heat.

Fuel cell technologies which are being commercialized including phosphoric acid, polymer electrolyte membrane fuel cells, solid oxide & molten carbonate fuel cells.

Conventional or Non-Renewable energy sources :-

In early days wood was used as fuel in rural areas, coal, oil and natural gas are also non renewable energy sources.

1- **Coal :-**
The coal reserves are non-cooking coal, the rest being coking coal, coal reserves are unevenly distributed in the country, with the bulk of reserves located in the eastern states of Bihar, West Bengal & Orissa.

2- **Petroleum and Natural gas :-**
Exploration licensing policy has been demonstrated by recent findings of natural gas in deep waters.

3- **Nuclear power :-**
The nuclear power programme in India is based on natural uranium & indigenous thorium reserves.
Atomic power plant with a capacity of 2×200 & 2×540 MW based on Boiling Water reactor (BWR) technology with assistance from USA. This power station is currently under operation & supplies.

4- **Hydro power :-**
The total potential for hydro-power in India, based on river system, was assessed at ∞ MW at 60 per cent load factor, and economic potential of 84044 MW.

Water pollution

Introduction :-
Water is essential for the survival of any form of life. Water is polluted by sewage, industrial wastes and wide array of synthetic chemicals. The water that is fit for drinking purposes is called potable water.

Characteristics of potable water :-
1- It should be colourless, odourless & tasteless.
2- It should be free from turbidity & other suspended impurities.
3- It should be free from germs, bacteria & other pathogenic organisms.
4- It should not contain toxic dissolved impurities, such as heavy metals.
5- It should have a pH in the range 7-8-5.

6- It should be moderately soft, having hardness preferably in the range 50-100 ppm. Its hardness should not be above 150 ppm.

7- It should not be corrosive to the pipelines & should not cause any incrustations in the pipes.

Water pollutants & their sources:-
The various types of water pollutants are:-

(a) Oxygen-demanding.
→ These include domestic & animal sewage bio-degradable organic compounds and industrial wastes from food-processing plants, meat-packing plants, slaughter and pulp mills, tanneries etc. as well as agricultural runoff.
→ All these wastes undergo degradation and decomposition by bacterial activity in presence of dissolved oxygen (D.O).
This results in rapid depletion of DO from the water, which is harmful to aquatic organisms.

(b) Disease-causing Wastes:-
→ These include pathogenic micro-organisms which may enter the water along with sewage and other wastes and may cause tremendous damage to public health.
→ These microbes, comprising mainly of viruses and bacteria, can cause dangerous water-borne diseases such as cholera, typhoid, dysentry, polio.

(c) Synthetic organic Compounds:-
These are the man-made materials such as synthetic, pesticides, synthetic detergents (synadets) food additives, pharmaceuticals, insecticides, paints, synthetic fibres, elastomers, solvents plasticizers, plastics and other industrial chemicals. Most of these chemicals are potentially toxic to plants, animals & humans.

(d) Sewage & agricultural run-off:-
→ Sewage and run-off from agricultural lands supply plant nutrients, which may stimulate the growth of algae and other aquatic weeds in the receiving water body.

This unwieldy plant growth results in the degradation of the value of the water body.

(c) Oil:-

Oil pollution may take place because of oil spills from cargo oil tankers on the seas, losses during off-shore exploration and production of oil, accidental fires in ships and oil tankers, accidental or intentional oil slicks.

Oil pollution results in reduction of light transmission through surface waters, thereby reducing photosynthesis by marine plants.

2. Inorganic pollutants:-

Inorganic pollutants comprise of mineral acids, inorganic salts, finely divided metals or metal compounds, trace elements, cyanides, sulphates, nitrates, organometallic compounds and complexes of metals with organics present in natural waters.

Hg, Cd and Lead, metalloids such as As, Sb and Se are most toxic.

(3) Suspended solids & sediments:-

Sediments are mostly contributed by soil erosion by natural processes, agricultural development, strip mining and construction activities, suspended.

(4) Radioactive Materials:-

(a) Mining and processing of ores, e.g. Uranium tailings.

(b) Increasing use of radioactive isotopes in research, agricultural, industrial & medical (diagnostic as well as therapeutic) applications, e.g I^{131}, P^{32}, Co^{60}, Ca^{45}, S^{35}, C^{14}, Rb^{86}, In^{132} & Cs^{137}.

(c) Radioactive materials from nuclear power plants & nuclear reactors, e.g. Sr^{90}, Cs^{137}, Pu^{241}, Am^{241}.

Radioactive materials from nuclear power plants & nuclear reactors.

(d) Radio-active materials from testing and use of nuclear weaponry e.g. Sr^{90}, Cs^{137}.

(5) Heat:-

Considerable thermal pollution results from thermal power plants, particularly the nuclear-power based electricity generating plants. In such industries, where the water is used as a c.

coolant. The waste hot water is returned to the original water bodies. Hence the temperature of the water body increases.

Effects:-

1- Tannery effluents contain several constituents which are deleterious, irrespective of the fact that where they are discharged viz. into river, storm, sewer, land or sea.

2- The acidic or alkaline effluents are corrosive to concrete and metal pipes.

The suspended solids such as hair, flesh, $CaCO_3$ etc.

High amounts of fluoride (over 1000 ppm) present in phosphatic fertilizer effluent enrich

3- Volatile substances such as alcohols, aldehydes, ethers & gasoline may cause explosion in sewers.

4- Radioactive isotopes are toxic to life forms. For instance, Sr^{90}, which emanates from testing of nuclear weapons, accumulates in bones & teeth & cause serious disorders in human beings.

Control of water pollution:-

The control of water pollution is difficult, but we may try for its prevention and minimisations.

1- scientific techniques are necessary to be adopted for the environmental control of catchment areas of rivers, lakes, ponds, or streams.

2- Industrial plants should be based on recycling operation.

3- The possible reuse of recycle of treated sewage effluents and industrial wastes should be emphasized and encouraged.

4- Minimum, appropriate quantity and concentration of fertilizers, pesticide and insecticides should be used, because excess will cause pollution.

5- There should be propaganda for water pollution control, on radio, TV, Newspaper etc. because public awareness is a must-

Chapter

Soil pollution

Introduction:-

Soil is a very important constituents of the lithosphere. The study of soil science is called pedology or edaphology.

Source of soil pollution:-

1- Pollutants remain in direct contact with the soil for relatively longer periods and hence alter the chemical and biological properties of the soil. The hazardous chemical can also enter the human food chain from soil or water plants.

2- The major sources of metallic contamination of soils include mining, smelting, sludge, fertilizers, pesticides, composted town refuse etc. Metals such as Cd, Pb, Hg, Ni, Mo, Ni, Cu etc are toxic to plant and animal life.

3- Indiscriminate dumping of industrial wastes and municipal wastes leads to the leaching and/or seepage of toxic substances into the soil and pollution of ground water.

4- Fly ash generated from thermal power plants, industrial waste discharged into steam or dumped into the surrounding land, mining wastes non-biodegradable organic pollutants.

5- Commercial and domestic urban wastes consisting of dried sewage sludge as well as garbage & rubbish material such as plastics metal cans, glasses, street sweepings, waste paper, fibres, rubber etc contribute to soil pollution.

Effects of soil pollutants:-

Soil pollution" was originally defined as the contamination of the soil system by considerable quantities of chemical or other substances, resulting in the reduction of its fertility or productivity

(a) **Effects of modern agricultural practices:-**

Synthetic fertilizer:-

→ Synthetic fertilizers are employed to increase the soil fertility & crop productivity

→ These fertilizers concentrate the essential nutrients in layer of the soil.

(i) Wheat, maize, corn, etc. grown on soils fertilized with NPK fertilizers may result in considerable reduction in protein content of the crop.

(ii) Excessive use of nitrogenous fertilizers leads to the accumulation of nitrates in the soil which may contaminate the ground water.

(iii) vegetation growth in nitrate rich soils may exert toxic effects in cattle.

(iv) Excessive quantities of potassium fertilizers in soils may reduce the quantities of valuable ascorbic acid (vitamin C) and carotene in fruits and vegetables grown in such soils.

(v) the large-sized fruits and vegetables grown in highly fertilized soils may be more vulnerable to attacks by pests and insects.

pesticides:-

(i) Pesticides pose potential hazard to animals, humans and aquatic life.

(ii) they also cause deleterious effect on soil fertility and crop productivity

(iii) Pesticides applied to crops are retained in the soil in considerable quantities.

(iv) they enter into cyclic environmental process such as absorption by soil, leaching by water etc. and contaminate both lithosphere and biosphere.

(v) pesticides including herbicides, fungicides and rodenticides are persistant pollutants.

(vi) pesticides may enter the food chain and pose serious health hazards.

(vii) some of the pesticides residues are carcinogenic while their metabolic products too are toxic.

(b) Effects of Industrial effluents:-

(i) solid, liquid and gaseous chemicals from various industries as such paper & pulp, iron and steel, fertilizers, dyes, automobiles, pesticides, tanneries, coal-based thermal power plants etc.

(ii) contain a variety of pollutants such as toxic heavy metals, solvents, detergents, plastics, suspended particulates are refractory/non-biodegradable/recalcitrant chemicals

(iii) Indiscriminate dumping of untreated or inadequately treated domestic, mining and industrial wastes on land is an important source of soil pollution.

(c) Effects of urban wastes:-

(i) Millions tones of urban waste are produced every year from critically polluted cities.

(ii) the inadequately treated or untreated sewage sludge not only pose serious health hazards but also pollute soil and decrease its fertility and productivity.

(iii) used plastic, bags, garbage, sludge, dead animals, waste medicines, hospital wastes, skin, tyres, shoes, cans etc.

control of soil pollution :-

The discussed in earlier sections, the major sources of soil pollution are domestic wastes, industrial wastes and agricultural wastes including there toxic chemicals (e.g pesticides) arising from modern agricultural practices.

(i) Launching extensive afforestation & community forestry programmes.

(ii) Implementing ~~to~~ ten different measures against deforestation.

(iii) Imparting informal and formal public awareness programmes to educate people at large regarding the health hazards and undesirable effects due to environmental pollution.

(iv) Banning the use of highly toxic and resistant synthetic chemical pesticides or atleast regulating / restricting their use only for special purposes under through monitoring.

(v) Encouraging the use of bio-pesticides in place of toxic chemical pesticides.

chapter

Thermal pollution

Thermal pollution : It can be defined as :-

(i) The warming up of an aquatic system to the point where ~~dose~~ desirable ~~organ~~ organisms are adversely affected.

(ii) Addition of excess of undesirable heat to water that makes it harmful to man, animal, plant or aquatic life or other wise causes significant dangers to the normal activities of aquatic communities in water.

(iii) Heated effluents either from natural or man made sources, contaminated with water supplies, may be harmful to life because of their toxicity, reduction in Dissolved oxygen, aesthetically unsuitable and spread diseases.

(iv) It reduces the number of aquatic species and destroys the balance of life in streams as is evidenced by the biological indices of community and diversity.

(v) It is a by-product of rapid and unplanned industrial progress and over population.

Sources of thermal pollution:-

1- Nuclear power plants:-

(i) Nuclear experiments and explosions discharge a lot have unutilized heat and trapped radionuclides into nearby water streams.

(ii) Emissions from nuclear reactors and processing instruments are also responsible for increasing the temperature of water bodies.

2- Coal-fired power plants:-

Thermal power plant utilize coal as fuel and they constitute the major source of thermal pollutants.

3- Industrial effluents:-

Industries generating electricity, like Coal as fuel and nuclear powered thermal plants, require huge amounts of cooling water.

4- Hydro-electric power:-

The generation of hydroelectric power, sometimes, results in negative loading in water system. Apart from electric power industries, various factories with cooling contribute to thermal loading.

5- Domestic sewage:-

Domestic sewage is commonly discharged into rivers, lakes and canals with or without waste treatment the municipal sewage normally has a higher temperature than receiving water.

Effects of thermal pollution:-

The various effects of the thermal pollution are:-

1- Reduction in Dissolved oxygen:-

Concentration of dissolved oxygen decreases with increase in temperature of water. For example, the D.O. content is 14.6 ppm in water at a temperature of 32°F and 6.6 ppm at 64°F.

2- change in water properties:-

A rise in temperature changes the physical and chemical properties of water. The vapour pressure increases sharply, while the viscosity of water decreases.

3- Increase in Toxicity:-

The rising temperature increases the toxicity of the poison present in water.

4- Interference with biological activities:-

Temperature is considered to be of vital importance to physiology, metabolism and biochemical process in controlling respiratory rates, digestion, excretion and overall development of aquatic organisms.

5- Interference with reproduction:-
In fishes, several activities like nest building, spawning, hatching, migration and reproduction etc, depend on some optimum temperature.

6- Changes in Metabolic rate:-
Fishes show a marked rise in basal rate of metabolism with temperature to the lethal point. The respiratory rate, oxygen demand, food uptake and swimming speed in fishes increase.

7- Increased Vulnerability to disease:-
Activities of several pathogenic microorganisms are accelerated by higher temperature.

8- Undesirable changes in Algae population:-
The life in an ecosystem is greatly influenced by the algal growth.

9- Destruction of organisms in cold water:-
The volume of water required for cooling purposes from a stream is enormous.

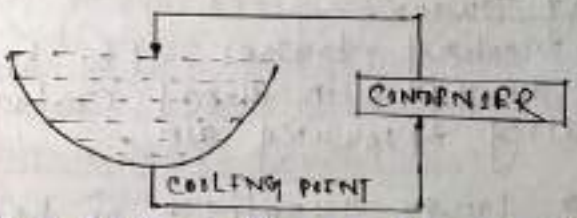
10- Biochemical oxygen Demand:-
When the temperature of stream carrying biodegradable organic matter rises,

11- Effect on Marine Life:-
Temperature plays an important role in affecting the physiology, metabolism growth and development of marine animals.

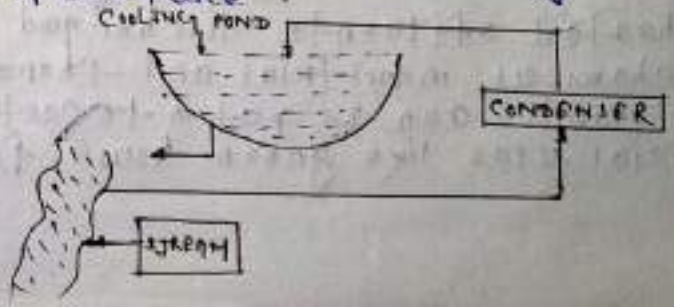
Control of thermal pollution:-
Heat must be removed from the condenser cooling waters prior to their disposal into water bodies. The major principles involved in the process of heat loss are:-

1- conduction
2- convection
3- Radiation
4- Evaporation

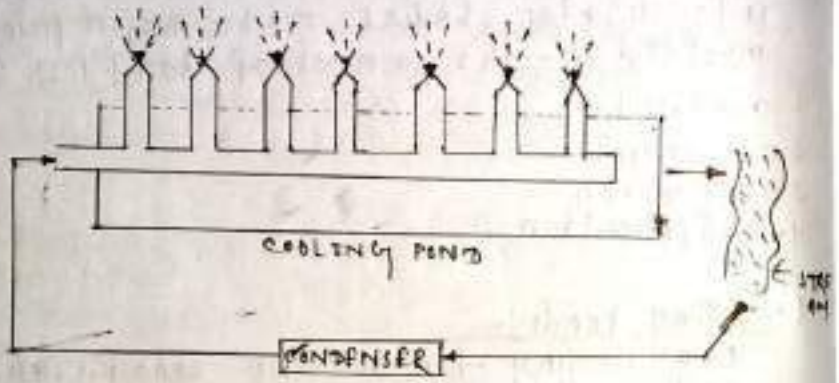
1- Cooling ponds:-
The cooling towers are beneficially used in dissipation of heat.



The water from the condensers is stored in the earth like ponds where natural evaporation brings down the temperature.



2- Spray ponds:-
In spray ponds, the water is sprayed in the cooling ponds with the help of spray nozzles to convert it in to fine droplets which provide more surface area to facilitate efficient heat transfer to atmosphere.



3- Cooling Towers:-
Wet cooling Towers:-
In wet cooling towers, the heated water is brought in direct contact with continuously flowing air.

4- To handle large quantity of heated effluents, large tanks or reservoirs should be constructed to retain the water for a little longer time.

5- The heated effluents discharged from the chemical industries and thermal power plants can be put in to certain beneficial uses like green house, frost protection during colds, aquaculture, heating the buildings etc.

Nuclear Hazards:-
(i) A number of atoms possess the ability to emit radiations and thereby cause radio-active pollution.
(ii) Radiations originate from instability of the nuclei of an atom which loses sub-nuclear particles and energy to acquire a stable state i.e. radioactivity.
A radio isotope is characterized by the following properties:-
(i) Half life period (ii) Mode of decays
(iii) Energy of radiations (iv) Definite energy state
These radiations destroy the organic molecules of which the body cells are composed. If ion pairs enter into a living protoplasm, they damage it and the damage is proportional to the number of ion-pairs absorbed.

(i) Emission of alpha (α) particles:-
Alpha particles are nothing but Helium nuclei. Emission of alpha particle will change into elements of lower atomic number. These are deflected by electric and magnetic fields.

(ii) Emission of Beta particles: (β)
Emission of Beta particle changes into another element with a higher atomic number. Beta particles are high velocity electrons. Strongly deflected in electric and magnetic fields.

(iii) Emission of Gamma ray (γ):-
These are high energy electromagnetic radiations. Can penetrate several cm. of lead sheet depending upon the energy. These are undeflected in magnetic fields.

Sources of Radioactive pollution:-
The two main sources of radioactive pollution are, natural and manmade.

(a) Natural sources:-
(i) The natural sources of radioactivity are considered mainly of the cosmic radiation received from the space, and the naturally occuring radioisotopes present in the environment and those contained within the body of the organisms.

(ii) All the elements above atomic number of 82 (Lead) are radioactive in nature and emit a variable quantity of radiations.

(b) Man-Made sources:-
Man causes radio-active pollution by testing of nuclear weapons, establishment of nuclear power plants, mining and refining of plutonium, and thorium, and preparation of radioactive isotope.

1- Nuclear Weapons:-
Testing of nuclear arms comprises.
(a) The use of Uranium 235 and plutonium 239 for fission.
(b) Hydrogen or lithium as fusion material.
Atomic explosions are uncontrolled chain reactions. They

01.09.19
Thursday

CHAPTER-1
Eco-SYSTEM

What is eco-system?-

→ Eco-system is a defind as a community of organism interacting is one another & the environments in which they live.

→ Ex:- A forest, an ocean, A pond etc.

Function and types of eco-system:-

→ Functioning of the eco-system is self regulating and self-sustaining.

→ Depending upon the species, diversity & the manner their organise.

Types of eco-system:-

permanent and Natural eco-system:-

These operate under natural condions without any interferance.

1- Terrestrial eco-system.
2- Aquatic eco-system.

Terrestrial eco-system:-

→ This type of eco-system depends on land.

→ Ex:- Forest, desert, grassland etc.

Aquatic eco-system:-
→ This type of eco-system depends on water.
→ It is divided into two types:-
1- Fresh water eco-system.
2- Marine water eco-system.

Fresh water eco-system:-
→ It is usually consists of fresh water bodies.
→ Ex:- River, Lake, pond.

Marine water eco-system:-
→ This eco-system is basically consists of salty water. It is also called as large eco-system.
→ Ex:- ocean, sea.

Temporary and Natural eco-system:-
→ These are shortly leaves but operate under natural condition.
→ Ex:- pond.

Artificial or Anthropogenic eco-system:-
→ These eco-systems are man made.
→ Ex:- Fish aquarium, Fishery tanks etc.

8-05-19

Structure of an eco-system

Eco-system:-
→ The structure of eco-system provides information about the range of climatic conditions that prevail in the area composition & organisation of biological communities & abiotic components.
→ It is discovered by Ep odum in 1963.

Biotic:-
→ These are basically consists of leaving organisms.
→ Ex:- Plants, Animals, Micro-organism.

Autotrophic components:-
These components are basically includes plants, it is also called as producers.

Heterotrophic components:-
→ These are basically consists of all the leaving bodies except plant.
→ It is also called as consumers.
→ Ex:- All animals, Human beings, Micro-organism etc.

Producers:-
→ All green plants are called as producers
→ They are also called as converter or transferse.
→ They are leaving members of eco-system that utilise sunlight as the primary source to produce different types of foods using photo-synthesis process.

Consumer:-
→ The consumers are derive the food directly or indirectly from the producer.
→ The food is then digested (broken into simple substances) which are metabolized in the consumers body.
→ There are three types:-

Primary consumer:-
→ They are also called as herbivores, they feed directly from producers.
→ Ex:- Cows, deers.

Secondary consumer:-
→ They are also called as carnivores, they eat on herbivores.
→ Ex:- Tiger, lion, bear

Tertiary consumers:-
→ In most of eco-systems some organism that eat other carnivores.
→ Ex:- Human, Dog, Bigfish etc.

Omino-vores:-
→ They are eat in both plants & animals.
→ Ex:- Human beings.

Decomposers:-
They are also called as bacteria & fungi, they creates their foods from dead bodies they are also called as micro-consumers.

Abiotic structures:-
The physical and chemical components of an eco-system consists of abiotic structures.

Inorganic :-

- The material like water, minerals and atmospheric gases are called as inorganic components.

Organic components :-

→ Amino-Acids, Carbohydrates, proteins are called as organic compounds.

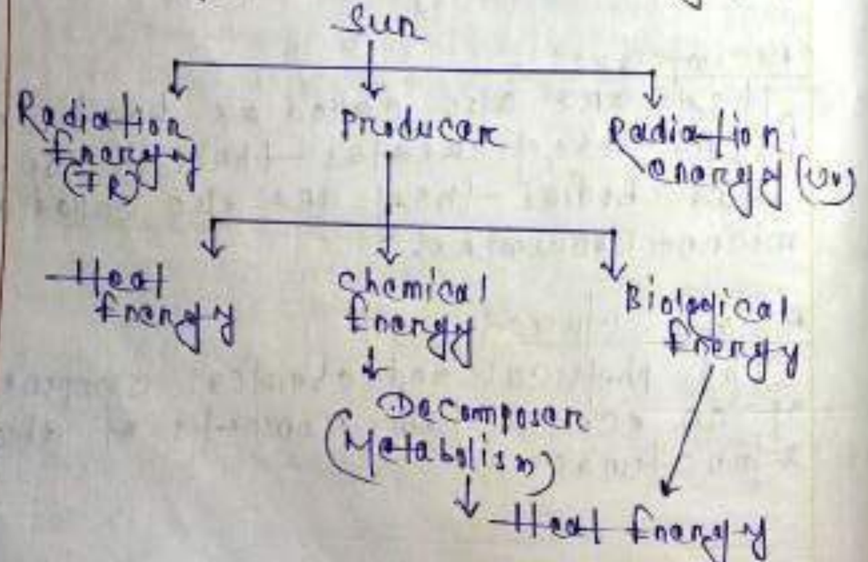
→ They are helpful to giving energy to the animals, human beings etc.

Climate :-

- Annual rainfall, wind latitudes, temperature changes are called as climate components.

Dt: 09.08.19

Energy Flow in the Eco-system



→ Energy is needed for every biological activity, solar energy with transfers into chemical energy by a process of photo-synthesis.

→ The energy stored in plant tissue & then transfer into chemical & heat form during metabolic activities.

→ In the biological process the energy flows from sun to plants and then to all heterotropic organism.

Law of thermodynamic :-

1st Law of thermodynamic :-

Energy neither can be created nor be destroyed, it can be transferred from one form to another form.

Second Law of thermodynamic :-

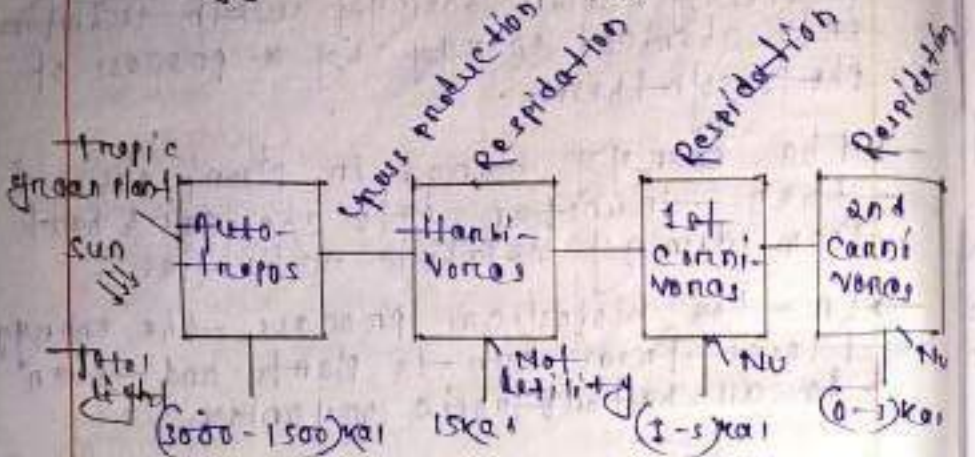
The energy transformation involves degradation or desipation of energy from a concentrated to a displace form.

Energy Flow Models :-

- This model is uni-directional flow of energy from sun to producer & then various types of consumers, this type of models is called as energy flow model in eco-system.

$$6CO_2 + 6H_2O \xrightarrow{\text{At the presence of sun light}} C_6H_{12}O_6 + O_2 \uparrow$$

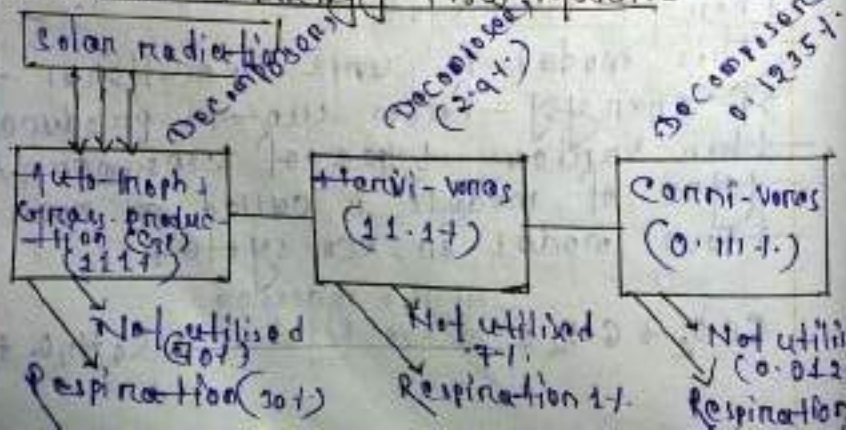
Eco-logy odum's energy Model:-



→ Fr odum 1965 explained the flow of energy involving 3 tropic levels with the help of a energy flow model.

→ The flow of energy takeplace. Their is gradual loss of energy at every level their by resulting in loss energy available and next tropic level.

Lindeman's energy Flow Modal:- 21.16.28.19



→ There is a uni-directional flow of energy i.e. the system would collapse if the primary source i.e. sun were cut-off.

→ Progressive decrease in energy of each tropic level.

→ There is also a corresponding decrease a biomass.

Ecological succession:-

→ The change can be understood on several level.

→ changes takeplace continuously in the community structure, organisation, physiognomi; the associated animals and the environment at a placed in the course of time is called as ecological succession.

→ A complete succession.

Primary succession:-

→ It is the process of species colonization and replacement in which the environment is initially virtually free of life, i.e. the process starts with base rock or sand dune or river delta or glacial debris and it ends when climax is reached.

→ The sere involved in primary succession is called PRISERE. primary succession occurs when a community begins to develop on a site previously unoccupied by living organism.

Secondary succession:-

→ The term secondary succession refers to community development on locations of sites previously occupied by well developed communities. It occurs

→ It occurs where a community has been disrupted and the surface is completely or largely devoid of vegetation.

→ It may be due to earthquake, fire or even clearing of forests by man.

→ In each case organism modify the environment in a way that allow one species to replace another. The sere involven in secondary succession is called SUBSERE.

1- Hydrach or hydrosere
2- Mesarch or Mesosere
3- xerach or xerosere
a- Lithosere
b- Psammosere
c- Halosere

Hydrach or hydrosere:-
The succession when starts in the aquatic environment such as ponds, lake, streams, swamps, etc.

Mesarch or Mesosere:-
The succession which started growth in moisture.

Xerach or xerosere:-
The succession is started its growth in dry bodies, rocks, deserts etc.
It is divided into 3 types:-

Lithosere:-
The succession growth in initiating the rocks bodies.

Psammosere:-
The succession growth in initiating with climate change of environment

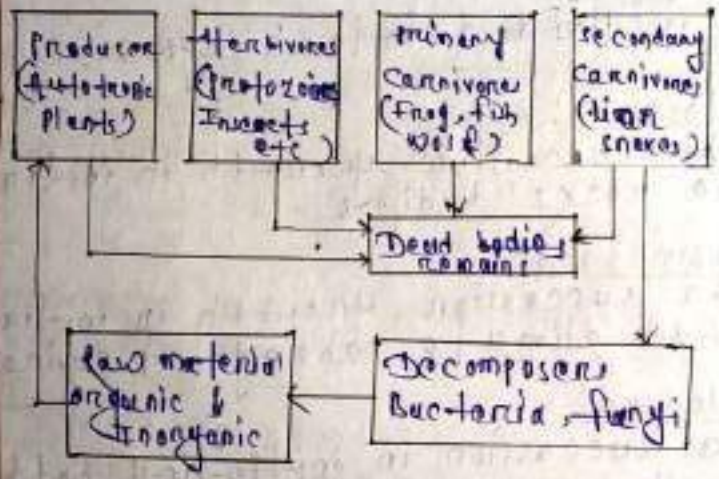
Halosere:-
The succession in initiating both climate change and soil bodies.
(N-sy)

Autotrophic succession:-
It is characterised by early and continued dominance of autotrophic organisms like green plants. It begins in a predominantly inorganic environment and the energy flow is maintained indefinitely.

(Nov)
Heterotrophic succession:-
It is characterised by early dominance of hetero-trops such as bacteria, actinomycetes, fungi and animals. It begins in a organic environment and there is a progressive decline in energy content.

22.12.19

Food chain:-



Definition:-
The sequence of eaten & to eat being eaten with the resultant transfer of energy of one tropical level to another tropical level is called food chain.

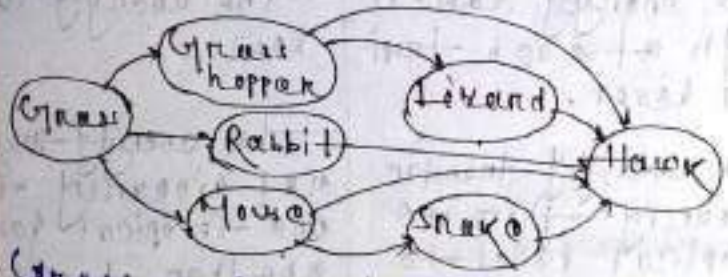
Grazing	Detritus
→ This type of food chain starts from green plants & ends to carnivores through herbivores.	→ It's food chain starts from organic materials & ends large carnivores.
→ The energy table is high at each tropical level.	→ The energy table is low.
→ The energy transfer linearly from one tropical level to another tropical level.	→ The energy transfer not linearly from one tropical level to another tropical level.
→ It obeys 10% rule of energy losses.	→ It is does'nt obeys.
→ Ex:- Autotrophs → Herbivores → primary carnivores → secondary carnivores → son.	→ Detritus → Detritivores → Detritivores Consumers → small carnivores → large carnivores.

Other examples of food chains are:-
1- Grass → Rabbit → Fox → Wolf → Lion
(Grass land ecosystem)
2- Phytoplankton → Water flea → small fish → Tuna
(Pond ecosystem)
3- Lichens → Reindeer → Man
(Arctic-tundra)

24.05.19

Food Web :-

A network of food chains where different type of organisms are connected a different tropical level is , so that here are a number of options of eating and being eaten of each tropical level.



1- Grass → Grasshopper → predatory bird (Hawk)
2- Grass → Grasshopper → Lizzard → Hawk.
3- Grass → Rabbit → Hawk (or Vulture or man)
4- Grass → Mouse/Rat → Hawk
5- Grass → Mouse/Rat → Snake → Hawk.

Ecological pyramids :-

This relationship (primary producer to consumers and primary carnivores to top carnivores, each represented in diagrammatically is called as ecological pyramids.

There are 3 types of pyramids are-
1- Pyramid of number.
2- Pyramid of biomass
3- Pyramid of energy

(1) Pyramid of Numbers :-

→ This deals with the relationship between the number of producers, herbivores and carnivores at successive trophic levels.

→ At the base of such figure (pyramid) is always the number of primary producers and subsequent structures on this base are represented by the number of consumers at successive levels.

→ In figure 3.8 a grassland ecosystem, the producers which are mainly grasses are always many in number.

→ The number then shows a decrease towards apex, as the primary consumers of herbivores like rabbits are less in number than the grasses. The secondary consumers are lesser in number than primary consumers.

(Pyramid of number)

Pyramid of Biomass:-

→ Pyramid of biomass are comparatively more fundamental, as they instead of geometric factor, show the quantitative relationships.

→ In order to explain the inverted nature of a pyramid of numbers, the idea of pyramid of biomass is given where the weight of primary Producers forms the base.

→ The biomass of one tree is very high. The biomass of a number of birds feeding upon the tree is far less than that of the tree.

→ Similarly, the biomass of even a very large number of parasite in and on the body of the birds is far less.

Pond ecosystem

(Pyramid of Biomass)

Pyramid of Energy:-

→ Of the three types of ecological pyramids, the energy pyramid give the best picture of overall nature of the ecosystem.

→ As against the pyramids of a number and biomass the shape of pyramid of energy is always upright, because in this the time factor is always taken in to account.

→ The pyramid of energy represent the total quantity of energy utilized by different trophic level organisms of an ecosystem per unit area over a set period of time.

(Pyramid of Energy)

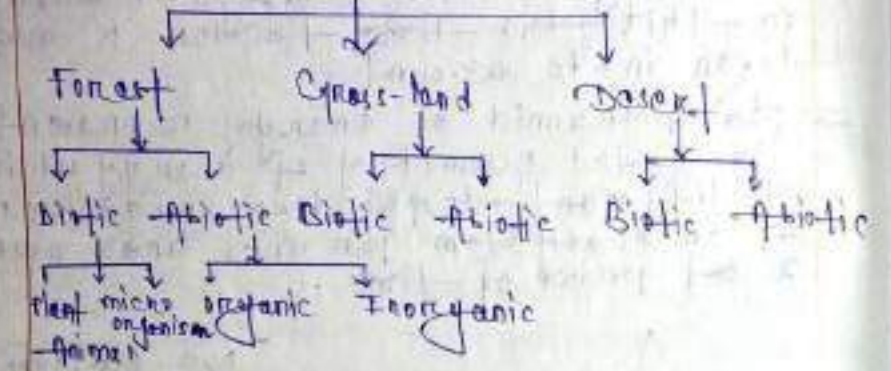
It is invented charles Elton 1927 for each name it is called as Eltonian pyramid.

Dt. 29.08.14

Major eco-system:-

(a) Terrestrial eco-system
(b) Fresh water eco-system
(c) Marine eco-system

Terrestrial ecosystem:



Forest ecosystem:-

→ Roughly 40% of the land is occupied by forest. But in India it is one-tenth. In India, tropical rain forests are found in Western Ghats, Andamans and North-East Himalayas.

→ So these have maximum bio-diversity. The different components of a forest ecosystem.

Abiotic component:-

These are the inorganic & organic substances present in the soil & atmosphere. In addition to the minerals present in the forests, we find the dead organic debris. The light conditions are different due to complex stratification in the plant communities.

Biotic component:-

The living organisms present in the food chain occur in the following order.

1. **Producers:-**

→ These are mainly trees that show much species diversity and greater degree of stratification specially in tropical moist deciduous forest.

→ Deciduous forest is greatly modified by man and much of it is replaced by cultivated and forest edge communities.

→ Thus trees are of different kids depending upon the kind of forest.

2. **Consumers** - These are as follows -

(a) **Primary consumers:-**
These are the herbivores that include the animals feeding on tree leaves as ants, flies, beetles, leafhoppers birds, spiders etc.

(b) **Secondary consumers:-**
These are the carnivores like snakes, birds, lizards, fox etc, feeding on herbivores.

(c) **Tertiary consumers:-**
These are the top carnivores like lion, tiger etc, that eat carnivores of secondary consumers level.

3. Decomposers :-
These are wide variety of micro-organisms like actinomycetes (streptomyces), bacteria (Bacillus, clostridium, pseudomonas etc), fungi (species of Aspergillus, coprinus, polyporus, fusarium, trichoderma etc) rate of decomposition in tropical and subtropical forests is more rapid than that in the temperate ones.

Grassland ecosystem :-
This type of terrestrial ecosystem occupy roughly 19% of the earth surface
Rainfall is average but erratic.
There are three types of grasslands depending upon climatic regions.

(i) Tropical grassland :-
Tropical biomes (grasslands with scattered trees or clumps of trees) are found in warm regions with 40-60 inches of rainfall but with a prolonged dry season when fires are an important part of the environment.
In africa these are known as savannas.

(ii) Temperate grassland :-
In US and Canada, these grasslands are known as prairies, in south America as pampas, in Africa as veids and in central Europe and Asia as steppes.

These occur where rainfall is too low (between 10-30 inches).

(iii) Arctic tundra :-
There are two tundra biomes covering large areas of arctic, one in the palearctic and other in the Nearctic region.
In both continents the boundary between tundra and forest lies further north in the west where climate is moderated by warm westerly winds.
The various components of the grassland are :-

Abiotic Components :-
The elements like C, H, O, N, P, S, etc are supplied by CO_2, water, nitrates, phosphates, sulphates etc - present in soil & atmosphere. In addition, some other elements are also present in traces.

(i) primary consumers :-
The herbivores feeding on grasses are grazing animals as cows, buffaloes, deer, sheep, rabbit, mouse etc.

(ii) secondary consumers :-
The animals like fox, jackals, snakes, lizards, birds etc.
Carnivores feed on herbivores.

Decomposers :-

→ The microbes active in the decay of dead organic matter are different species of fungi, some bacteria and actinomycetes.

→ They bring about the minerals back to the soil, thus making them available to the producers.

Desert eco-system :-

Desert generally occur in regions having less than 10 inches of rainfall. Scarcity of rainfall may be due to -

(1) High subtropical pressure as in the Sahara and Australian desert.
(2) Geographical position in rain shadow.
(3) High altitude.

→ About 1/3rd on our world's land area is covered by deserts. There are three life forms of plants that are adapted to deserts :

(i) the annuals, which avoid drought by growing only when there is adequate moisture.
(ii) The succulents, such as cacti, which store water.
(iii) the desert shrubs.

Based on the climatic conditions, deserts may be classified as :-

(a) Sahara, Namib in Africa, Thar, Rajasthan (India) are called tropical desert, which are driest.
(b) Mojave in southern california is called temperature desert where days are very hot and cool in winters.
(c) Gobi desert in china is called cold desert where cold winters and warm summers.

→ The biotic components are :

1 Producers :-

→ As we have seen, these are shrubs bushes, some grasses and few trees. Sometimes, cacti are also present.

→ Some lower plants like lichens and xerophytic mosses may also be present.

2 Consumers :-

→ The most common animals are reptiles & insects. In addition to them, some nocturnal rodents and birds are also found.

→ Camels "the ship of desert" feed on tender shoots of the plants.

3 Decomposers :-

Due to poor vegetation, there are very few. They are some fungi and bacteria.

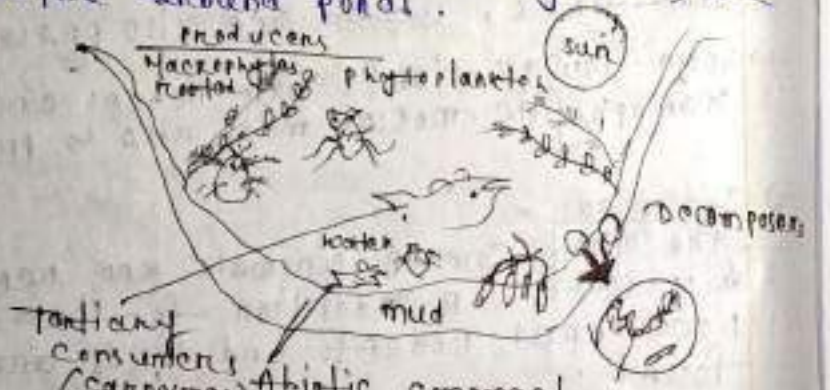
Aquatic ecosystem: -

More than 70% of the land is covered by water. The important ecosystems are: -

Pond ecosystem: -

→ Pond are small bodies of water in which the littoral zone is relatively large and the limnetic & profundal regions are small or absent.

→ Ponds play an important role in the villages where most of the activities like washing clothes, bathing, swimming, cattle bathing etc, are carried around ponds.



These components are as

Abiotic Components: -

→ Apart from heat, light the basic inorganic and organic compounds, elements are water, CO_2, oxygen, calcium, nitrogen, phosphorus, amino-acids etc.

→ Light intensity and turbidity index of water at different depths can also be measured by lux-photometer and secchi disc respectively.

Biotic components: -

They are as follows: -

1 producers: -

→ These are autotrophic, green plants and bacteria. They fix radiant energy and with the help of minerals from water & mud form complex organic substances like carbohydrates, proteins and lipids.

→ producers are of the following types.

(a) **Macrophytes: -**

These are mainly rooted large plants which include partly or completely submerged floating and emergent hydrophytes.

(b) **Phytoplankton: -**

→ These are minute, floating on suspended lower plants like Ulothrix, Spirogyra, Oedogonium, Cosmarium, Pandorina, Volvox, Chlamydomonas etc & some flagellates.

→ Energy content is generally expressed in terms of cal/gm dry wt.

2 Consumers:-
Most of the consumers are herbivores except insects and some large fish. But generally are heterotrophs. In pond consumers are distinguished as -

(i) Primary consumers:-
These are herbivores, also known as "primary macro consumers" feeding directly on living plants. they may be large or in small size.
- they are further differentiated as -

(a) Benthos:-
These are the animals associated with living plants labelled as 'a' in fig and these bottom forms which feed upon the plants remains at the bottom labelled as 'b' in fig.

(b) Zooplanktons:-
These are chiefly the rotifers, (Brachionus, Lecane etc), protozoans (Euglena, colops etc) and crustaceans (cyclops, stenocypris etc) they feed on phytoplanktons labelled as 'c' in fig.

(ii) Secondary consumers:-
These are carnivores like insects and fish which feed on primary consumers (herbivores) like zooplanktons labelled as 'd' in fig.

(iii) Tertiary consumers:-
These are carnivores like insects and fish which feed on primary consumers (herbivores) like zooplanktons.
- these are some large fish feed on smaller fish as shown in fig. In pond fish may occupy more than one trophic levels as shown in figure.

3 Decomposers:-
→ these are microconsumers, which absorb only a fraction of the decomposed matter.
→ they decompose organic matter of both Producers as well as microconsumers in simple forms.
→ The bacteria, actinomycetes and fungi (species - Aspergillus, cladosporium, Pythium, penicillium, circinella etc.) are most common decomposers in water and mud of the pond.

Marine (ocean) Ecosystem:-
→ The marine environment of sea and oceans is large occupying 70% of the earth surface.
→ the volume of the surface area of marine environment lighted by sun is small in comparison to the total volume of water involved.
→ They have some major life zones i.e. Coastal, Euphotic, Bathyal and Abyssal zones.

The biotic components of an ocean are as follows:-

(1) Producers:-
These are autotrophs, which are mainly the phytoplanktons. They trape radiant energy from sun through their pigments.
A number of macroscopic seaweeds (brown and red algae) are also come in this category.
They are in distinct zones at different depths of water.

2. Consumers:-
These are heterotrophic macroconsumers being dependent for their nutrition on the primary producers. They are:-

(i) The herbivores like crustacians, molluscs, fishes etc. which do feed directly on producers are called primary consumers.

(ii) The carnivores fishes like shad, herring etc. feeding on herbivores are called secondary consumers.

(iii) The top carnivores fishes like cod, haddock, halibut etc. that feed on secondary consumers are called tertiary consumers.

3. Decomposers:-
The microbes active in the decay of dead organic matter are chiefly bacteria and some fungi.

Estuaries (Estuarine ecology):
Estuarine is derived from the word aestus means tide, Pritchard in 1967 defined as a semi-enclosed coastal body of water, which has a free connection with the open sea.
It is thus strongly affected by tidal action and within it sea water is mixed with fresh water from land drainage.
To illustrate estuarias, the different classifications will be represented based on:-
(1) Geomorphology
(2) Water circulation and stratification.
(3) Estuarine energetics.
According to Pritchard 1967, four subdivisions of estuaries are from geomorphological point of view.
(i) Drowned river valleys.
(ii) Fjord type estuaries
(iii) Bar-built estuaries
(iv) Estuaries formed by tectonic processes

River-delta estuaries found at the mouths of large rivers such as Mississippi or the Nile. It is different from formers. on hydrographic basis estuaries can be placed in three broad categories.

(a) Highly stratified or salt wedge estuary
(b) the partially mixed or moderately stratified estuary.
(c) the completely mixed or vertically homogeneous estuary
- the hypersaline estuary is special type.

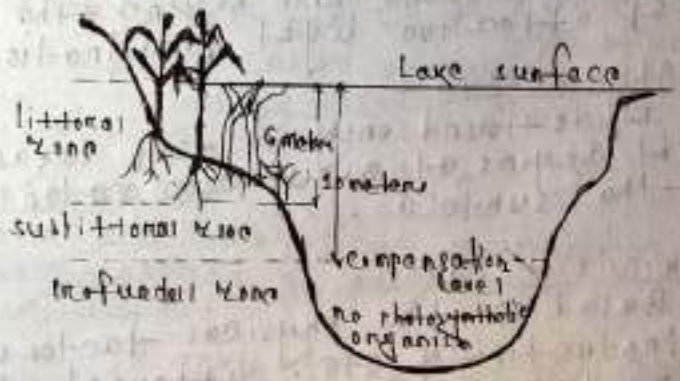
Physico chemical aspects of estuaries:-
→ Current and salinity both are important here. Estuarine currents result from the interaction of one direction stream flow which varies with the session and rainfall with oscillation ocean tides and with wind.
→ the salinity varies vertically and horizontally and fluctuates strikingly between 0.5 to 0.35%.

Biotic communities of Estuaries:-
→ Carriker in 1967 has classified the regions of estuaries in to upper, middle and lower reaches with increasing ranges of salinities and the mouth with salinity nearly equal to the sea.

→ In Hoogly-Matla estuaries, Gopalkrishna 1971 has reported an abundance of phytoplanktonic forms, several species of diatoms synedra, Navicula etc.

Lake ecosystem:-
Lakes are inland depressions containing standing water, they vary in size and depth (few feet of 5000 feet). some lakes have outlet streams. In lake there are three to five well recognized horizontal strata namely.

(i) Littoral zone:-
shallow water near the shore forms this zone.



Different zone of a deep freshwater lake.

→ It contains upper warm and oxygen rich circulating water layer, which is called epilimnion.
→ It include rooted vegetation

(ii) Sublittoral zone :-
It extends from rooted vegetation to the non circulating cold water with poor oxygen zone i.e, hypolimnion.

(iii) Limnetic zone :-
It is the open water zone away from the shore. It is up-to-the depth of effective light penetration where rate of photosynthesis is equal to the rate of respiration.

(iv) Profundal zone :-
It is the deep water area beneath limnetic zone and beyond the depth of effective light penetration.

(v) Abyssal zone :-
It is found only in deep lakes since it begins at about 3000 meter from the surface.

Kinds of Lakes :-
→ Based on the physical factors, productivity etc different classifications of lakes are given.
→ Based on temperature, Hutchinson (1957) classified into dimictic, monomictic and polymictic.
→ Based on humic acid contents, the lakes are classified into clean water lakes and Brown water lakes.

physico-chemical properties of lakes :-
Lake have the tendency to become thermally stratified during summer and winter undergo definite seasonal periodicity in depth. Light too penetrates only to a certain depth, depending on turbidity.

Biotic communities of lakes :-
→ organism depending on substratum are called pedonic forms and that are free from it called limnetic forms.
→ The lakes have several type of organisms.

(i) Nekton :-
These including floating plants such as duckweeds and many type of animals. Animals are called epinekton while others including insects called hyponekton.

(ii) Plankton :-
These are small plants and animals whose powers of self locomotion is very limited.
certain zooplanktons are very active some planktons are called as nektoplanktons.

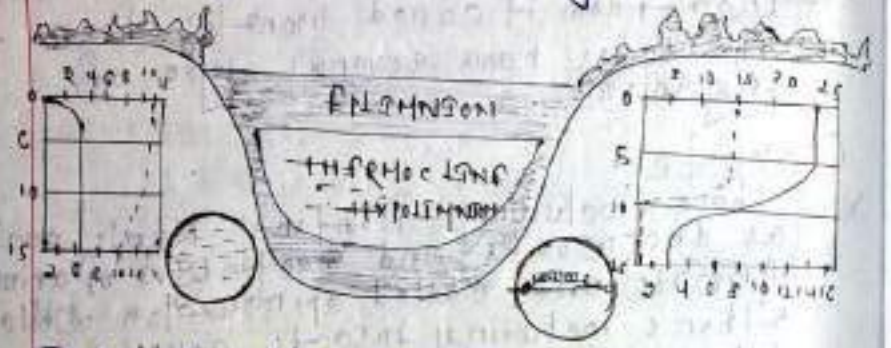
(iii) Nekton :-
These animals are swimmers.

(iii) Bethos :-

There includes the organisms living at the bottom of the water mass. The living above the sediment water interface are termed benthic epifauna and those living in sediments itself are termed as infauna.

Stratification in lakes :-

The typical sessional cycle illustrated



During the summer the top water become warmer than the bottom waters, as a result only the warm top layer circulates and it does not mix with the more viscous colder water called thermocline.

Sub tropical lakes having surface temperatures that never fall below 4°C.

(a) Dimictic - (Mictic = mixed) - two sessional Period of free circulation.
(b) Cold monomictic - water never above 4°C (Polar regions), seasonal overturn in summer
(c) Warm monomictic - water.
(d) Polymictic
(e) oligomictic
(f) Miromictic

In terms of water circulation pattern most of the lakes of the world can be conveniently assigned to one of the following categories (Hutchinson 1957).

(a) Dimictic - (Mictic = mixed) two sessional periods of free circulation.

(b) cold monomictic - water never above 4°C (Polar regions), seasonal overturn in summer.

(c) Warm monomictic - water never below 4°C. one period of circulation in winter.

(d) polymictic - More or less continuously circulating with only short, if any, stagnation period.

(e) oligomictic - Rarely mixed.

(f) Meromictic - permanently stratified.

Streams :-

→ Biotic community in streams is quite different from that of ponds. Most streams in the vicinity of urban area are polluted.

→ streams are fresh water aquatic system where water current is a measure controlling factor, oxygen and nutrients are in water.

→ Differences between streams and ponds revolve around a triad of conditions.

(i) current :-

→ It is a major controlling and limiting factor in stream. velocity of the current varies greatly in different parts of the same stream and from one time to another.

→ In large streams the current may be so reduced that virtually standing water conditions result.

→ current is the most important primary factor which :

(1) makes for a big difference between stream and pond life and

(2) governs differences in various parts of a given stream.

→ The velocity of the current is determined by steepness of the surface gradient, the roughness of depth and width of the stream bed.

(ii) Land-water Interchange :-

→ The land water surface junction is relatively great in proportion to the size of the stream habitat.

→ This means that streams are more intimately associated with the surrounding land, than are most standing bodies of the water.

(iii) oxygen :-

→ stream organisms face more extreme conditions in regard to current and temperature.

→ Because of the small depth large surface exposed to the air and constant motion, streams generally contain an abundant supply of the oxygen even when there is no green plants.

→ For this reason stream animals generally have a narrow tolerance and are specially sensitive to reduced oxygen.

Zonation in streams :-

→ In streams zonation is longitudinal. In streams we find zones increasing by older stages from source to mouth.

→ changes are more pronounced in the upper part, because of gradient, volumes of flow and chemical composition changes rapidly.

stream communities :-

streams generally exhibit two major habitats i.e. rapid & pools. some within these categories the type of the bottom whether sand, pebbels, clay, bedrock or rubble rock is very important in determining the nature of the community and population density.

CHAPTER - 2
Biodiversity & its conservation

Genetic, species and ecosystem Diversity:
Biodiversity is usually analysed at three levels i.e. species, genetic and ecosystem, each of which has its own significance.

1. Diversity of biotic communities and ecosystem:-
Biodiversity is usually analysed at three levels i.e. species, genetic and ecosystem, each of which has its own significance.

→ Depending largely upon the availability of abiotic resources and conditions of the environment an ecosystem develops its own characteristic community of living organisms.

→ A small pond, for example, constitutes an ecosystem and possesses a set of flora and fauna different from a river which is another type of ecosystem.

→ Different types of forests, grass-lands, lakes, ponds, rivers, wet-lands etc. represent diverse ecosystems each with a characteristic biotic community.

2. Diversity of species composition within a community:-
The biotic component in an ecosystem may be composed of a few species only or a large number of species of plants, animals and microbes, which react and interact with each other and with the abiotic factors of the environment. The richness of species in an ecosystem is usually referred to as species diversity.

3. Diversity of genetic organization within a species:-
Within a species there are often found a number of varieties or races or strains which slightly differ from each other in one, two or a number of characters such as shape, size, quality of their product, resistance to insects, pests and diseases, ability to withstand adverse conditions of environment etc.

→ These differences are due to slight variations in their genetic organization. This diversity in the genetic make up of a species is referred to as genetic diversity.

Biogeographical classification of India:-

India is one of the 12 mega biodiversity countries in the world. The country is divided into 10 biogeographic regions.

The wide variety in physical features and climatic conditions have resulted in a diversity of ecological habitats like forests, grasslands, wetlands, costal and marine ecosystems and deserts which harbour and sustain immense biodiversity.

Biogeographically India is situated at the trijunction of three realms namely afro-tropical, Indo-Malayan and paleo-arctic realms & therefore has characteristic elements from each of them. This assemblage of three distinct realms makes the country rich & unique in biological diversity. With only 2.4% of the land area, India accounts for 7-8% of the recorded species of the world.

★ The following 10 biogeographical regions have been identified in India:

(1) Himalaya
(2) The Desert
(3) Deccan peninsula
(4) Malabar
(5) Andaman Islands
(6) Nicobar Islands
(7) Gangetic planes
(8) Laccadive Islands
(9) Maldive/chagos Island
(10) Western Ghats
(11) Burman/bangalian forest
(12) Marine coast
(13) Coromondal Mahanandian

Floristic (Botanical) regions of India:-

The country has been divided into the following nine floristic regions with respect to floral diversity.

(a) Sub-montane zone:-
It is constituted of tropical and sub tropical parts and extends up to 1500 meters altitude. It comprises mostly of siwalik ranges.
Snowfall does not occur. The plants like shorea robustica, Dalbergia sissoo, cedrela toona, Eugenia jambolana, Acacia catechu.

(b) Western Himalaya:-
The it extends from Kumaon to Kashmir and has annual rainfall up to 20 cm. corresponds to three climatic belts, there are three zones of vegetation.

(i) Temperate zone:-
Above sub-montane zone extend temperate zone forests up to 3500 meter altitude. They are dominated by plant species like Acer, Ulmus, Rhododendron, Betula, salix, populus, cornus, Quercus, pinus, taxus, picea etc.

(c) Alpine zone :-
It extends from 3500 - 4500 meters altitudes and is characterized with alpine forest vegetation. Most common tree species are Betula, Juniperus, Rhododendrons etc.

(ii) Eastern Himalayas :-
It includes regions of Sikkim and NEFA & is characterised by more rainfall, less snow and higher temperature. This is also divided into the following three zones altitudinally.

(a) Tropical zone :-
upto 1500 meters altitudes, this zone has tropical semi-evergreen or moist deciduous forests. These forests comprise the plants like Shorea robusta, Acacia catechu, Dalbergia sissoo.

(b) Temperate zone :-
This zone extends between 1500 meters to 3800 meters altitudes and has typical montane temperate forest which are dominated by oaks like Michelia, Quercus, Pyrus, Symplocos, Eugenia etc.

(c) Alpine zone :-
Beyond the temperate zone, extends alpine zone upto 5000 meters altitudes. It has alpine vegetation including Juniperus and Rhododendron.

(iii) Indus plains :-
This zone includes the arid and semiarid regions of Punjab, Rajasthan, Kutch, part of Gujarat & Delhi, the rainfall is less than 70cm. The vegetation is tropical thorn forest in semi-arid region and is typical desert in the arid region.
The common plant species of this zone are Acacia nelotia, prosopis sp, Salvadora, Tecomella, Capparis, Tamarix Zizyphus.

(iv) Gangetic plains :-
This region extends over Uttar Pradesh, Bihar, Bengal and part of Orissa and is characterised by moderate amount of rainfall and most fertile i.e. alluvial soils.
Vegetation of this zone is chiefly of tropical moist and deciduous and dry deciduous forest type.
The common plants of this zone are Dalbergia sissoo, Acacia nelotica, Saccharum munja, Butea monosperma

(v) Central India :-
It comprises Madhya Pradesh, parts of Orissa and Gujarat. The rainfall is 150 - 200 cm and its vegetation is thorny, mixed deciduous and teak type. The chief plants of this region are Tectona grandis, Madhuca, Diospyros, Butea.

(vi) Malabar (West coast):
This region include Western coast of India from Gujarat to cape comorin and has heavy rainfall. The forests are tropical evergreen in extreme west, semievergreen towards interior sub-tropical or montane temperate evergreen forests in Nilgiris and mangroves near Bombay and Kerala coast

(vii) Deccan plateau:-
This region extends all over peninsular India (i.e Andhra pradesh, Tamil Nadu & Karnataka) and has rainfall upto 100cm. Its central hilly plateau has tropical dry deciduous forests of Boswellia serrata.

(viii) Assam:-
This region is characterised by heavy rainfall (200 to 1000). The vegetation is either dense evergreen forest or sub-tropical. The evergreen forests include trees like Dipterocarpus macrocarpu, Mesua ferrea, shorea robusta, Ficus elastica etc.

(ix) Andamans:-
This region possesses a varied type of vegetation: mangroves and beach forest at its coasts and evergreen forests of tall trees in the interior, Important plant species of this island are Rhizorbora, Minusops, Calophyllum, Lagerstroemia, etc.

Chapter - 3

Social Issues and the Environment

There are two aspects of sustainable development:-

(i) Inter-generational equity -
This emphasizes that should stop over-exploitation of resources, reduce waste discharge and emissions and maintaining an ecological balance. It expects to hand over a safe healty and resourceful environment to the future generations.

(ii) Intra-generational equity -
This emphasizes that technological development should support economic growth of the poor countries so as to reduce the wealth gap within and between the nations.

Measures for sustainable development-
There are following major measures for sustainable development:-

1- To promote environment education and awareness - From childhood, we should develop a feeling of belongingness to earth. This can be possible by introducing environment as a subject in education from primary stage.

2- Three 'R' approach - Three 'R' means, Reduce, Reuse and Recycle. We should reduce the excessive use of natural resources, but use them again and again instead of pacing it on to the waste steam. Recycle the materials to reduce pressure on our existing natural resources.

3- Appropriate technology - The technology should use less resources and produce minimum waste. It is over which locally adaptable, eco friendly, resource efficient and culturally suitable.

4- To utilize resources as per carrying capacity of the environment - sustainability of a system depends largely upon the carrying capacity of the system. If carrying capacity of a system crossed, environmental degradation status continues till it reaches a point of no return. carrying capacity has two basic components.

(i) supporting capacity - It is formed of productive and protective system.

(ii) Assimilative capacity - It is formed of the systems which utilize the wastes produced by human activities.

Urban problem Related to energy :-

Urban areas are developing very fast. In most of cities there is influx of populations from surrounding areas, mostly in search of employment and better living conditions. Therefore, it is difficult to accommodate all the industrial, commercial and residential facilities within limit.

1. Increasing use of energy for domestic and commercial purposes due to increased population and industrialization
2. Industrial plants using big proportion of energy.
3. Non renewable resources of energy like coal, petroleum and natural gas are decreasing
4. Increasing of transport means.
5. Decreasing production of hydro electricity due to insufficient rains.
6. transmission loss due to defected power distribution system.

There are following steps to solve the energy related problems.

1- To control urbanization.

2- To develop renewable resources of energy like solar radiation, wind power, hydel power, nuclear power, bio mass etc. These are pollution free also.

3- Non renewable energy resources should be used only when no non-conventional source of energy is available.

4- Welcoming the awareness programs to save energy.

5- Effective measures for transition loss and energy theft.

Water conservation:-

Water is needed in almost every sphere of human activity. Without water life is not possible. In many aspects the properties of water are unique. It is called universal solvent. No other liquid can replace it. The global distribution of fresh water on earth's crust including ground water and water present as vapours in atmosphere.

Water is required for direct consumption or indirectly for washing, cleaning, cooling transportation or even for waste disposal. Important sectors of human activity, which require water can be ground as:-

1- Irrigation
2. Industries
3. Thermal power generation
4. Live stock management
5. Domestic requirements
6. Hydroelectric generation, fisheries navigation and recreational activities.

1. Water economy, reuse and recycling. If water meters are installed and charged properly, the consumption of water in domestic establishments, livestock management and industries shall drastically decline.

2. Agricultural runoffs from fields. This can be used to irrigate cropland down the stream, while an efficient use of water with conditions of proper drainage can significantly reduce the agricultural runoffs.

3. Efficient distribution system. Water resources are not distributed evenly. Some localities have plenty of water and other have little.

4. Enhancement of surface storage capacity. About 37000 cubic kms of fresh water which rush down to the oceans through steam and rivers are of no use to the mankind.

5. Reduce evaporation losses. Water losses through evaporation and seepage are enormous both from the reservoirs and distribution system. It should be reduced.

6. Improvement of underground storage capacity. The fresh water is stored in underground underground deposits. Every year about 10-15% of the total precipitation enters the ground water table.

7. Desalination of sea water. A huge store of water exists in our oceans. If the salt content of the sea water is removed, we can use it.

8. Afforestation and Reforestation of hill slopes to check loss of water in floods.

9. Artificial rain making and precaution of water pollution.

Rain water Harvesting:-

→ Water is an essential natural resource for sustaining life and environment.

→ The ministry of water resources in India is endeavoring to make rain water harvesting a part of every day life in our villages and cities as a people's movement, and this will go a long way in the management of ground water as a sustainable resource.

→ Rainwater harvesting is control on utilization of rain water close to the point rain reaches earth.

Rain water harvesting systems, both small & large, consists of six basic components:-

a- Catchment area/roof,- the surface upon which rain falls.

b- Gutters and downspouts, - the transport channels from catchment surface to storage.

c- Leaf screens and roof washers, which are systems that remove contaminants and debris.

d- Cisterns or storage tanks, where rain water is stored.

e- Water treatment,- the filters and equipment as well as additives to settle filter and disinfect. main

The main causes of fall in ground water levels are:-

(a) overexploitation or excessive pumping either locally or over large areas to meet increasing water demands.

(b) Non-availability of other sources of water. Therefore, sole dependence is on ground water.

(c) Unreliability of municipal water supplies both in terms of quality and quantity, driving people to their own sources.

(d) Misuse of ancient means of water conservation like village ponds, baolis, percolation tanks and therefore, higher pressure of ground water development.

The main effects of overexploitation of ground water resources are:

(a) Drastic fall in ground water levels in some areas.
(b) Drying up of the wells/bore wells.
(c) Enhanced use of energy.
(d) Deterioration in ground water quality
(e) Ingress of sea water in coastal areas.

You can capture and recharge 65,000 litres of rainwater in Delhi from a 100 sq. m. size roof top and meet drinking and domestic water requirements of a family of four for 100 days. The method and technique include:-

(a) Roof top rain water harvesting and its recharge to underground through existing wells or bore wells or by constructing new wells, bore wells, shafts, spreading basins, storm water drains etc.

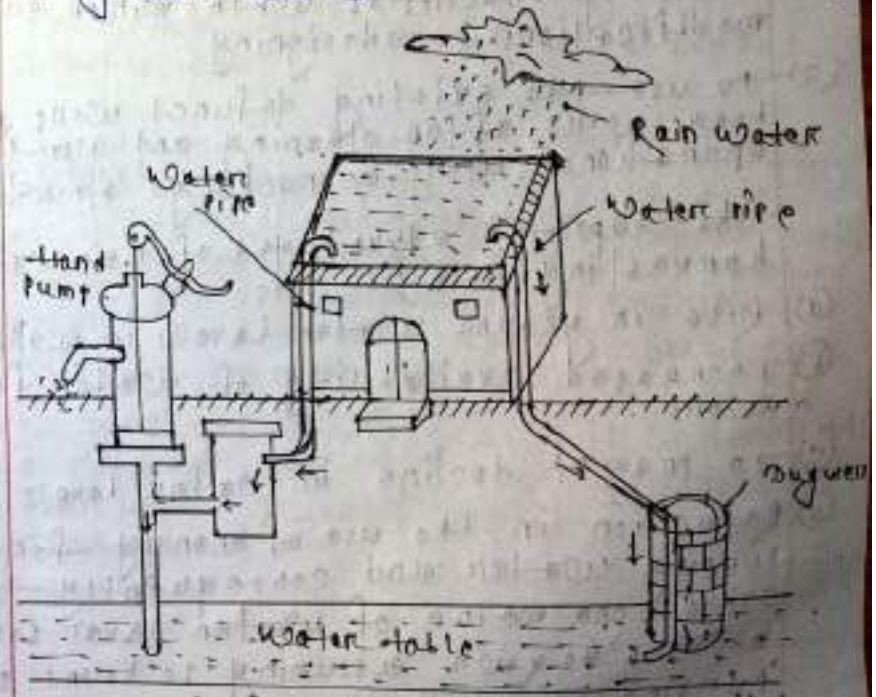
(b) Harnessing runoff in the catchments by constructing structures such as gabions, check dams, bhandaras, percolation trenches, sub-surface dykes etc.

(c) Impounding surplus runoff in the village catchment and water sheds in village ponds and percolation tanks.

(d) Recharging treated urban and industrial effluents underground by using it for direct irrigation or through recharge ponds or wells etc.

The main objectives of rain water harvesting are:

(a) to restore supplies from the aquifers depleted due to over exploitation.
(b) to improve supplies from aquifers lacking adequate recharge.
(c) to store excess water for use at subsequent times.
(d) to improve physical and chemical quality of ground water.



Roof-top rainwater harvesting by recharging ① through hand pump or ② through abandoned dugwell

(1) To reduce storm water run off and soil erosion.

(2) To prevent salinity ingress in coastal areas.

(3) To increase hydrostatic pressure to prevent or stop land subsidence.

(4) To recycle urban and industrial waste waters etc.

(5) To rehabilitate the existing traditional water harvesting structures like village ponds, percolation tanks, bandis, tanks etc.

(6) To convert the traditional water harvesting structures into ground water recharge facilities with minor scientific modifications & redesigning.

(7) To use the existing defunct wells & bore wells after cleaning and also the operational wells as recharge structures.

The expected advantages of rain water harvesting are:

(a) Rise in ground water levels in wells.

(b) Increased availability of water from wells.

(c) To prevent decline in water levels.

(d) Reduction in the use of energy for pumping water and consequently the costs: one metre of water level saves about 0.40 kwh assuming 10 hours of pumping per day for 365 days.

(e) Reduction in flood hazards and soil erosion.

(f) Improvement in water ingress.

(g) Assuring sustainability of the ground water extraction sources and consequently the village and town water supply systems.

(h) Mitigating the effects of droughts & achieving drought proofing.

(i) Reviving the dying traditional water harvesting structures and their rehabilitation as recharge structures.

(k) Effective use of lakhs of defunct wells and use wells as recharge structures

(l) Upgrading the social & environmental status etc.

26 09 19

Watershed Management:-

→ Watershed is a drainage area on earth's surface from which runoff, resulting from precipitation flows past a single point in to a large stream, a river, a lake or the ocean.

→ It is a geo-hydrological unit & drains at a common point, has been accepted world over as a scientific unit for area development.

→ the watershed can range from a few square kilometer to few thousand square kilometer in size.

→ Damodar valley corporation in 1949 adopted first integrated watershed Management.

→ watershed development is the rational utilization of natural resource of soil water and vegetation for increasing and stabilizing the productivity of land on a sustainable basis.

→ The development of watershed will result in increase in sub soil water regime, recharge of wells.

→ The watershed based development approach in undoubtedly an agreeable concept to set the goal.

objectives of watershed management, Watershed management is the rational use of land and water resources for optimum production causing minimum damage to the resources. The main objectives of watershed management are as:-

1. to increase agricultural production i.e. increasing the availability of fodder, fuelwood, timber and raw materials for industries.
2. the national utilization of natural resources like water soil and vegetation.
3. to minimize the risks of floods, droughts and landside.
4. to manage the watershed for development activities like domestic water supply, irrigation, hydropower generation.
5. to develop the rural areas and their life style.

Various measures are necessary for watershed Management. some of them are:-

1. scientific mining and quarrying must be done in the watershed area because hills loose stability and get disturbed by improper mining.
2. water harvesting in the watersheds to be used in dry season in low rainfall areas.
3. afforestation and agro forestry (crop plantation) should be promoted to prevent runoff, loss and soil erosion and increase soil moisture.
4. some mechanical measure like terracing, bunding, bench terracing, contour cropping etc. are used to minimize runoff and soil erosion in the slopy regions of watersheds.
5. to promote soil binding plants like vitex.
6. people's participation should be ensured including farmers and tribals in the watershed management programmes.

Resettlement and rehabilitation of people: its problems and concerns:-

→ some times for the development of projects like construction of dams, mining, creation of tanks etc. and during natural calamities like earthquake, landslides, volcanos, floods, droughts, cyclones, the problems of resettlement and rehabilitation arise. For example recently the tsunami cyclone affected thousands of families and during construction of Indira sagar dam in khandwa district of Madhya pradesh thousands families were displaced and rehabilitated near khanena and other places. this caused permanent loss of the benefits and facilities. this disturbed socio-economic and ecological base of local community which are generally forest and tribal people.

→ Families are disintegrated and also lost ancestral link between people and the environment. More than 1500 families are displaced during total dam construction. they rehabilitated in Dehradoon and Haridwar regions.

Displacement due to dams.

Univarse without energy is not imaginable. the most easily accessible and eco-friendly form of renewable energy is hydropower. water is scarce natural resource and India is blessed with it. Hence it has to judiciously harnessed and managed for welfare of all living beings.

Case study:-

Indira sagar project (ISP):-

→ Indira sagar project (1000MW) is in khandwa district of MP. It is constructed, operate and maintain by Narmada Hydroelectric Development Corporation (NHDC). Narmada is bestowed with rich potential of 29 major, 135 medium and 3000 minor projects. the reservoir of ISP Dam is largest reservoir in India with storage capacity of 12.22 BM of water for irrigation of 2.70 lakh-ha.

→ A separate township CHANERA was developed for displaced people. Under this project 23000 ha area is proposed for irrigation. 564 villages to be benefited by irrigation. this will cause the production of 4.00 lakh tonnes of food grains and 10.55 lakh tonnes of other crops every year additionally.

other benefits of the projects are! -

(i) pisciculture - 1500 tonnes of fish production every year.

(ii) Industrial development - Due to power and irrigation, development of new industries in Nimar and Malwa region.

(iii) supply of water to thermal power plant - water will be supplied to 2000 MW thermal power plant proposed in village Birs.

(iv) Tourism - Reservoir of 152 spread over 913 sq. km. area will be a boom for tourism development in Madhya pradesh.

Tehri Dam! -

→ Tehri Dam is on meeting point of river Bhagirathi and Bhilangana. It was controversial since 1961 i.e. from its construction. There was campaign against the project by Tehri people and noted activist Sunder Lal Bahuguna, the propagation of CHIPKO MOVEMENT.

→ The object of this dam is to produce power and provide irrigation facilities.

→ Its length is 575 meter and 260.50 meter high. It is highest rock fill Dam of India.

→ Its catchment capacity is 34.50 million m^3. Its hydroelectric capacity is 2400 MW. It provide 300 cu.sec drinking water to villages, towns of U.P and Delhi and irrigation facility to 270 ha. Land. The project covered 4C7 sq. km area of Tehri, which effected Tehri town and 112 Villages.

Sardar sarovar project: -

→ It is situated in Bharuch district of Gujarat state on Narmada river. This project will submerge 245 villages of MP, Gujarat and Maharashtra and will displace more than one lakh people.

→ It is also a controversial project. The project will also effect 58000 ha agricultural and 60000 ha forest land.

→ It is multi-purpose project, and will fulfil the necessity of power drinking water and irrigation.

(ii) Displacement due to mining :-

Mining is also one of important means in the field of prosperity Mineral wealth has its own importance therefore, it covers large area for this purpose. Due to this development activity, thousands of people are displaced. people displaced due to this activity are poorest and mostly tribal.

Jharia Coal field :-

a case study - It is in Jharkhand. In this project, underground fires are. Thousands of hectares land effected by this. people are asked to vacate the native place. since 1976, about 115 crores of rupees have been spent to put out fires. The problem of resettlement and rehabilitation of the people is still there.

(iii) Displacement due to National parks :-

To conserve flora and fauna (natural resources). some times large forest area is covered under National parks and sanctuary. It is declared as core area & entry of local dwellers, tribals & villagers (of nearby area) are prohibited.

Case study :-

(i) Velimiri Tiger Reserve area in west champaran districts displaced 142 villages of Tharu community tribals.

(ii) Nagarhanad sanctuary :-

displaced about 55478 tribal families. their rehabilitation is still incomplete. The Kerala people are fighting with officials of forest for their cause.

Rehabilitation

(i) The united Nations Universal declaration on human Rights (Article 25(1) has declared that "Right to housing is basic human right". this suggest better rehabilitation, adequate compensation, job opportunities, civic amenities and religious and cultural benefits. Therefore, National Rehabilitation Policy is needed to honour the human rights of the displaced people. Govt. under Land acquisition Act 1894 has power to vacate the land from people by giving notice for Govt use. therefore, most of the displacements have resulted due to land acquisition by Govt. There is need of public awareness also in resettlement and rehabilitation plans. In general Govt. and other agencies provide a number of amenities for rehabilitated persons.

10. Every landless person was provided 2 acres agriculture land, Rs-12-15000/- per acre cost of land to displaced person. Rs 20,000 on a plot for residence and 3-5000/- for transportation was also given with certain other compensations.

For displaced persons in case of Indira sagar Dam the following compensation for rehabilitement and rehabilitation were given:-

1- Developed plot on Rs 20,000 for purchase of plot for one family.
2- Rehabilitation grant of Rs 18700/- on 9350/- as per status of PAFs.
3- Transportation grant Rs 5000/- for shifting of one family
4- Allotted 2-5 hectares of agriculture land per family on Land compensation.
5- Attractive compensation for house, trees, wells and other structures.
6- At the plot sites, developed roads, water supply to lights, schools, health centres, worship places, panchayats, community centres, shops etc.
7- R and R work is being executed smoothly
8- Additionally more benifits were given.
9- professional training being given to project affected families at Indira Narmada Nagar.
10- central school (Kendriya vidyalaya started in June 02)
11- Different socio-economic upliftment programmes such as free medical check up, vaccination, training programmes are being organized

Environmental Ethics:-

Issues & possible solutions:-

The issues, principles and guideline relating to human interaction with their environment Ethics on earth Ethics. Ethics constitute the basic codes of civilized behaviour, without which our environment as we know would be impossible. Such rules embody the basic constraints each of us agrees to practice in relationship with others. Ethical codes can be of help in most instances that confront us, but dilemmas do arise in which it seems there are no suitable alternatives.

In relation to environmental protection or in need of environmental ethics to world views are: -

1. Eco-centric worldview: - this states that earth resources are limited, and they are not for human beings alone but for all species. so we have to draw our requirements from environment, but not to that extent it degrades the environment. A healthy economy depend upon the healthy environment, therefore, success of mankind depend upon how we cooperate with nature while trying to use the resources of nature.

2. Anthropocentric world view: -
It states that man is the most important species of nature. Earth has an unlimited supply of resources. Most of the industrial societies believe in this view. so the success & healthy economy of mankind depend upon how nicely man derives benefits from nature.

To check the environmental crisis, we must follow the certain environmental ethics for better future. some of them are -

1- one should love and honour the earth.
2- We should celebrate the turning of the seasons of the earth.
3- Do not waste or exploit the natural resources.
4- to bring about awareness regarding conservation of life support systems.
5- one should be fair in sharing of resources.
6- We should respectful to plants and animals which provide us food.
7- We should conserve the ecosystem & promote appropriate sustainable development.
8- We should not do anything at the cost of nature.
9- We should consume the natural resource in moderate amounts so that all may share this treasure.
10- We should concentrate on general awareness regarding environmental ethics from primary education.
11- A healthy environment depends upon a healthy economy.

climate change:-

(i) Though climate is an average weather of an area or environmental factors of an area. These include quantity of light, temperature, humidity, wind, gases, water etc which average for about 30 yrs.

(ii) Thus the changes in environmental conditions of an area over long period of time is called climate change.

(iii) These changes effect the agriculture, migration of animals, hydrological cycle, thermal gradient between the poles and equator, wind pattern, distribution of rainfall etc.

Prevention and control of air pollution:-

(i) Power to declare air pollution control areas.

(ii) Power to give instructions for ensuring standards for emission from automobile.

(iii) Restrictions on use of certain industrial plants.

(iv) Persons carrying an industry etc. not to cause emission of air pollutants in excess standard laid down by state board.

(v) Power to take samples of air or emission & procedure to be followed.

(vi) Reports of analysis.

(vii) Appeals.

Penalties & procedure:-

Penalties for certain acts:-

(a) destroys, pulls down, removes, injures or defaces any pillar, post or stave fixed in the ground or any notice or other matter put up, inscribed or placed by or under the authority of the Board or

(b) obstructs any person acting under the orders or directions of the Board from exercising his power and performing his functions under this act or

(c) destroys any works or property belonging to the board, or

(d) fails to furnish to the Board or any officer or other employee of the Board any information required by the board or such officer or other employee for the purpose of this act, or

(e) fails to intimate the occurance of the emission of air pollutants into the atmosphere in excess of the standards laid down by the state board on the apprehension of such occurrence, to the state board & other prescribed authorities or agencies as required under sub-section (1) of section 23, or

(f) in giving any information which he is required to give under this act, makes a statement which is false in any material particular, or

(g) for the purpose of obtaining any consent under section 21, make a statement which is false in any material particular

The Air (Prevention & control of pollution) Act, 1981 (14 of 1981) [29th March 1981]

Giving effect decisions taken at the United Nations Conference on the Human Environment held in Stockholm in June, 1972, in which India participated, to take appropriate steps for the preservation of the natural resources of the earth which, among other things, include the preservation of the quality of air & control of air pollution

Powers & Functions of Boards:-

Functions of Central Board:- (1) subject to the provisions of this Act, & without prejudice of the performance of its functions under the Water (Prevention & control of pollution) Act, 1974 (6 of 1974), the main functions of the Central Board shall be to improve the quality of air & to prevent, control or abate air pollution in the country.

(2) In particular & without prejudice to the generality of the foregoing functions, the Central Board may-

(a) advise the Central Government on any matter concerning the improvement of the quality of air & the prevention, control or abatement of air pollution.

(b) plan & cause to be executed a nation wide programme for the prevention, control or abatement of air pollution.

(c) co-ordinate the activities of the state Boards & resolve disputes among them

(d) provide technical assistance & guidance to the state Boards, carry out & sponsor investigations & research relating to problem of air pollution & prevention, control or abatement of air pollution.

(e) Lay down standards for the quality of air.

(f) collect & disseminate information in respect of matters relating to air pollution.

(g) perform such other functions as may be prescribed.

(3) The Central Board may establish or recognize a laboratory or laboratories to enable Central Board to perform its functions under the section efficiently

(4) The Central Board may-

(a) delegate any of its functions under this Act generally or specially to any of the committe appointed by it.

(b) do such other things & perform such other acts as it may think necessary for the proper discharge of its functions & generally for the purpose of carrying into effect the purpose of this Act.

Functions of state boards:-

1. subject to the provisions of this act & without prejudice to the performance of its functions, if any, under the water (prevention & control of pollution act, 1974), the functions of a state board shall be.

(a) to plan a comprehensive programme for the prevention, control or abatement of pollution & to secure the execution thereof;

(b) to advise the state Government on any matter concerning the prevention, control abatement of air pollution.

(c) to collect & disseminate information relating to air pollution.

(d) to collaborate with the central board in organising the training of persons engaged or to be engaged in programmes relating to prevention, control, or abatement of air pollution & to organise mass-education programme relating thereto.

Nuclear accidents and holocaust:-

Japanese towns of Hiroshima & Nagasaki. the first atom bomb was exploded about 580 metres in the atmosphere over ill fated Hiroshima on August 6, 1945, the second atom bomb was dropped detonated 507 metres high in air over Nagasaki. At least 100,000 people were reported killed, severely injured & missing in Hiroshima alone. where the bomb virtually demolished all structures & buildings in about 13 square km, area. In Nagasaki 49000 civilians were killed, injured & disappeared while an area of 6 to 7 km was devastated.

the atom bomb exploded on Hiroshima used Uranium (U-235) with a half life period of 8.5 X 10^8 years, while the Nagasaki bomb had Plutonium (Pu-239) as an explosive man-made radio-nuclide with half life of 24,000 years.

Exhaustive studies conducted in Hiroshima show that heavily exposed hibakusha, bomb affected people, have a 50% greater chance than normal of dying from cancer.

The first hydrogen bomb:-
was exploded in 1954 on Bikini island in the pacific. the radio-active fallout from this explosion severely affected the crew of a japanese fishing boat, the lucky dragon about 150 km, away from the site of explosion, several persons were hospitalized, killed & disappeared, while in Bikini island the explosion caused the ecological vanished.

In 1957 & 1958, the USA, soviet union & great britain detonated nuclear weapons whose total yield was about 25 megatons. these weapons were equal to 4250 hiroshima sized atom bombs. they caused several dangerous effects on man.

In 1961, Russia detonated a bomb of 57 megatons that could obliterate a city more than three hundred times the size of hiroshima.

Case study:-
Chernobyl accident:-
Chernobyl was the first officially acknowledged nuclear accident in USSR & first to the world. April 26, 1986 was a sad day for nuclear power generation when a major accident at 1.23 A.M. in the nuclear reactor at chernobyl, in the Ukraine area of the soviet.

It resulted in clouds of radio-active smoke over a large area in scandinavian countries with 2000km away in the Russian nation itself. there was a devastating fire in the reactor caused few casualties & severe damage to the nuclear plant. on finding the fire uncontrol the soviet authorities sought the help of west germany & other nuclear nations to tackle situation. presumably, the core of the nuclear reactor had melted.

The explosion at the chernobyl power plant in soviet Ukraine, USSR confirmed the nuclear disaster. poor design of the reactor magnified with operation negligence caused. the operators ignored warnings from various sensors & even disconnected the emergency cooling system.

The vast cloud of radiations caused considerable anxiety in western europe. the union reported in a statement on April 29, 1986 that two persons were killed & few in but the senior US official told that the death toll was probably much higher.

Wasteland Reclamation:-

The areas on land like salt affected, sandy, barren, hill-ridge snow covered or glacial which economically unproductive suffer from environmental deterioration are called waste lands. There are for one reason or the other do not fulfill their life sustaining potential. Therefore wasteland should be reclaimed & put to some productive use. About half of our country's geographic area is lying as wasteland. Maximum wasteland areas in our country lie in Rajasthan, followed by Madhya Pradesh & Andra pradesh.

There are two modes of formation of wastelands:-

1- Natural process:-
These include undulating uplands, snow covered lands, coastal salin areas, sandy areas etc.

2- Anthropogenic (Man-made) activities:-
These are deforestation, overgrazing, mining & erroneous agricultural practices.

Biodiversity & its Conservation

Values of Biodiversity:-

Biodiversity is a value natural resource for the survival of mankind. Man has domesticated a number of economically important plants & animal species old traditional varities & the wild relatives of domesticated plants & animals constitute a vital genetic resource for us. Many plants & animals including wild life are of very important for human being. They can be used directly or indirectly to have consumptives, productive, social, aesthetic & options values i.e in terms of money.

Consumptive value:-

Most of the developing countries obtain fuel wood from forests. still more than 1500 million people cook their food by burning wood. about 1200 million cubic meter wood is used for fuel across the globe this imposes heavy pressure on forests. Hunting of wild life, use of grass with some commercially important plants as fodder are of only consumptive.

Various tribal societies fully depend on forests (biodiversity) for their habitation & livelihood. They used tubers, roots, fruits, seeds & meat of wild animals as their food.

Productive value:-
Bamboos, grasses, canes, essential oils, tanning material, dyes, gums, resin, drugs, spices, poisons, insecticides, soap substitutes, rudraksha, tec. honey wax, lac, Mahua seeds, Mahua flowers and other seeds are forest products, they have their high commercial values.

Social values:-
Social value is one of the instrumental values where some thing has as a means to another's end. Materialistic uses of biodiversity are the core of instrumental values. The biodiversity has distinct social value attached with different societies. Goods & services provided by ecosystems to our society include

1. Provision of food, fuel & fiber.
2. Provision of shelter & building materials
3. Purification of air & water
4. Detoxification & decomposition of wastes
5. Generation & renewal of soil fertility, including nutrient cycling
6. Control of pests & diseases.
7. Stabilization & moderation of earth's climate.
8. Maintenance of genetic resources as key inputs to crop varieties.
9. Live stock breeds, medicines & other products etc.

Ethical values:-
Ethical or religious value is also one of the indirect values of biodiversity. The ethical & religious value of biodiversity is rooted in the understanding that humanity is part of nature & that we are just one species among others. All species have an inherent right to exist. Each future generations also have an inherent right to know them & to have the choice of using them or not.

Aesthetic value:-
The aesthetic value of biodiversity has been expressed in many ways through art, poetry, songs, literature, music & dance. Forests are closely linked with our religion & culture. Human race has a great evolutionary attachment with forests as our ancestors lived in forests. Forests are nature's laboratories, where scholars study natural sciences.

Optional values:-
Biological resources existed in this biosphere are very important for human beings. The option value of biodiversity suggests that any species may prove to be a miracle species. It is the precious gifts of nature presented to us option value is the indirect value of a species to provide an economic benefit to human society at some point in near future.

Biodiversity at global, National and local level

Level: Biodiversity at global level:-

It is estimated that there exists 5-30 million species of living forms on our earth & of these only 1.5 million have been identified include 300000 species of green plants & fungi 800000 species of insects, 40 000 species of vertebrates & 3,60,000 species of micro-organisms but present studies shows that the number of insects alone may be as high as 80 million. the data related to different species in different parts of world are different For example approx. 200000 species of plants are in south America.

Biodiversity at National level:-

India is located in south asia, between latitude 8° & 38°N & longitudes 68° & 97° E. In flora, the country can boast of 45,000 species which accounts for 15 per-cent of the known world plants. of the 15,000 species of flowering plants, 33 percent are endemic & located in 26 endemic centres among the monocotyledons, out of 588 genera occurring in the country, 62 are strictly endemic

India is very rich in faunal wealth & has nearly 75,000 animal species, about 80 percent of which are insects. the distribution of major animal groups -

Biodiversity at local level:-

the biodiversity at local level can be well understand by demarcating the rich places. Zones rich in biodiversity

the local biodiversity on following lines:-

1- Richness of species at a given place
2- physical characteristics of habitat and vegetation in particular area.
3- change in species composition across different habitats
4- Local diversity based on climate, geographical, ecological & other process responsible for creation.
5- Rate of change of across gradients and conditions.

Threats of Biodiversity:-

one of the measure threat to biodiversity is space, food & raw material for expanding human & plant establishment Wilson 1985 described the losses of biodiversity as "crisis", & this is more serious for developing countries like India.

Habitat loss:-

Habit loss due to human activities & other disturbances are well known factor. Due to habitat degradation wild populations become more vulnerable to predators & diseases. Due to pollution & the presence of toxic & hazardous pollutants, our fresh water resources have suffered and many species of

aquatic birds, fish & mammals have been threatened.

Poaching of wildlife:-

Poaching is another threat to wildlife. As an ancient period, hunters, collectors, and smugglers (traders) are the measure threat to a number of species including endangered species. They collected furs, hides, horns, tusks, and smuggled to others for millions of dollars.

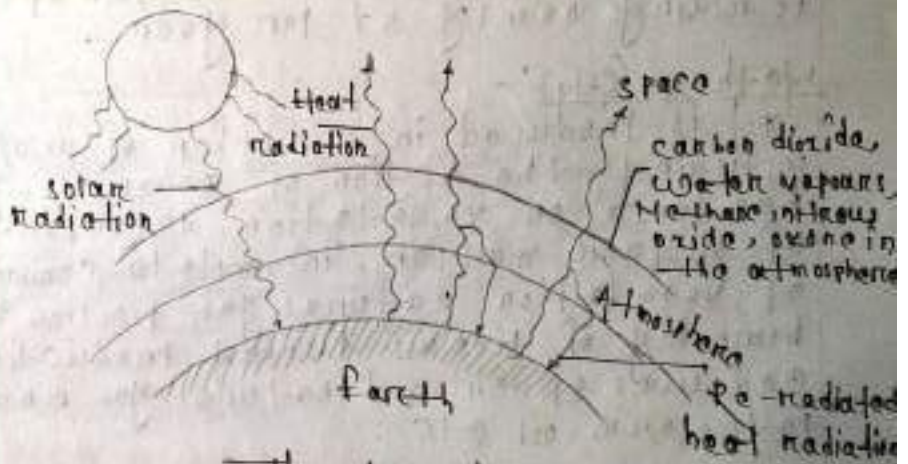
Man-wildlife conflicts:-

Struggle for existance. This is applicable for both, man & wild animal. Due to habit loss animals come out of the forest & destroy the crops later on they become danger to human being. Villagers & affected people kill them.

Global warming:-

The average global temperature is 15°C. The lower most layer of atmosphere i.e troposphere, traps the heat by a natural process due to the presence of certain gases called green house gases. They are carbon dioxide, ozone, methane, Nitrous oxide, chlorofluorocarbon (CFCs) and water vapours. In absence of these gases the temperature (15°C) would have been -18°C.

Thus warming of the earth's climate owing to the increased concentration of green house gases is called green house effect.



the greenhouse effect

Green House Gases:-

The green house gases present in the troposphere & resulting in an increase in the temperature of air and the earth are discussed here.

Carbon Dioxide (CO_2):-
The CO_2 is considered as the most dominant factor responsible for the green house effect. The troposphere contains only 0.037% CO_2 (by volume) and its amount is controlled by carbon cycle. The four major pools or reservoirs of carbon are fossil-fuels, the atmosphere, the biosphere & the oceans.

Chloro Fluoro carbons (CFCs):-
The main source of CFCs include leaking the conditioners & refrigerators, evaporation of industrial solvents, production of plastic forms aerosols, propellants (CFC-11) etc. The concentration of CFCs is rising nearly 5% per year.

Methane (CH_4):-
It is produced in a number of ways including the action of anaerobes bacteria on vegetation, decomposition of organic matter, incomplete combustion of vegetation natural gas pipeline leaks, burning of biomass during production and use of oil and natural gas and petroleum oil etc.

Nitrous oxide (N_2O):-
It is released from nylon products, from burning of biomass and fuels (specially coal). From breakdown of fertilizers in soil, livestock wastes & nitrates contaminated ground water, nylon products etc. It is responsible for about 6% of global warming.

Ozone:-
It comes mostly from hydrocarbons & nitrogen oxides. It causes irritation to eyes & respiratory organs. It decreases the resistance power to infections & aggravates illness.

Impact of Global Warming:-

(i) Climatic change (Increase in global temperature):
Increase the level of green house gases causes the global warming have affected the global climate. This effect will increase in future. According to IPCC (1996) the world climate has warmed from 0.3 to 0.6°C during the last century.

(ii) Effect on sea levels:-
Rising temperatures will cause glaciers to melt and the polar ice caps to shrink. As a result sea level may rise by 0.2 - 1.5 m over the next 50 - 100 yrs.

(iii) Reduction of Biodiversity:-
As we have discussed, increased temperature, inundation of some coastal biological communities and changes in the pattern of distribution of many species over a long period of time are likely to cause reduction in biodiversity in aquatic and terrestrial ecosystems.

(iv) Effect on Agriculture:-
There are different views regarding the effect of global warming on agriculture. It may be positive or negative, however, the effects of this change will vary for C_3 (i.e. wheat, rice & beans) and C_4 (e.g. maize, millet & sugarcane) plants.

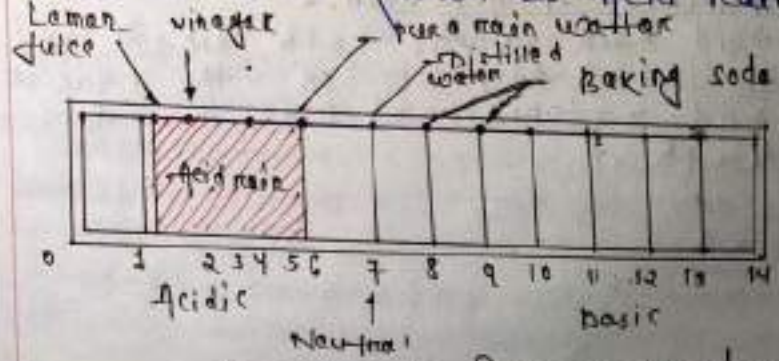
(v) Effect on human health:-
The global warming will lead to changes in the rainfall pattern in many areas, thereby effecting the distribution of vector borne diseases like malaria, filariasis, elephantiasis etc.

(vi) Effect on Arctic ecosystems:-
Global climate change will have profound effects on arctic ecosystems. Tundra is more sensitive to global climate change than most other ecosystem on earth.

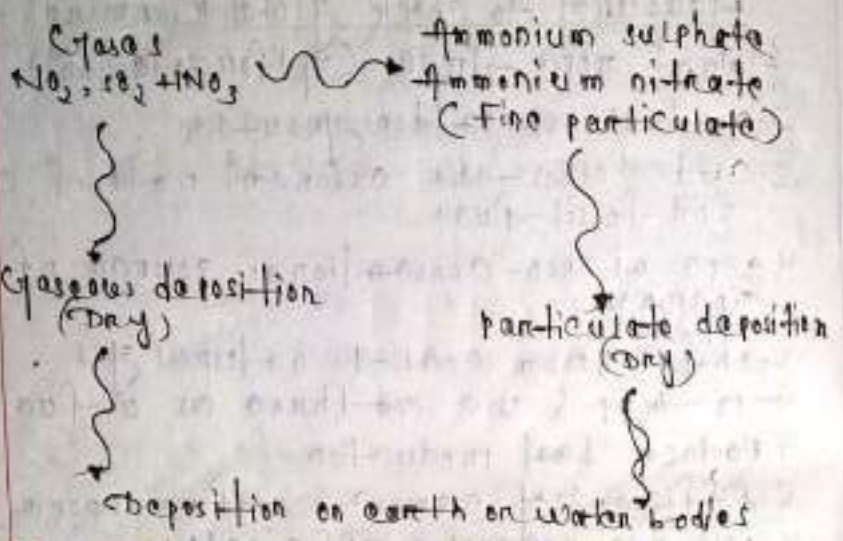
(vii) Ecological disturbance:-
Global warming increases the desert. It increases temperature in North America, South Africa, Mexico, India & other countries.

Measures to check global warming:-
1. plant more trees (Afforestation)
2. control population growth.
3. cut down the current rate of CFCs and fossil fuel.
4. use of non-conventional source of energy.
5. shift from coal to natural gas.
6. to trap & use methane as a fuel.
7. reduce beef production.
8. efficiently remove CO_2 from smoke.
9. use energy more efficiently.

Acid Rain:-
Normal rain water is always acidic because of the fact that CO_2 present in the atmosphere gets dissolved in it forming carbonic (H_2CO_3) acid. Because, the presence of SO_2 (sulphur dioxide) and NO_2 (Nitrogen oxide) gases as pollutants in the atmosphere, the pH of the rain water is further lowered (as low as 2.4). This is known as acid rain.



The pH scale of common substances.



Acid rain is man-made and an environment problem that knows no boundaries. Increasing acidity in natural waters and soils is becoming a problem all over the world.

Where does acid come from:-

Acidification of environment is a man made phenomenon. No doubt that most acid come from human activities i.e. cars, houses, factories, power stations etc.

Effects of acid rain:-

Acid rain affects both direct and indirect effects on the organisms and materials it comes in contact with.

1- A significant reduction in fish population accompanied by decrease in the variety of species in food chains have been observed.

2- Adirondack ponds having high acidity levels, were among the first to lose fish population.

3- Different species reacts differently to acidified lakes. Adult fish can survive in more acidic water having high concentration aluminium that dead fish.

4- Many bacteria and blue green algae are killed due to acidification, disturbing the whole ecological balance.

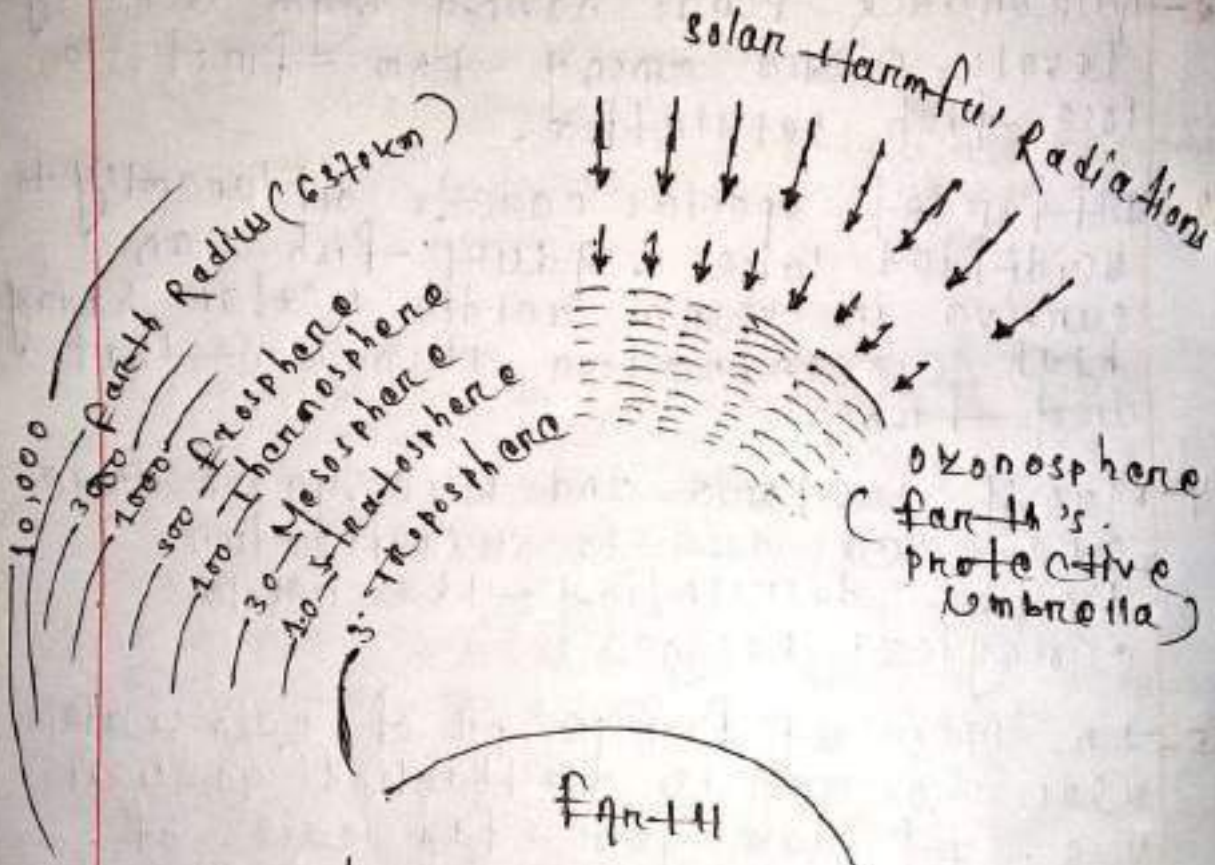
5- In 1956 of Europe pH of rain water was 5.6 and in Netherland (1962) was 4.5. It damaged the leaves of plants and trees.

Ozone Layer depletion:-

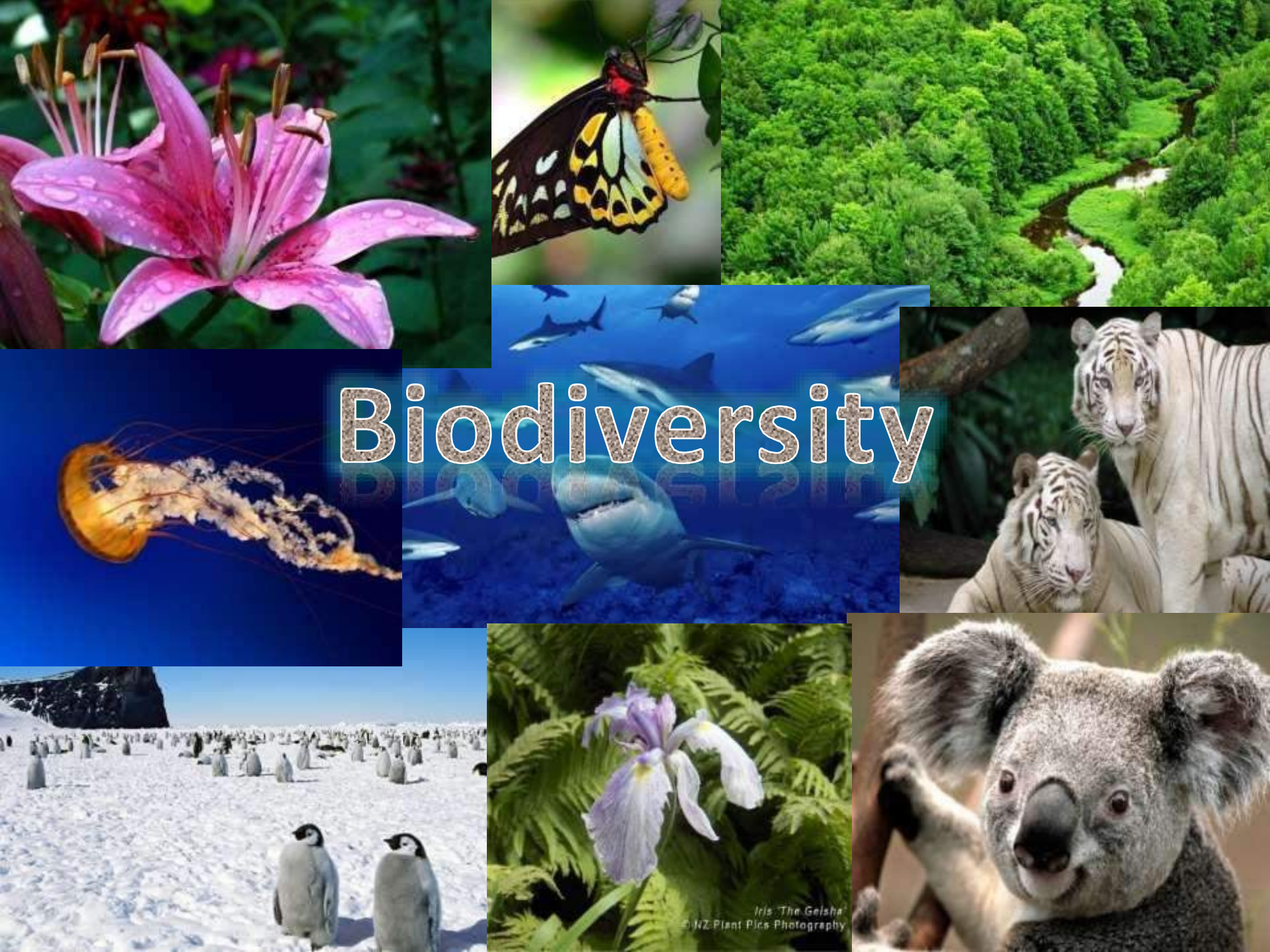
Stratosphere -

Troposphere is the part of atmosphere where humans live and other life processes also occur. The stratosphere is the region of space between approximately 15 - 50 kms above the earth's surface. The gas molecules in the stratosphere act as absorbing centres, moderating the transmission of the solar radiation to the earth.

The qualitative as well as quantitative effect of this is an important determining factor with respect to life processes.



Atmospheric ozone - earth's protective Umbrella.


Biodiversity
Iris 'The Geisha'
© NZ Plant Pics Photography

Introduction

The term Biodiversity was first coined by Walter G. Rosen in 1986.

The biosphere comprises of a complex collections of innumerable organisms, known as the Biodiversity, which constitute the vital life support for survival of human race.

Biological diversity, abbreviated as biodiversity, represent the sum total of various life forms such as unicellular fungi, protozoa, bacteria, and multi cellular organisms such as plants, fishes, and mammals at various biological levels including gens, habitats, and ecosystem .

Concept of Biodiversity & its Types

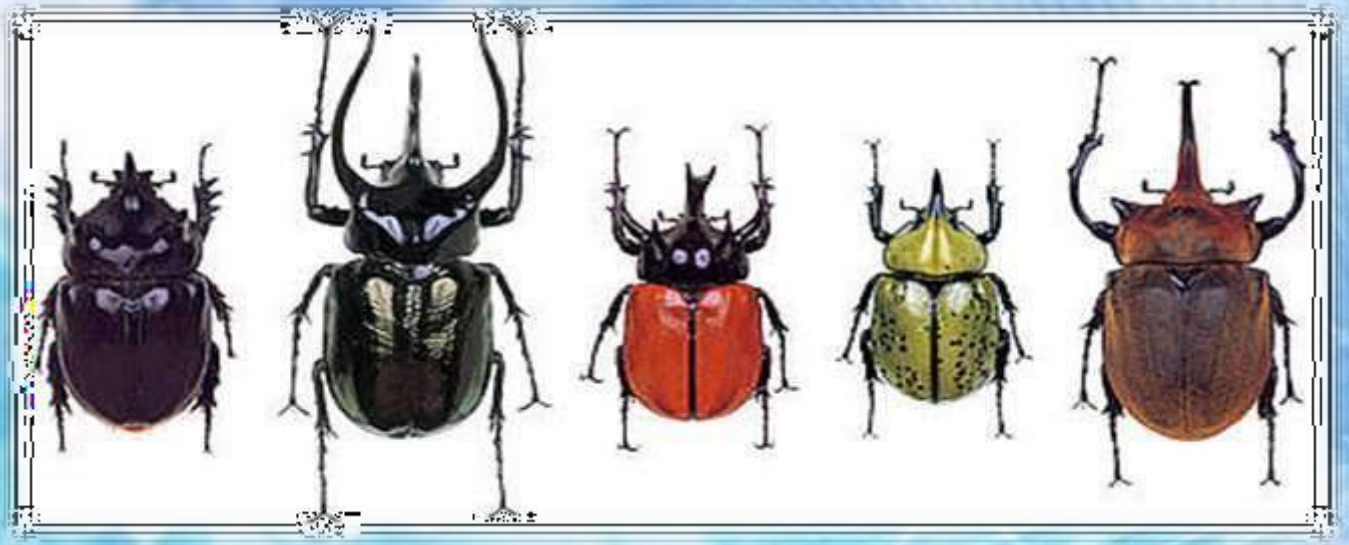
- Biodiversity is the variety of life on Earth.
- For any kind of animal or plant – each individual is not exactly the same as any other; nor are species or ecosystems.
- Biodiversity is generally described at three levels: genetic diversity, species diversity and ecosystem diversity.

Types of Biodiversity

- There are three types of biodiversity:-
  - Genetic Biodiversity
  - Species Biodiversity
  - Ecosystem Biodiversity

Genetic Biodiversity

Species Biodiversity



Ecosystem Biodiversity

Ecosystem or Habitat Biodiversity

- Ecosystem is the structural and the functional unit of the biosphere.
- Ecosystem diversity is defined as,“ the aggregation of various habitats, community types and abiotic environment in a given area.”
- India has one of the biggest ecosystem diversity, ranging from the deserts, plains, hills, mangroves, rainforests to cold Himalayas.

Distribution of Biodiversity

- Biodiversity is not evenly distributed, rather it varies greatly across the globe as well as within regions.
- Terrestrial biodiversity is thought to be up to 25 times greater than ocean biodiversity.
- The study of the spatial distribution of organisms, species and ecosystem, is the science of biogeography.


BIO
DIVERSITY
AND THREATS TO IT….

Threats to Biodiversity

- Habitat Destruction- Important to protect habitat in order to protect biodiversity within it. Huge pressure from the World's rapidly increasing population.
- Global Climate Change- Change in a biotic elements of ecosystems leading to biotic change.
- Habitat Fragmentation- From human activity. Reduces ability of habitat to support species.
- Pollution- Introduction of pollutants such as nutrient overloading with nitrate fertilizer as well as more immediately harmful chemicals.
- Over-Exploitation- This includes the illegal wildlife trade as well as overfishing, logging of tropical hardwoods etc.
- Alien Species- Introduced by humans to regions where there are no natural predators.
- Disease- Reduction in habitat causing high population densities, encourages spread of diseases.

Habitat loss


Adrian Dorst

Habitat loss:-

Habitat loss can be described when an animal loses their home. Every animal in the animal kingdom has a niche, a their in their animal community and without their habitat they no longer have a niche.

Reasons of habitat loss by humans:

~ agriculture, farming
~ harvesting natural resources for personal use
~ for industrial and urbanization development

Habitat destruction is currently ranked as the primary causes of species extinction world wide...!!!

Example :

The impact upon china's panda, ones found across the nation. Now it's only found in fragmented and isolated regions in the south west of the country as a result of wide spread deforestation in the 20th century.

There are natural causes too..

Habitat destruction through natural processes such as volcanism, fire and climate change is well documented in the fossil record. One study shows that fragmentation of tropical rainforest in euro 3000 million years ago lead to a great loss of amphibian diversity.

Solutions on for this..

~ Protecting remaining intact section of natural habitat.

~ Reduce human population and expansion of urbanisation and industries.

~ Educating the public about the importance of natural habitat and bio diversity.

~Solutions to habitat loss can include planting trees, planting home gardens so as to reduce need for man to need large lands for agricultural farms which lead to habitat loss.

Poaching

- # Poaching:-
- **Poaching** is the hunting and harvesting taking of wild plants or animals, such as through hunting, harvesting, fishing, or trapping.
- # History of poaching
- ~ Millions of years ago, in the Stone Age
- ~Followed through the ages, to even the tribal natives
- ~but it was during the Late Middle Ages that poaching became a punishable offense

- Why Poaching is done???
- ~ Poaching is done for large profits gained by the illegal sale or trade of animal parts, meat and pelts.
- ~ Exists because there is a demand for these products, caused by a lack of education or disregard for the law amongst the buyers.
- ~ Many cultures believe that certain animal parts have medicinal value.

Poaching is not limited to animals its also for plants too……!

Three of the most often poached species in the park are galax, black cohosh, and ginseng.

GALAX

BLACK COHOSH

GINSENG

- How does poaching affect the environment?
- ~Poaching or illegal hunting causes animals endangered of being extinct. If more animals becomes extinct there's a disruption in the food chain, and that will cause major problems in our ecosystem, resulting eventually in new adaptations of animals, and or species beyond human control.
- ~Poaching results in animals being hunted too soon for them to have time to reproduce and repopulate.

Recent Issue on Biodiversity

- Some 75% of the genetic diversity of crop plants been lost in the past century.
- Some scientists estimate that as many as 3 species per hour are going extinct and 20,000 extinctions occur each year.
- Roughly one-third of the world's coral reef systems have been destroyed or highly degraded.
- About 24% of mammals and 12% of bird species are currently considered to be globally threatened.
- More than 50%of the world's wetlands have been drained, and populations of inland water and wetland species have declined by 50% between 1970 and 1999.

Conservation of Biodiversity

- Restoration of Biodiversity
- Imparting Environmental Education
- Enacting, strengthening and enforcing Environmental Legislation
- Population Control
- Reviewing the agriculture practice
- Controlling Urbanization
- Conservation through Biotechnology

Biodiversity in India

Categories	No. of Indian Species	% of Indian Species Evaluated	Species Threatened in India
Mammals	386	59	41%
Birds	1219	-	7%
Reptiles	495	73	46%
Amphibians	207	79	57%
Freshwater Fish	700	46	70%

The Ten Biography Regions of India

- The Trans-Himalayan
- The Himalayan
- The Indian Desert
- Semi-arid Zone
- Western Ghats
- Deccan Peninsula
- The Gangetic Plain
- North East India
- The Islands
- The Coasts

- India figured with two hotspots- The Western Ghats & The Eastern Himalayas in an identification of 25 of the world's biological richest and most threatened ecosystem
- These two hotspots that extends to India are
  - The western Ghats/Sri Lanka
  - The Indo-Burma region (covering the Eastern Himalayas)
- And they are included amongst the top eight most important hotspots.
- The are the areas with higher concentration of endemic species and which usually experience rapid rate of habitat modification and loss.

Western Ghats

- Western Ghats faced with tremendous population pressure the forests of western Ghats and Sri lanka have been dramatically impacted by demands for agriculture and Timber.
- The region is home to rich endemic assemblage of plants, reptiles and amphibians as well as elephants, tiger and endangered lion tailed Macaque.

The Eastern Himalayas

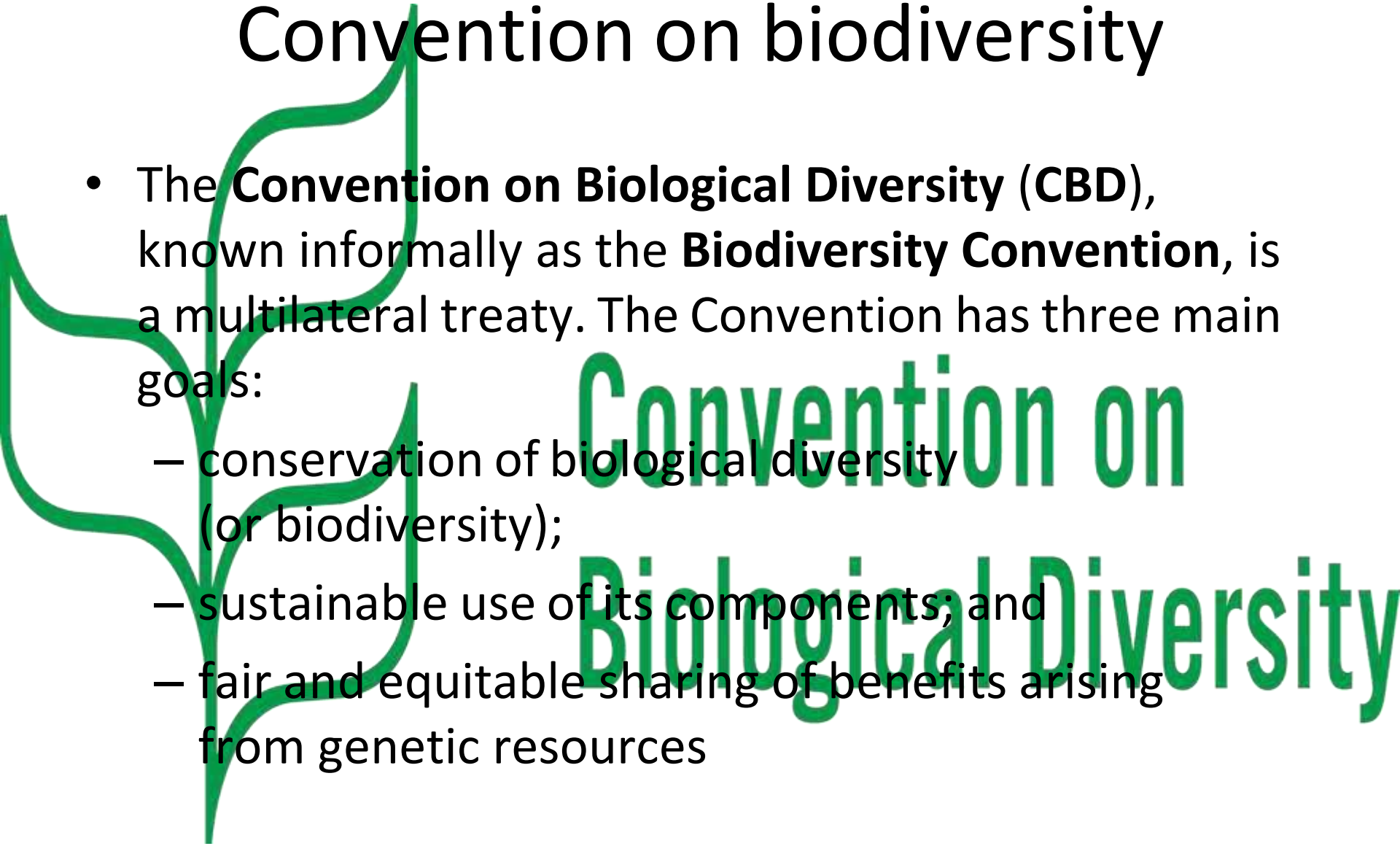
- Himalayas is the home to world's highest mountains, including Mt. Everest. Abrupt rise in rise of mountains results in diversity of ecosystems that range from alluvial grasslands and subtropical broad leaved forests to alpine meadows above the tree line. It's a home to variety of large birds, mammals including tiger, elephants, rhinos and wild water buffaloes.

Biodiversity in Maharashtra

- Flora of Maharashtra is heterogeneous in composition.
- In 2012 the recorded thick forest area in the state was 61,939 km^2(23,915 sq mi) which was about 20.13% of the state's geographical area.
- There are three main Public Forestry Institutions (PFIs) in the Maharashtra state: the Maharashtra Forest Department (MFD), the Forest Development Corporation of Maharashtra (FDCM) and the Directorate of Social Forestry (SFD).

Convention on biodiversity

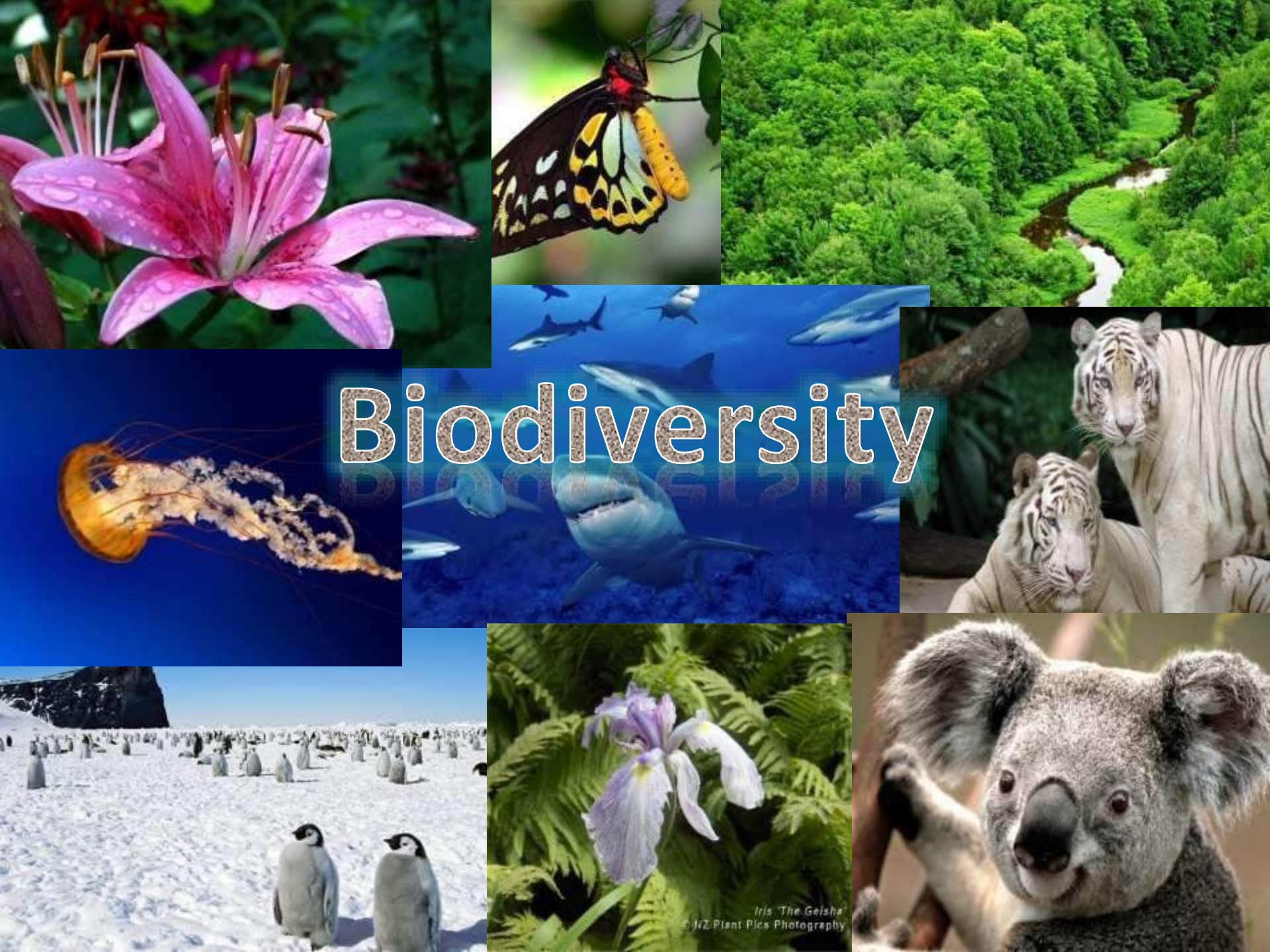
- The **Convention on Biological Diversity** (**CBD**), known informally as the **Biodiversity Convention**, is a multilateral treaty. The Convention has three main goals:
  - conservation of biological diversity (or biodiversity);
  - sustainable use of its components; and
  - fair and equitable sharing of benefits arising from genetic resources



Conclusion

- Biodiversity is a concept that has no general definition. Usually it is used in a context that stresses the need for attention on our living environment and the sustainable use of natural resources.
- Biodiversity can be divided in different types such as habitat, species and genetic diversity.
- The integrated approach used in coastal zone management is an adequate method in dealing with the matter of biodiversity.


Thank You!


Biodiversity
Iris 'The Geisha'
© NZ Plant Pics Photography

Introduction

The term Biodiversity was first coined by Walter G. Rosen in 1986.

The biosphere comprises of a complex collections of innumerable organisms, known as the Biodiversity, which constitute the vital life support for survival of human race.

Biological diversity, abbreviated as biodiversity, represent the sum total of various life forms such as unicellular fungi, protozoa, bacteria, and multi cellular organisms such as plants, fishes, and mammals at various biological levels including gens, habitats, and ecosystem .

Concept of Biodiversity & its Types

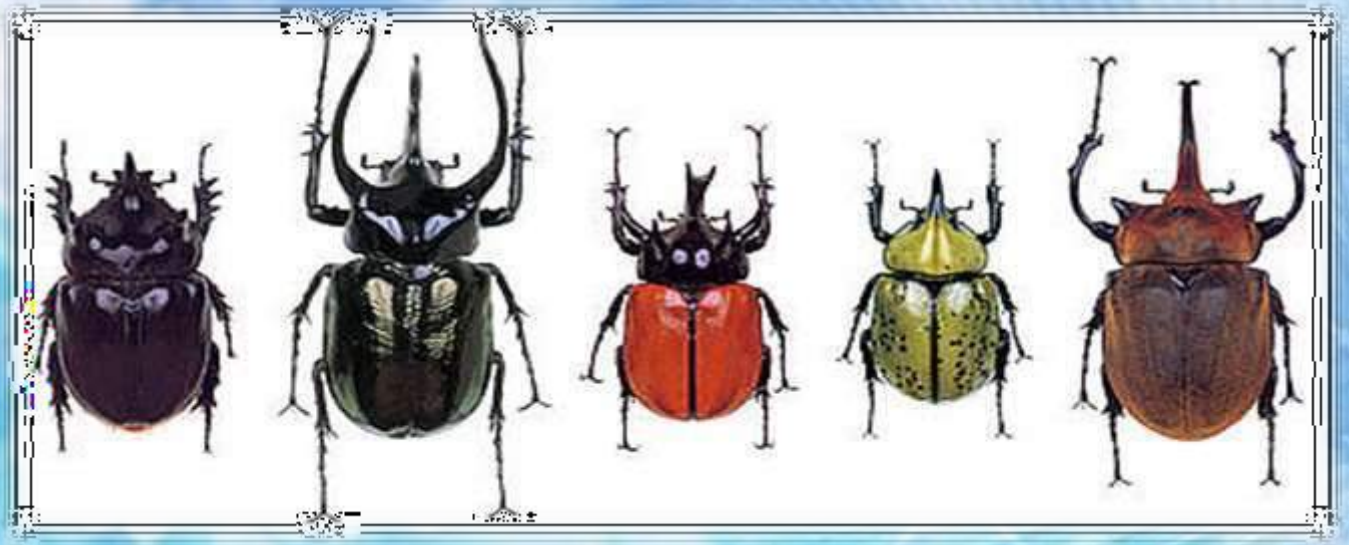
- Biodiversity is the variety of life on Earth.
- For any kind of animal or plant – each individual is not exactly the same as any other; nor are species or ecosystems.
- Biodiversity is generally described at three levels: genetic diversity, species diversity and ecosystem diversity.

Types of Biodiversity

- There are three types of biodiversity:-
  - Genetic Biodiversity
  - Species Biodiversity
  - Ecosystem Biodiversity

Genetic Biodiversity

Species Biodiversity



Ecosystem Biodiversity

Ecosystem or Habitat Biodiversity

- Ecosystem is the structural and the functional unit of the biosphere.
- Ecosystem diversity is defined as,“ the aggregation of various habitats, community types and abiotic environment in a given area.”
- India has one of the biggest ecosystem diversity, ranging from the deserts, plains, hills, mangroves, rainforests to cold Himalayas.

Distribution of Biodiversity

- Biodiversity is not evenly distributed, rather it varies greatly across the globe as well as within regions.
- Terrestrial biodiversity is thought to be up to 25 times greater than ocean biodiversity.
- The study of the spatial distribution of organisms, species and ecosystem, is the science of biogeography.


BIO
DIVERSITY
AND THREATS TO IT….

Threats to Biodiversity

- Habitat Destruction- Important to protect habitat in order to protect biodiversity within it. Huge pressure from the World's rapidly increasing population.
- Global Climate Change- Change in a biotic elements of ecosystems leading to biotic change.
- Habitat Fragmentation- From human activity. Reduces ability of habitat to support species.
- Pollution- Introduction of pollutants such as nutrient overloading with nitrate fertilizer as well as more immediately harmful chemicals.
- Over-Exploitation- This includes the illegal wildlife trade as well as overfishing, logging of tropical hardwoods etc.
- Alien Species- Introduced by humans to regions where there are no natural predators.
- Disease- Reduction in habitat causing high population densities, encourages spread of diseases.

Habitat loss


Adrian Dorst

Habitat loss:-

Habitat loss can be described when an animal loses their home. Every animal in the animal kingdom has a niche, a their in their animal community and without their habitat they no longer have a niche.

Reasons of habitat loss by humans:

~ agriculture, farming
~ harvesting natural resources for personal use
~ for industrial and urbanization development

Habitat destruction is currently ranked as the primary causes of species extinction world wide...!!!

Example :

The impact upon china's panda, ones found across the nation. Now it's only found in fragmented and isolated regions in the south west of the country as a result of wide spread deforestation in the 20th century.

There are natural causes too..

Habitat destruction through natural processes such as volcanism, fire and climate change is well documented in the fossil record. One study shows that fragmentation of tropical rainforest in euro 3000 million years ago lead to a great loss of amphibian diversity.

Solutions on for this..

~ Protecting remaining intact section of natural habitat.

~ Reduce human population and expansion of urbanisation and industries.

~ Educating the public about the importance of natural habitat and bio diversity.

~Solutions to habitat loss can include planting trees, planting home gardens so as to reduce need for man to need large lands for agricultural farms which lead to habitat loss.

Poaching

- # Poaching:-
- **Poaching** is the hunting and harvesting taking of wild plants or animals, such as through hunting, harvesting, fishing, or trapping.
- # History of poaching
- ~ Millions of years ago, in the Stone Age
- ~Followed through the ages, to even the tribal natives
- ~but it was during the Late Middle Ages that poaching became a punishable offense

- Why Poaching is done???
- ~ Poaching is done for large profits gained by the illegal sale or trade of animal parts, meat and pelts.
- ~ Exists because there is a demand for these products, caused by a lack of education or disregard for the law amongst the buyers.
- ~ Many cultures believe that certain animal parts have medicinal value.

Poaching is not limited to animals its also for plants too……!

Three of the most often poached species in the park are galax, black cohosh, and ginseng.

GALAX

BLACK COHOSH

GINSENG

- How does poaching affect the environment?
- ~Poaching or illegal hunting causes animals endangered of being extinct. If more animals becomes extinct there's a disruption in the food chain, and that will cause major problems in our ecosystem, resulting eventually in new adaptations of animals, and or species beyond human control.
- ~Poaching results in animals being hunted too soon for them to have time to reproduce and repopulate.

Recent Issue on Biodiversity

- Some 75% of the genetic diversity of crop plants been lost in the past century.
- Some scientists estimate that as many as 3 species per hour are going extinct and 20,000 extinctions occur each year.
- Roughly one-third of the world's coral reef systems have been destroyed or highly degraded.
- About 24% of mammals and 12% of bird species are currently considered to be globally threatened.
- More than 50%of the world's wetlands have been drained, and populations of inland water and wetland species have declined by 50% between 1970 and 1999.

Conservation of Biodiversity

- Restoration of Biodiversity
- Imparting Environmental Education
- Enacting, strengthening and enforcing Environmental Legislation
- Population Control
- Reviewing the agriculture practice
- Controlling Urbanization
- Conservation through Biotechnology

Biodiversity in India

Categories	No. of Indian Species	% of Indian Species Evaluated	Species Threatened in India
Mammals	386	59	41%
Birds	1219	-	7%
Reptiles	495	73	46%
Amphibians	207	79	57%
Freshwater Fish	700	46	70%

The Ten Biography Regions of India

- The Trans-Himalayan
- The Himalayan
- The Indian Desert
- Semi-arid Zone
- Western Ghats
- Deccan Peninsula
- The Gangetic Plain
- North East India
- The Islands
- The Coasts

- India figured with two hotspots- The Western Ghats & The Eastern Himalayas in an identification of 25 of the world's biological richest and most threatened ecosystem
- These two hotspots that extends to India are
  - The western Ghats/Sri Lanka
  - The Indo-Burma region (covering the Eastern Himalayas)
- And they are included amongst the top eight most important hotspots.
- The are the areas with higher concentration of endemic species and which usually experience rapid rate of habitat modification and loss.

Western Ghats

- Western Ghats faced with tremendous population pressure the forests of western Ghats and Sri lanka have been dramatically impacted by demands for agriculture and Timber.
- The region is home to rich endemic assemblage of plants, reptiles and amphibians as well as elephants, tiger and endangered lion tailed Macaque.

The Eastern Himalayas

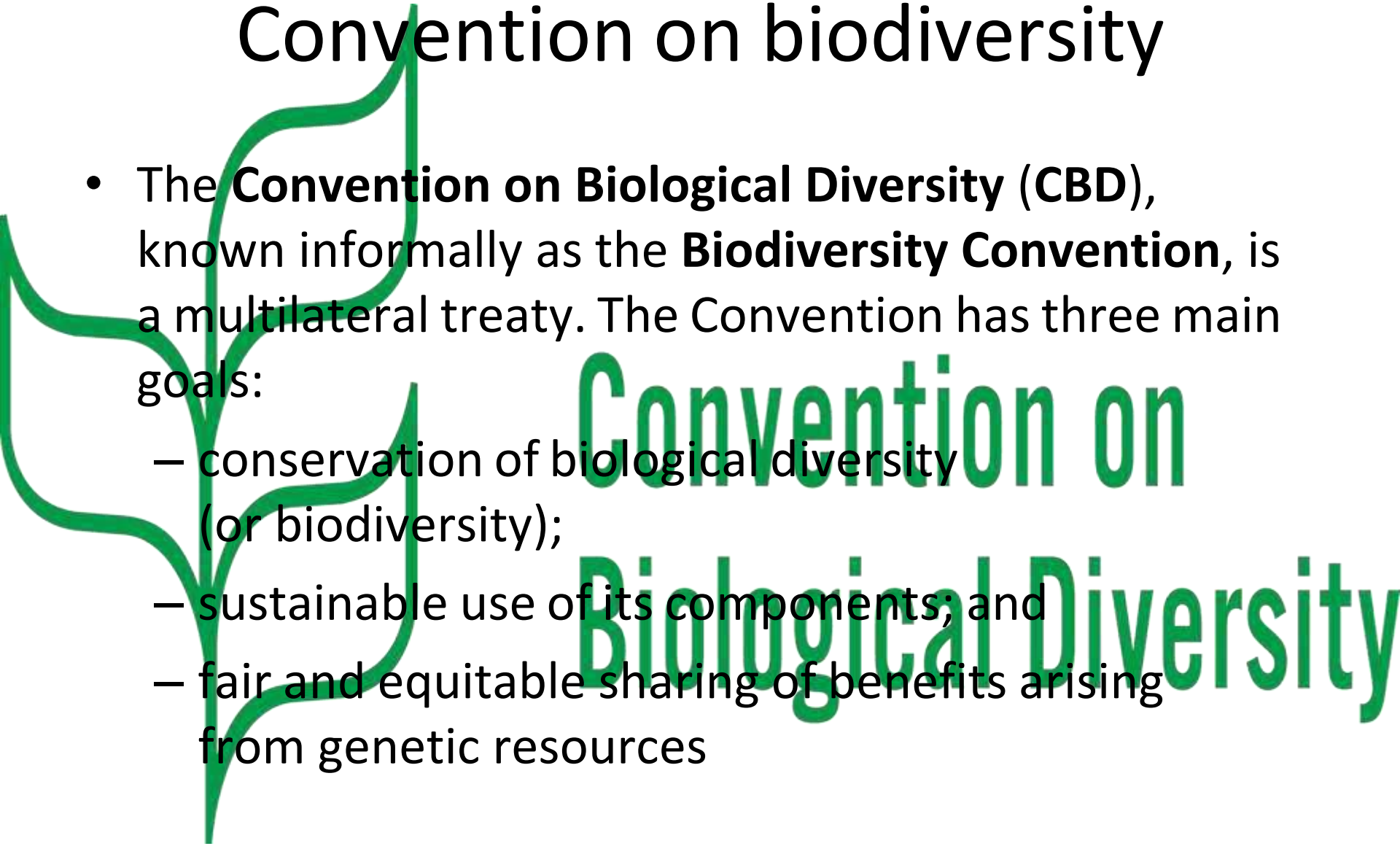
- Himalayas is the home to world's highest mountains, including Mt. Everest. Abrupt rise in rise of mountains results in diversity of ecosystems that range from alluvial grasslands and subtropical broad leaved forests to alpine meadows above the tree line. It's a home to variety of large birds, mammals including tiger, elephants, rhinos and wild water buffaloes.

Biodiversity in Maharashtra

- Flora of Maharashtra is heterogeneous in composition.
- In 2012 the recorded thick forest area in the state was 61,939 km^2(23,915 sq mi) which was about 20.13% of the state's geographical area.
- There are three main Public Forestry Institutions (PFIs) in the Maharashtra state: the Maharashtra Forest Department (MFD), the Forest Development Corporation of Maharashtra (FDCM) and the Directorate of Social Forestry (SFD).

Convention on biodiversity

- The **Convention on Biological Diversity** (**CBD**), known informally as the **Biodiversity Convention**, is a multilateral treaty. The Convention has three main goals:
  - conservation of biological diversity (or biodiversity);
  - sustainable use of its components; and
  - fair and equitable sharing of benefits arising from genetic resources



Conclusion

- Biodiversity is a concept that has no general definition. Usually it is used in a context that stresses the need for attention on our living environment and the sustainable use of natural resources.
- Biodiversity can be divided in different types such as habitat, species and genetic diversity.
- The integrated approach used in coastal zone management is an adequate method in dealing with the matter of biodiversity.

ENVIRONMENTAL POLLUTION

Content

- Definition of pollution
- Types of pollution
  - Air pollution
  - Water pollution
  - Land pollution
  - Noise pollution
  - Radio active pollution
- Conclusion

Definition of pollution

- Pollution is the introduction of contaminants into a natural environment that causes instability, disorder, harm or discomfort to the ecosystem .
- Pollution can take the form of chemical substances or energy such as noise, heat or light.

Types of pollution

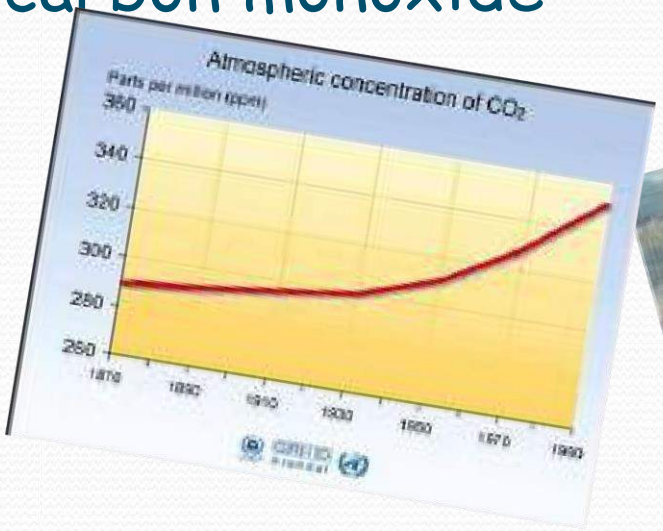
Air pollution

Air pollution : Definition

Air pollution is the introduction of chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or damages the natural environment into the atmosphere.

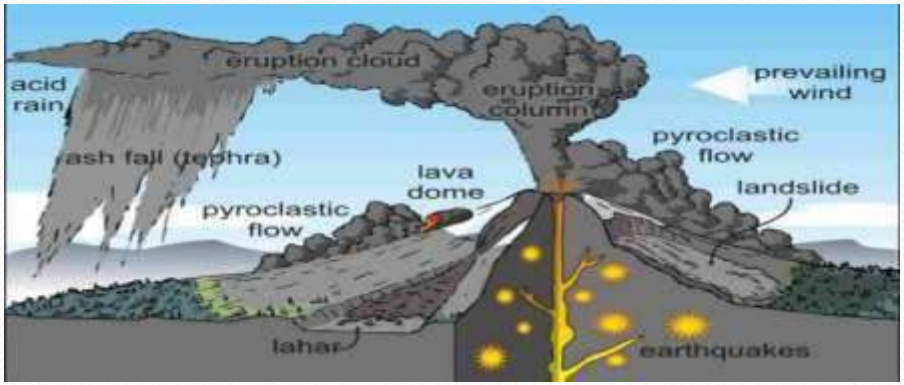
Air pollution : Causes

- - Industries.
- -Automobiles and Domestic fuels
- -Fire
- -High Proportion of undesirable gases, such as sulphur dioxide and carbon monoxide



Air pollution : Effects

- Human health
- Animals
- Plants
- The atmosphere as a whole
- Acid rain



How to prevent air pollution ?

- Carpool
- Walk or ride a bicycle
- Connect your outdoor lights to a timer or use solar lighting.
- Wash clothes with warm or cold water instead of hot.
- Plant trees etc…….

Types of pollution

Water pollution

Water pollution : Definition

Water pollution is the contamination of water bodies (e.g. lakes, rivers, oceans, aquifers and groundwater).

Water pollution occurs when pollutants are directly or indirectly discharged into water bodies without adequate treatment to remove harmful compounds

Water pollution : Causes

- Marine Dumping
- Industrial Waste
- Sewage, mainly from households
- Nuclear waste
- Oil pollution
- Underground storage leaks

Water pollution : Effects

- Diseases like Cholera
- Malaria
- Typhoid (spread during the rainy season)
- Aquatic life gets destroyed

Water pollution : Solutions

- Turn off running water
- Fertilize correctly
- Organize or participate in a clean up
- Join a special society devoted to the prevention of water pollution

Types of pollution

Noise pollution

Noise pollution : Definition

Noise pollution is displeasing human, animal or machine-created sound that disrupts the activity or balance of human or animal life.

Noise pollution : Causes

- Traffic Noise
- Air craft Noise
- Noise from construction and civil engineering works.
- Noise from the Industries.
- Noise from other sources.

Noise pollution : Effects

- Hearing Loss
- High Blood Pressure
- Stress
- Sleep Disturbance
- Colour Blindness

How to prevent noise pollution

- The government should ensure the new machines are noise proof.
- Airports should be away from residential areas.
- ‘No horn’ boards should be put on/near school areas.
- We should talk less and work more.

Types of pollution

Land pollution

LAND POLLUTION

Land pollution is the destruction of Earth's land surfaces through misuse of land resources by human activities. Polluted land has deposits of liquid and solid waste such as rubbish, garbage, paper, glass and plastic objects.

Land pollution : Causes

- Accidental Spills
- Industrial Accidents
- Landfill and illegal dumping
- Agricultural practices
- Mining and other industries
- Oil and fuel dumping
- Buried wastes
- Drainage of contaminated surface water into the soil
- Electronic waste

Land pollution : Effects

- Contaminated lands and environments can:
- Cause problems in the human respiratory system.
- Cause problems on the skin.
- Cause various kinds of cancers.

Land pollution : Effects

- The toxic materials that pollute the soil can get into the human body directly by:
- into contact with the skin.
- washed into water sources like reservoirs and rivers.
- Eating fruits and vegetables that have been grown in polluted soil.
- Breathing in polluted dust or particles.

How to prevent land pollution

- More and more land should be brought under farming.
- Trees should be planted everywhere.
- Waste matter should be disposed immediately
- Avoid drilling lands for underground water.
- Avoid using fertilizer and pesticides for farming.

Types of pollution

Radio Active pollution

Radio Active Pollution : Definition

Despite the Advantage of nuclear as a clean energy, the big concern is the resulted from nuclear reaction, which is a form of pollution called Radio activity.

Radiation (Laser-Rays) will from Radio Active Pollution.

Radio Active Pollution : Causes

- Nuclear power plants(Ex:Neyveli,Kalpakkam)
- Nuclear Weapon(Ex:Missiles)
- Disposal of Nuclear Waste
- Uranium Mining

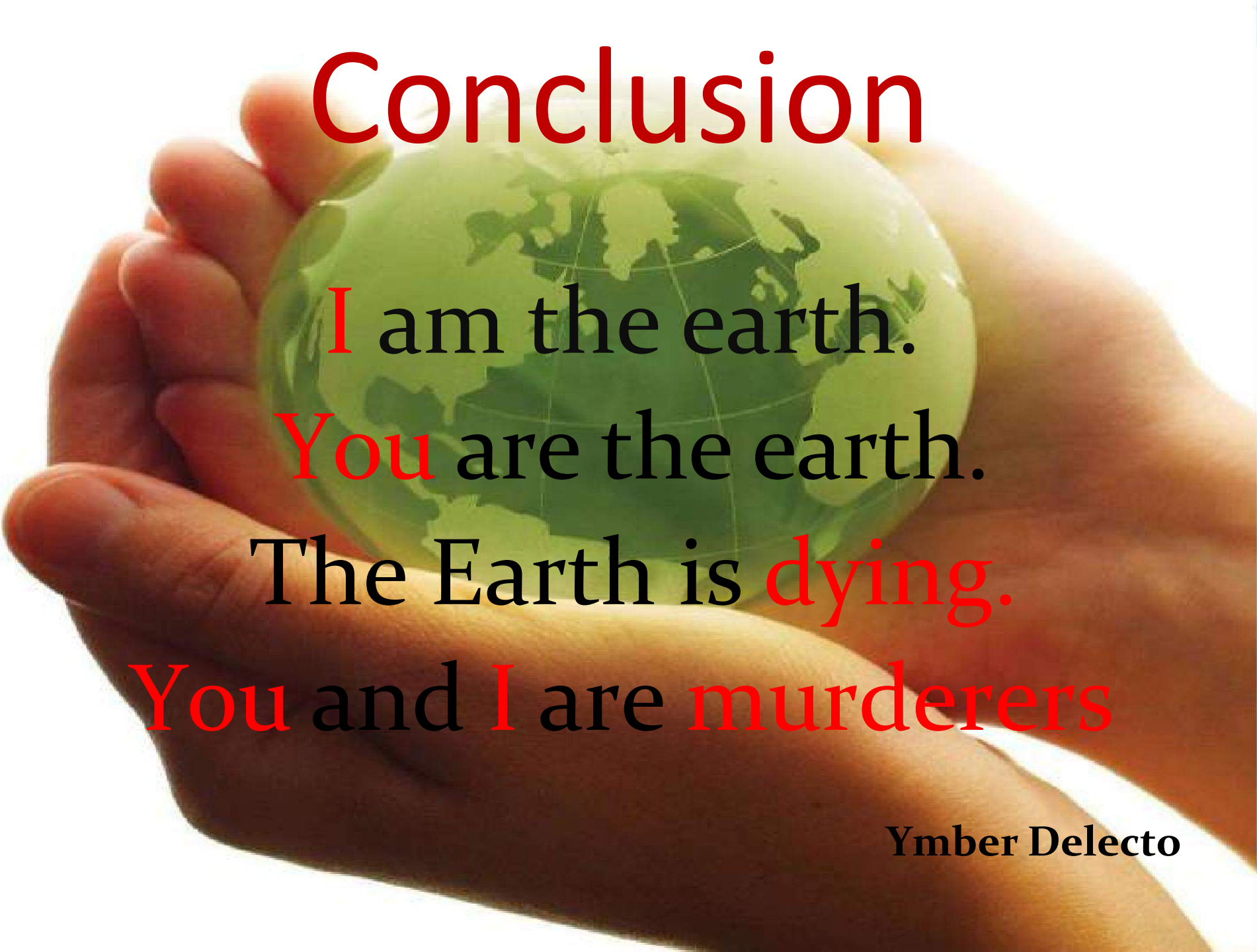
Radio Active Pollution : Effects

- The Diseases include blood in cough
- Ulcer
- Swelling of bone joints
- Cancer
- Lung Cancer
- Skin Cancer
- Bone Cancer
- Eye Problems

How to Prevent of Radio Active Pollution

- Avoid Constructing Nuclear Power Plants
- Avoid Using Nuclear Weapon
- Have Proper Treatment for Nuclear Waste
- Avoid mining for Uranium to a minimal

Conclusion



I am the earth.

You are the earth.

The Earth is dying.

You and I are murderers

Ymber Delecto

Social issues and the environment

Introduction

- We live in a Natural as well as social world
- Development cannot be of only the rich nor it means only high living standards.
- Also not just ECONOMIC development
- It has to be a holistic approach.
- Social aspects, development and environment have a strong relation.

From Unsustainable to Sustainable

- G.H Bruntland, Director of World Health Organisation : "Meeting the needs of present without compromising the ability of future generations to meet their own needs"

Key aspects of Sustainable development

- Inter- generational equity
  - Reduce impacts
  - Hand over a safe, healthy and resourceful environment to our future generations
- Intra-generational equity
  - Support economic growth of poorer countries
  - Provide technological help

Measures for Sustainable development

- Using appropriate technology: concept of "Design with nature"
- 3-R approach: Minimization of resource use, use again and process to get new product from same material.
- Promoting environmental awareness and education
- Carrying capacity: Supporting and Assimilative

Indian Scenario

- Tremendous Population
- Tremendous natural diversity
- Hence makes planning sustainably all the more important but complex
- National Council of Environmental Planning and Coordination set up in 1972.
- Ministry of Environment and Forests set up in 1985.

Social Issues

- Urban problems related to ENERGY
- WATER CONSERVATION
- Resettlement and Rehabilitation issues
- Environmental ethics
- Climate Change
- Global Warming
- Acid Rain and Ozone layer Depletion
- Nuclear Accidents and Holocaust
- Wasteland Reclamation
- Consumerism and waste products

1. Urban problems related to energy

- Cities are the main centers of Economic growth, trade, education, employment
- Now 50% population lives in Urban areas
- Urban sprawl
- Difficult to accommodate
- Uncontrollable and unplanned growth
- Densely populated, consume more resources, NEED MORE ENERGY

Energy demanding activities

- Residential and Commercial lighting
- Private and Public transport
- Modern life style: electronic gadgets
- Industries
- Waste disposal
- Prevention and Control of pollution

Effects

- Unequal distribution of energy
- Power cuts and load – shedding
- Demand energy from other states
- Overall society suffers
- Economic development hampered.

Water Conservation

- Water is a vital resource.
- Majority of water resources are polluted heavily
- Its amount is limited for use
- So conservation is Extremely important
- **Water conservation** refers to reducing the usage of water and recycling of waste water for different purposes such as cleaning, manufacturing, and agricultural irrigation.

Actions...

- Some researchers have suggested that water conservation efforts should be primarily directed at farmers, in light of the fact that crop irrigation accounts for 70% of the world's fresh water use.
- Drip irrigation instead of sprinkle irrigation.
- Common strategies include: public outreach campaigns, tiered water rates (charging progressively higher prices as water use increases), or restrictions on outdoor water use such as lawn watering and car washing.
- 100's of ways to conserve water

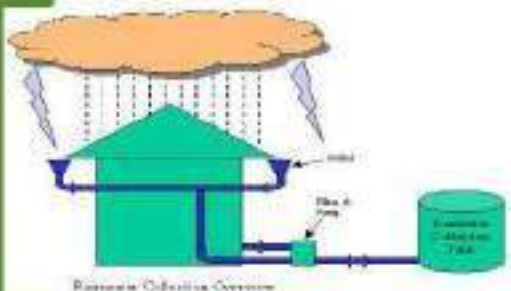
Introduction

- In urban areas, the construction of houses footpaths and roads has left little exposed earth for water to soak in.
- In parts of the rural areas of India, floodwater quickly flows to the rivers, which then dry up soon after the rains stop. If this water can be held back, it can seep into the ground and recharge the groundwater supply.
- This has become a very popular method of conserving water especially in the urban areas.
- Rainwater harvesting essentially means collecting rainwater on the roofs of building and storing it underground for later use. Not only does this recharging arrest groundwater depletion, it also raises the declining water table and can help augment water supply.

Status

- Town planners and civic authority in many cities in India are making rainwater harvesting compulsory in all new structures.
- No water or sewage connection would be given if a new building did not have provisions for rainwater harvesting
- A number of government buildings have been asked to go in for water harvesting in Delhi and other cities of India.

Process



Case study

- The area surrounding the River Ruparel in Rajasthan, is an example of proper water conservation. The site does not receive even half the rainfall received by Cherrapunji, but proper management and conservation have meant that more water is available than in Cherrapunji.
- The water level in the river began declining due to extensive deforestation and agricultural activities along the banks and, by the 1980s, a drought-like situation began to spread.
- Under the guidance of some NGOs (non-government organizations), the women living in the area were encouraged to take the initiative in building johads (round ponds) and dams to hold back rainwater.

- Gradually, water began coming back as proper methods of conserving and harvesting rainwater were followed.
- The revival of the river has transformed the ecology of the place and the lives of the people living along its banks. Their relationship with their natural environment has been strengthened.

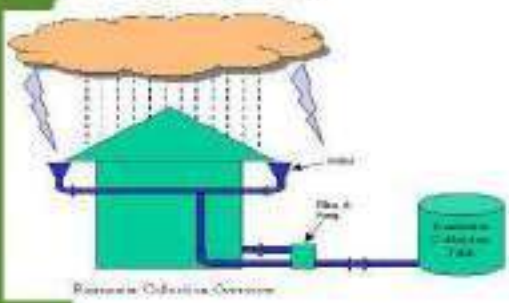
WATER SHED MANAGEMENT

Concept of Watershed

- Watershed is a geo hydrological unit or piece of land that drain at a common point.
- A watershed is defined as any spatial area from which rain or irrigation water is collected and drained through a common point.
- The watershed and drainage basin are synonymous term indicating an area surrounded by a ridge line that is drained through a single outlet.

- A watershed is simply the land that water flows across or through on its way to a common stream, river, or lake.
- A watershed can be very large (e.g. draining thousands of square miles to a major river or lake or the ocean), or very small, such as a 20-acre watershed that drains to a pond.

Process



Watershed management practices

- Watershed management involves many techniques
- The techniques can be summarized as : Grassland development, Gully Plugs, Tree plantation and contour trenching on hill tops and slopes, Contour bunding, Water conservation structures, Lift irrigation schemes, Land leveling etc.
- Public participation and awareness

The Sukhomajri - Water Shed Management Project : A Success Story of Participatory Approach

- Sukhomajri, a small hamlet of about one hundred families with average land holding of 0.57 ha, is located in the foothills of Shivaliks in Panchkula district of Haryana.
- It is at a distance of about thirty kilometers by road to the north-east of Chandigarh.
- Central Soil & Water Conservation Research and Training Institute, Chandigarh.

- Until 1975, Sukhomajra had no source of regular irrigation. The entire agricultural land (92 hectares) was under rain-fed single cropping.
- Small land holdings (less than one hectare per family) coupled with frequent crop failures due to erratic distribution of rainfall, made agriculture less dependable as a means of adequate livelihood.
- Consequently, the people of Sukhomajri were forced to keep a large number of sheep, goats and cows to eke out a living.
- But, once the domestic animals, especially the goats and cows, were allowed to graze freely in the nearby hills, followed by indiscriminate felling of trees for fuel and other domestic consumption, the hill slopes, once covered with lush green vegetation, soon became bare and not even a blade of grass was to be seen.

- In the year 1975, the continuing problem of silting of the prestigious man-made Sukhna Lake in Chandigarh drew the attention of the Central Soil and Water Conservation Research and Training Center, Chandigarh.
- A reconnaissance survey conducted by the Centre under the leadership of Shri P.R. Mishra, the then Officer-in-Charge, revealed that the major source of sediment was about twenty-six per cent of the catchment area located in the close proximity of Sukhomajri and a few nearby villages.
- Sedimentation was caused by the erosion of the bare hill slopes caused by over-grazing particularly by goats whose rearing had been the traditional occupation of the Gujjars inhabiting the village.

- To address the problem the Research Center applied soil conservation techniques developed by combining of mechanical and vegetative measures.
- This reduced the run-off sediment from the highly eroded Shivaliks at a spectacular rate from eighty tonnes to less than one tonne per hectare, within a short span of a decade.
- The vegetative measures consisted of planting of tree species like khair (*Acacia catechu*) and shisham (*Dalbergia sissoo*), in gabi and bhabbar grass (*Eulaliopsis binata*) on mounds of trenches, and also Agave americana and Opuntia dillenii, in critical areas to protect the soil against erosion.
- However, all these measures for containing the sediment in situ did not succeed in the absence of the willing cooperation from the people of Sukhomajri, who depended for their sustenance on the resources available in the catchment area.

- Hence, to promote agriculture and water availability in the area earthern dams were constructed. This resulted in rain water harvesting & storage which could be used by the villages for agriculture through out the year.
- Villagers agreed to protect the hilly watersheds from grazing and illicit cutting of vegetation and in turn, were allowed to cut grass to stall feed their cattle and collect dry and dead wood or pruned branches for their domestic fuel consumption.
- As a result, the forest areas which had a desolate look in the beginning of the project were covered with grass and trees within a period of 10 to 15 years. Grass production increased more than double in the same period (from 3.62 t/ha to 7.72 t/ha).

- At Sukhomajri, four earthen dams have been built between 1976 and 1985. These serve three main purposes;
- to check instantly the gully formation in agricultural fields and, thereby, effectively prevent silting through the erosion of soil;
- to store surplus rainwater from the catchment area to be used later for irrigation after the withdrawal of monsoon and
- rehabilitation of the catchment.

LESSONS FROM SUKHOMAJRI

- Peoples' participation must be ensured right from the beginning.
- The needs and the problems of the people must be identified at the outset.
- Unless a project is aimed at meeting their needs, solving their problems and mitigating their hardship, it may not succeed.
- Watershed Management Projects should have short gestation period. The benefits should be available in shortest possible period.
- Constitution of a village society (HRMS) must be a pre requisite before taking up such projects.
- The emphasis should be on sustainability and equity, i.e., all the common property resources must be available to all sections of the society.

WATER CONSERVATION

Definition

Process of Saving Water for Future Utilization

Need for Water Conservation

- To meet the increasing demands of water.
- To recharge the underground water.
- To reduce the ground water contamination from the intrusion of saline water.
- To reduce the surface runoff loss.
- To increase hydrostatic pressure to stop land subsidence.

Methods of Water Conservation

- Rain Water Harvesting
- Watershed Management

RAIN WATER HARVESTING:

- Ground water plays a critical role in the urban environment.
- Urbanization strongly affects ground water recharge flow and quality thereby creating serious impact on urban infrastructure
- As urban dwellings go on increasing shrinkage of open land leads to continuous decline in ground water levels in many areas.

Rain water harvesting is essential

- Due to rapid urbanization infiltration of rain water into the soil has decreased drastically and recharging of ground water has diminished.
- Over exploitation of ground water resources has resulted in declined in water levels in most part of the country.
- To enhance availability of ground water at specific place and time.
- To improve the water quality in aquifers.
- To improve the vegetation cover.

BENEFITS OF RAIN WATER HARVESTING

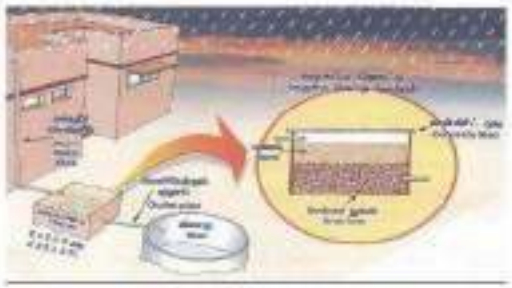
- The ground water level will rise.
- Quality of water improves.
- Soil erosion will be reduced.
- Saving ground water .

RAIN WATER HARVESTING TECHNIQUES:

There are two main techniques of rain water harvestings.

- Storage of rainwater on surface for future use.
- Recharge of ground water.

RAIN WATER HARVESTING



Water shed management

- watershed is a basin like landform defined by peaks which are connected by ridges that descend into lower elevations and small valleys.
- It carries rainwater falling on it drop by drop and channels it into soil and streams flowing into large rivers.
- It involves management of land, water, energy and greenery integrating all the relevant approaches appropriate to socioeconomic background for a pragmatic development of a watershed.

Greening of the watershed through proper management of land, water and energy resource.

The objectives of watershed management

- Conserving soil and water
- Improving the ability of land to hold water
- Rainwater harvesting and recharging
- Growing greenery trees, crops and grasses

RESETTLEMENT AND REHABILITATION

Resettlement

Relocation or displacement of human population

Rehabilitation

TREATMENT – MAKING THE SYSTEM TO WORK AGAIN

- Repairing Damaged Infra Structures
- Providing Safe Land for Building
- Restore Social Services

ENVIRONMENTAL ETHICS

Definition:

Environmental ethics refers to the

Issues.
Principles.
Guidelines.

relating to human interactions with their Environment.

Environmental Problems

a. Acid Rain.
b. Air Pollution.
c. Global Warming.
d. Hazardous Waste

ENVIRONMENTAL ETHICS

Definition:

Environmental ethics refers to the

Issues.
Principles.
Guidelines.

relating to human interactions with their Environment.

Environmental Problems

a. Acid Rain.
b. Air Pollution.
c. Global Warming.
d. Hazardous Waste

CLIMATE CHANGE

Causes

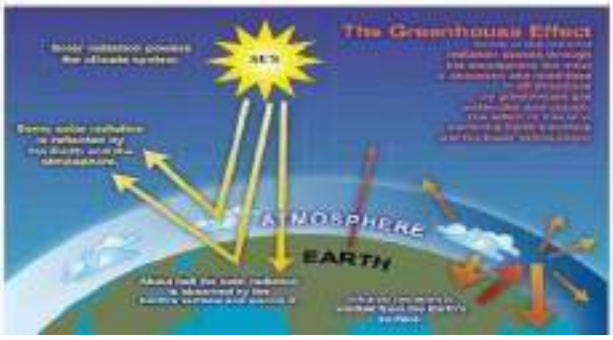
- Uneven Heating – Earth's Surface.
- Properties Air, Land and Water.
- Fossil Fuels – Combustion.
- Green House Gases.

Effects

- Affect Agriculture, Wind and Ocean Current.
- Relocation of Birds, Animals and Humans.
- Acid Rain.

GREEN HOUSE EFFECT

GREEN HOUSE EFFECT



The **greenhouse effect** is a process by which radiant energy leaving a planetary surface is absorbed by some atmospheric gases, called greenhouse gases.

They transfer this energy to other components of the atmosphere, and it is re-radiated in all directions, including back down towards the surface.

This transfers energy to the surface and lower atmosphere, so the temperature there is higher than it would be if direct heating by solar radiation were the only warming mechanism.

Greenhouse gases

By their percentage contribution to the greenhouse effect on Earth the four major gases are:

- water vapor, 36–70%
- carbon dioxide, 9–26%
- methane, 4–9%
- ozone, 3–7%

Global warming is the increase in the average temperature of Earth's near-surface air and oceans since the mid-20th century.

Global surface temperature increased 0.74 ± 0.18 °C (1.33 ± 0.32 °F) during the 20th century.

Most of the observed temperature increase since the middle of the 20th century has been caused by increasing concentrations of greenhouse gases, which result from human activity such as the burning of fossil fuel and deforestation. Global dimming, a result of increasing concentrations of atmospheric

ACID RAIN OR ACID PRECIPITATION

ACID RAIN

As the name suggests, acid rain is just rain which is acidic. The rain becomes acidic because of gases which dissolve in the rain water to form various acids.

In general about 70 percent of acid rain comes from sulphur dioxide (SO_2), which dissolves into the water to form sulphuric acid.

The rest comes from various oxides of nitrogen mainly NO_2 and NO_3, collectively called No_x. Oxides of carbon

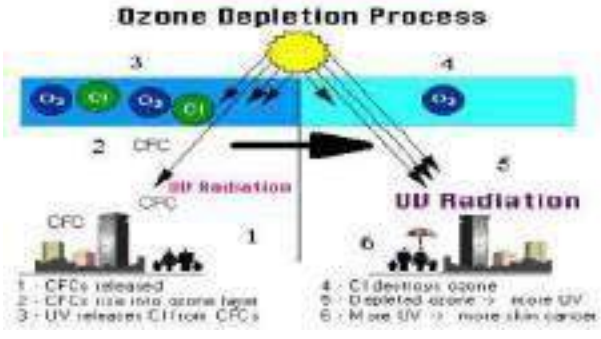
CONTROL METHODS

The best approach to reduce acid rain is to reduce the amount of NO_x, SO_2 and CO_2 being released into the atmosphere.

Fitting a catalytic converter to a car can reduce the emissions of NO_x by up to 90 percent, but they are very expensive, and cause more carbon dioxide to be released, which contributes to the greenhouse effect.

Best option is not to burn fossil fuels, but to use alternative energy sources which are less polluting.

OZONE LAYER DEPLETION



Formation of ozone in the atmosphere:

Ozone absorbs uv radiations and is broken into atomic and molecular oxygen.

$$O_3 \rightarrow 2O$$

$$O_3 \rightarrow O + O_2$$

The products formed combine again to form ozone

$$O + O_2 \rightarrow O_3$$

and hence a dynamic equilibrium is set up due to which the concentration of ozone in the atmosphere remains constant.

The ozone layer protects the earth from the harmful uv radiations.

If the concentration of ozone is reduced (ozone depletion), the concentration of uv radiations reaching the earth increases.

This leads to irritation of the eyes, skin cancer and damage to immune system in human beings.

In agriculture it causes decrease in productivity.

Causes of ozone depletion

Chlorofluorocarbons (CFCs) are used as refrigerants, aerosols and as industrial solvents.

CFCs are noncombustible and volatile. They reach the atmosphere and are broken down into chlorine free radicals by uv radiations.

Ill effects :

Due to ozone hole, the uv radiation increases causing eye infections, skin cancer in human beings and decrease in photosynthesis in plants.

Control of ozone depletion

Ozone depletion can be controlled by using hydrochlorofluorocarbons and hydrofluoroalkanes in place of CFCs. These contain more hydrogen in their molecule and undergo oxidation readily.

NUCLEAR ACCIDENTS AND NUCLEAR HOLOCAUST

Causes

- Trucks carrying radioactive waste
- Leakage in reactor vessel
- Explosion test – underground
- Improper disposal

Effects

Nuclear radiation of

- Low Dose(101 – 250 rads) – Fatigue, Vomiting and Loss of Hair
- Higher Dose(400-500 rads) – Bone Marrow, Blood Cells, Cancer
- Very Higher Dose(10,000 rads) – Heart, Brain and Cancer

WASTE LAND RECLAMATION(or RECOVERY)

Types of Waste Lands

- Uncultivable Waste Lands
- Cultivable Waste Lands

Causes of Waste Land Formation

- Over-exploitation of natural resources.
- Overgrazing, deforestation, soil erosion, water logging.
- Mining activities, growing demand for fuel, fodder, wood & food.
- Developmental activities – dams, power projects.

Objectives for Need of Waste Land Reclamation

- Increasing population – need Food, Land and Shelter
- Prevent – Soil Erosion, Landslides and Drought
- Conserve – Biological Resources and Natural Ecosystems
- Avoiding – Over exploitation of natural resources

AIR (PREVENTION AND CONTROL OF POLLUTION) ACT, 1981

The objective of the Act is to provide for the prevention, control and abatement of air pollution

Functions of Central Board

- Advice to central government on any matter related to air quality.
- To execute nation wide awareness programme.
- To provide technical assistance and guidance to state boards
- Collect technical and statistical data to prepare manuals, code, and guide related to air.
- To lay down standards for the quality of air.

ENVIRONMENTAL PROTECTION ACT, 1986 (EPA)

Environment: includes water, air and land and the interrelationship which exist among and between them and human beings, other living creature, plants, micro-organisms and property.

Environmental Pollutant: means any solid, liquid or gaseous substances present in such concentration as may be or tend to be injurious to environment.

Hazardous Substance: means any substance or preparation which by reason of its chemical or physico-chemical properties or handling is liable to cause harm to human beings, other living creatures, plants, micro-organisms, property or the environment.

Resettlement and Rehabilitation

Intro

- Development projects essential
- To have development natural resources are utilized.
- Most affected are locals or native people
- Poorest of poor and underprivileged people
- Various types of project lead to displacement of locals

Displacement due to dams

- Need space for such huge project.
- Locals, tribals and natives are affected.
- Families have to leave the ancestral place and need to settle elsewhere.
- Hirakund dam: 20000 people in 250 villages
- Bhakra Nangal : not even half of displaced resettled.
- Sardar Sarovar: 41,000 families will get displaced due to reservoir.
- Tehri dam: 10000 people of Tehri town

- A review by the World Bank posits that an average of 13,000 people are displaced by each new large dam constructed currently (Cernea 1996b).
- By this estimate, Indians displaced by the country's 3000+ large dams would number over 39 million.

Displacement due to mining

- Several thousand hectares of land are covered in Mining operations
- Mining accidents also cause displacement.
- Jharia Coal Mines, Jharkhand: 0.3 million people asked to leave the place
- Reason: Underground fires
- No alternative provided yet.
- Cost of R& R: 18000 crores

Displacement due to creation of Protected area

- Displacement also takes place where protected areas are established as compensatory measures for the forest lands and natural habitats that are lost.
- A welcome step for natural resource conservation
- But tribals loose the right to their natural homes
- Entry is prohibited in core areas.
- Valmiki Tiger reserve: 147 villages in Bihar of Tharu Community
- Wayanad Wildlife Sanctuary: 53,472 tribal families in Kerala

Rehabilitation- issues and policies

- Right to housing a basic human right
- Government acquires land for various reasons
- Already poor tribals most affected.
- Loss of land, food, home, jobs, property assets, social isolation
- Cash compensation not enough, Tribals are unaware so might be a case of cheating.
- Communal settlement does not happen.

Policy

- Department of Land Resources, Ministry of Rural Development has formulated a National Policy on Resettlement and Rehabilitation for Project Affected Families, 2003 with the objectives to:
- Minimize displacement and to identify non-displacing or least-displacing alternatives;
- Plan the resettlement and rehabilitation of Project Affected Families, (PAFs) including special needs of tribals and vulnerable sections;
- Provide better standard of living to PAFs; and
- Facilitate harmonious relationship between the Requiring Body and PAFs through mutual cooperation.
- National Policy on Rehabilitation and Resettlement 2007

Climate change

- Climate is average weather of an area
- Control temperature, evaporation rate, seasons, moisture content.
- Conditions if prevail for 30 years...its said to be the climate of an area
- Currently Climate is Changing

GLOBAL WARMING

- Overall increase in temperature few degrees.
- It happens when greenhouse gases (carbon dioxide, water vapor, nitrous oxide, and methane) trap heat and light from the sun in the earth's atmosphere, which increases the temperature.
- This hurts many people, animals, and plants.
- Many cannot take the change, so they die.

Facts

- Unsustainable consumption patterns of the rich industrialized nations are responsible for the threat of climate change.
- Only 25% of the global population lives in these countries, but they emit more than 70% of the total global CO_2 emissions and consume 75 to 80% of many of the other resources of the world.
- Impacts are already being seen in unprecedented heat waves, cyclones, floods, salinisation of the coastline and effects on agriculture, fisheries and health.

Why should India be Concerned about Climate Change?

- India is home to a third of the world's poor, and climate change will hit this section of society the hardest.
- Set to be the most populous nation in the world by 2045, the economic, social and ecological price of climate change will be massive.
- The three main 'categories' of impacts are those on agriculture, sea level rise leading to submergence of coastal areas, as well as increased frequency of extreme events. Each of these pose serious threats to India.
- India's main energy resource is coal. With the threat of climate change, India is called upon to change its energy strategy based on coal, its most abundant resource, and to use other energy sources (e.g. oil, gas, renewable and nuclear energy) which may turn out to be expensive.

Green House Effect

- The **greenhouse effect** is a naturally occurring process that aids in heating the Earth's surface and atmosphere.
- It results from the fact that certain atmospheric gases, such as **carbon dioxide**, **water vapor**, and **methane**, are able to change the energy balance of the planet by absorbing **longwave radiation** emitted from the Earth's surface.
- Without the greenhouse effect life on this planet would probably not exist as the average temperature of the Earth would be a chilly -18° Celsius, rather than the present 15° Celsius.

- Anthropogenic activities increase the concentration of green house gases.
- Enhanced green house effect
- Carbon dioxide from emissions
- Chloroflurocarbons
- Methane
- Nitrogen oxides

Effects

- Change in Wind current patterns
- Ocean currents will change
- Hydrological cycle will intensify
- Sea level rise: submergence of areas.
- Changed agricultural production
- Cases of flood, droughts, cyclones on a rise.

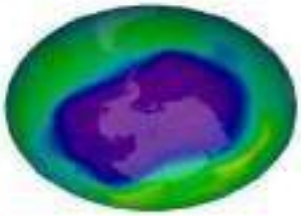
- Global warming is affecting many parts of the world. Global warming makes the sea rise, and when the sea rises, the water covers many low land islands. This is a big problem for many of the plants, animals, and people on islands.
- The water covers the plants and causes some of them to die. When they die, the animals lose a source of food, along with their habitat.
- When the plants and animals die, people lose two sources of food, plant food and animal food. They may also lose their homes. As a result, they would also have to leave the area or die. This would be called a break in the food chain, or a chain reaction, one thing happening that leads to another and so on.

- The oceans are affected by global warming in other ways, as well. Many things that are happening to the ocean are linked to global warming. One thing that is happening is warm water, caused from global warming, is harming and killing algae in the ocean.
- It is killing algae, but it is also destroying many huge forests.
- Global warming is also causing many more fires that wipe out whole forests. This happens because global warming can make the earth very hot. In forests, some plants and trees leaves can be so dry that they catch on fire.

Solution

- Renewable energy
- Biofuels
- Afforestation
- Reduce the current rate of CFCs use
- Trap methane for fuel
- Potential of algae in Carbon dioxide utilization
- Sustainable agriculture

Ozone layer depletion



Natural sunscreen: Ozone layer

- The production and emission of CFCs, chlorofluorocarbons, is by far the leading cause.
- CFCs in the stratosphere. There, the chlorine atom is removed from the CFC and attracts one of the three oxygen atoms in the ozone molecule. The process continues, and a single chlorine atom can destroy over 100,000 molecules of ozone.
- In 1984, ozone layer hole was discovered over Antarctica

ENVIRONMENTAL LEGISLATION

- India first country to have made provisions for environment protection in its constitution
- After Stockholm Conference , 1972
- Many laws and rules have been made
- **Article 48- A** : *The state shall endeavour to protect and improve the environment and to safeguard forests and wildlife of the country.*
- **Article 51 A (g):** - *It shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures*

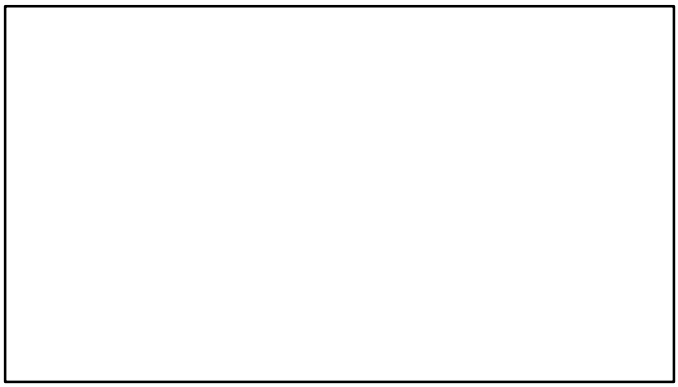
ACTS

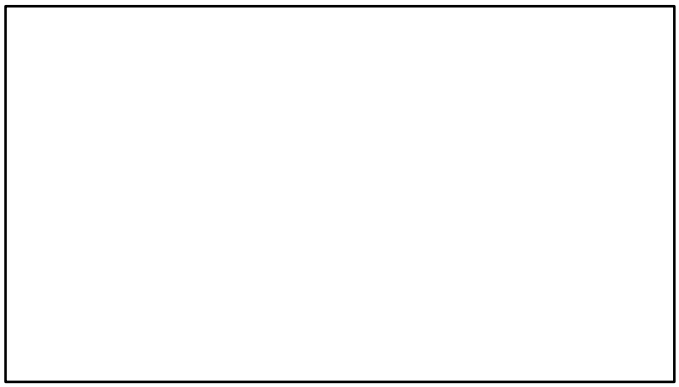
- Wildlife (Protection) Act, 1972
- Water (Prevention and Control of Pollution) Act, 1974
- Forest (Conservation)Act, 1980
- Air (Prevention and Control of Pollution) Act, 1981
- The Environment (Protection) Act, 1986
- The Bioreedical waste (Management and Handling) Rules , 1998
- The Municipal Solid Waste (Management and Handling) Rules, 2000
- The Noise Pollution (Regulation and Control) (Amendment) Rules,2002
- The Biological Diversity Act,2002

Environmental Ethics

- Ethical behaviour is of utmost importance
- We believe and think: Man is all powerful and supreme creature of the earth.
- Nature has provided us with resources and she nourishes us like our mother, so we should respect and nurture her
- Live sustainably.

- Two views:
- Anthropogenic and Eco centric.
- Earth ethics or environmental guidelines help us to protect our mother earth.
- DO NOT's and DO's
- Having fewer wants = limits to growth = good environment





Human population and the environment

INTRODUCTION

- **Population :** The word population has been derived from the Latin word "populatio" which means people.
- The group of individual species which occupy a definite geographic area is defined as ***population.***
- **Population Growth :** The change in population per unit area at particular time is called ***population Growth.***

Population density :Population density is defined as the number of individual or people per unit area in per unit volume of Environment.

Carrying Capacity : Maximum population size indefinitely supported by available resources .

Human Settlement

- The human settlement can be defined as communities who live in city, village or town with all social, material ,organizational, spiritual and cultural elements which exist and sustain for long time.
- The human settlement needs natural resources, physical elements as well as services to sustain.
- These components comprises of fresh clean air, water , food, shelter and services include like education, medical facilities.

Environmental factors governing human settlement

- **LAND :** As population increased , people started taking over more and more land for human settlements. Land was used to develop infrastructures like roadways , public complexes and industries.

- **FOOD :** With the increase in population , there was a demand for more and more food and so more land was started to be used for agricultural activities.

Development of advanced technologies in the field Of agriculture caused use of fertilizers and pesticides for increasing productivity which deteriorated the quality of environment and health of human beings.

- **Water Resources:** High population and settlement of human beings in different places caused the problem of water scarcity due to unequal distribution of water resources and unplanned use of these resources for industrialization and urbanization.

- **ENERGY RESOURCES :** Conventional energy resources started depleting due to high demand of increased population for energy.

- **FOREST RESOURCES :** Due to increased population , use of more land area for human settlement and industrialization also increased.

Population Pollution

- Population pollution is the pollution caused due to ***overpopulation.***

- Overpopulation is the condition when the population (number of organism) exceeds the maximum ***carrying capacity*** of the environment.

Population Pollution

- The maximum carrying capacity of environment is the capacity to support human beings with the availability of food , water , shelter, as well as protecting human beings against the extremities in environment.
- Over population is not a function of size or density of the population.
- Determined by calculating ratio of population to available sustainable resources.

Reasons for Overpopulation

High Birth Rate :

- The crude birth rate is the number of child's birth per 1000 people per year.
- If the birth rate is high , it implies more number of people will be for human settlement and will therefore cause overpopulation.
- Birth rates are affected by a number of factors :
  - Social beliefs
  - Religious beliefs
  - Mortality rate
  - Literacy
  - Economic prosperity
  - Abortion rate

Low Death Rate:

- Decline in mortality rate
- The crude death rate is the number of deaths per 1000 people per year.
- Low death rate is basically due to technological advancement in the field of medical science which reduced the mortality rate.
- Other reason for this may be: Average age , Nutritional levels, Standard of diet and housing, Access to clean water, Hygiene level.

Migration :

- People from towns and villages generally migrate to cities in search of jobs and better living standards which overpopulates the cities.

- Similarly, people from developing countries try to migrate to developed countries making them overpopulated.

ILLITERACY :

- People of lower and poor classes generally have larger families due to poor education facilities.

- In India, particularly in villages , due to religious beliefs or due to eagerness to have a male child people tend to have big families.

Effects of Population Explosion

- ***Population Explosion:*** When the population increases suddenly, it is termed as population explosion.
- ***Population Crash :*** When the population of human beings decreases , it is called population crash.
- It is different from Overpopulation, since this condition arises when economic development fails to maintain pace with the population growth.

Effects of Population Explosion

1. ***High Demand Of Basic Needs :*** Population explosion causes scarcity of food and increase in the prices of food items.

- It also leads to the formation of slums in big cities.
- Shortage in agricultural land and water may also cause starvation in some parts.
- It creates problems like rush in transportation, education and medical Facilities.

2. ***Reduction In Natural Resources :*** Population Explosion causes depletion in natural resources due to more consumption of these resources by the people.

It leads to high consumption of fossil fuels , minerals and forest resources.

More forest will be cut down to provide wood for housing and fuel.

More water is required for drinking, irrigation and industrial purpose.

3. ***Generation Of Huge Quantity Of Waste:***

- Population explosion results in generation of wastewater , industrial effluents and solid waste which poses the stresses over the facilities for disposal of wastewater.
- Causes ecological imbalance

4. OTHER EFFECTS :

(a) Increase in migration rate and reduction in living standard of people.

(b) Reduction in agriculture land.

(c) Increase in unemployment

(d) Deterioration in the quality of environment due to pollution in soil , air , water and air.

(e) High crime rate

(f) Energy crisis

(g) Increases number of slums

Population Growth Rate

- The population growth can be expressed by Population Growth Rate.
- *Population Growth Rate* is the fractional rate at which the number of individuals in a population increases.

$$\text{Growth rate} = \frac{(\text{population at end of period} - \text{population at beginning of period})}{\text{population at beginning of period}}$$

Control of population growth

1. Education
2. Living standard and employment
3. Government benefits and incentives
4. Publicity

Control of population growth

- **1.Education**
- Improvement of literacy rate in villages and lower and middle class of people, particularly in women can control the population growth.
- **2.Living standard and employment**

  Employment will improve the living standard of people so there will be improvement in education and awareness of family planning which could control the population growth.

3.Government benefits and incentives

- Implementation of government policies to give special incentives to people having only two children and benefits to such children in education later on ,may play an important role in control of population growth.

4.Publicity

- Publicity by giving advertisements and incentives, stating importance ,need and significance of birth control and family planning may also control growth.

$$P_n = P + n\,I$$

P_n=population forecasted

N=Decades

P=Present population

I=Average Increment of a decade

Geometrical increase methods

- Principle of this method is that the percentage growth rate of population with time is constant.
- For the past three or four decades , data for future population is calculated by the formula given below.

$$P_n = P_o\{ 1+r/100\}^n$$

- P_o= Initial population
- Pn= Population forecasted for n decades.
- r= % growth rate of population

NOTE= This method is used only for those cities having high population growth.

WOMEN AND CHILD WELFARE

- IN THE COUNTRY LIKE INDIA, WOMEN ARE ALWAYS HAVING A PLACE IN THE HOLY SERMON, EVEN PEOPLE FEEL THAT THE WOMEN ARE BEING A CONSTANT SUPPORTER TO HIS FAMILY MEMBERS AND ESPECIALLY HER HUSBAND.
- BUT ON THE OTHER HAND, THE EVILS LIKE DOWRY AND FEMALE FETICIDE ARE BEING THE OBSTACLES TO THE GROWTH AND DEVELOPMENT OF THE WOMEN.
- IT HAS BEEN SEEN THAT MOST OF THE WOMEN ARE LIVING IN THEIR DEPRESSED, CRUSHED AND EXPLOITED PERSONALITIES.
- THOUGH SOME WOMEN ARE FOUND DOMINATING IN EXPOSING THEIR STRENGTHS AND TALENTS. NOW A DAYS ARE LEADING IN ALMOST ALL FIELDS.
- IN THE ELECTION ALSO 33% SEATS ATE KEPT RESERVED FOR WOMEN, SO THAT THEY CAN EXPLORE THEIR LIMITS AND CAN BE A PART IN ECONOMIC AND SOCIAL ADVANCEMENT.

- THE REASON WHY WE NEED TO PROVIDE SOME STATUTORY PROTECTIONS TO THE RIGHTS OF THE WOMEN IS, THEY ARE BEING FORCED BY THE FAMILY MEMBERS AND SOCIETIES NOT TO THINK OUT OF THE BOX .
- AFTER MARRIAGE WOMEN ARE NOT ENCOURAGED TO TAKE PART IN ANY PRODUCTIVE ACTIVITIES AND ARE ONLY ALLOWED TO TAKE CARE OF THEIR FAMILY AND ADJUST WITH THE NEW ENVIRONMENT.
- THE TRADITIONS LIKE DOWRY, SATI PRATHA, AND ENCOURAGING ONLY MALE BIRTH NECESSITATES THE NEEDS TO PROVIDE SOME STATUTORY PROTECTIONS TO THE RIGHTS OF WOMEN.
- FOLLOWING ARE SOME OF THE ACTS WHICH HELPS THE WOMEN TO STAND ON THEIR FEET AND ENABLES THEM TO FIGHT AGAINST INJUSTICE.

1. DOWRY PROHIBITION ACT, 1961: TO PAY OR DEMAND FOR DOWRY IS A NON COGNIZABLE OFFENCE. (IT IS COGNIZABLE AS PER THE AMENDMENT MADE IN THE ACT AFTERWARDS)
2. HINDU WIDOW REMARRIAGE BILL
3. THE HINDU WOMEN'S RIGHTS TO PROPERTY
4. THE HINDU SUCCESSION ACT
5. THE EQUAL REMUNERATION ACT: TO EQUALIZE THE WAGE TARES FOR MEN AND WOMEN EMPLOYEES WORKING AT THE SAME POSTS.
6. WOMEN AND GIRL ACT 1956- TO PROTECT OR TO UPLIFT FROM ENTRAPPING WOMEN TO NON-ETHICAL ACT.

- **CHILD WELFARE:** FOLLOWING ARE SOME OF THE PROGRAMMES UNDERTAKEN FOR CHILD WELFARE UNDER THE "NATIONAL CHILDREN BOARD".

1. **INTEGRATED CHILD DEVELOPMENT SERVICE:**
   - IMPROVING NUTRITIONAL AND HEALTH STATUS OF CHILDREN.
   - PROPER PSYCHOLOGICAL AND SOCIAL DEVELOPMENT OF CHILDREN.
   - REDUCING INCIDENCE OF THEIR MALNUTRITION, MORTALITY, MORBIDITY AND SCHOOL DROPOUT.
   - ENHANCING CAPACITY OF MOTHER TO LOOK AFTER NORMAL HEALTH AND NUTRITIONAL NEEDS OF CHILD THROUGH PROPER HEALTH, NUTRITION AND EDUCATION.
2. **BALWADI NUTRITION PROGRAMME: (1970-71)**
   - TO PROVIDE FULL NUTRITION.
   - PROVIDE FACILITIES AND INFORMAL PRE-SCHOOL EDUCATION TO CHILDREN 3-5 YEARS OF AGE.
3. **TOY BANK SCHEME: (1986)**
   - TOY ARE COLLECTED IN SCHOOLS FROM CHILDREN AND ARE SENT TO ANGANWADI, BALWADI AND NURSERIES FOR DISTRIBUTING TO CHILDREN WHO CANNOT AFFORD TO BUY SUCH TOYS.

4. **CHILD LABOUR ERADICATION SCHEME: (1994)**
   - TO SHIFT THE CHILD LABOUR FROM HAZARDOUS INDUSTRIES TO SCHOOL.
5. **MID-DAY MEAL SCHEME: (1995)**
   - PRIMARY SCHOOLS ARE PROVIDED FREE MID-DAY MEAL. (AKSHAYPATRA)
6. **THE CHILD LABOUR (PROHIBITION AND REGULATION) ACT, 1986:**
   - PROHIBITS THE EMPLOYMENT OF THE CHILDREN UNDER THE AGE OF 14 YEARS.
7. **INTEGRATED CHILD DEVELOPMENT PROGRAMME: (1975-76)**
   - SUPPLEMENTARY NUTRITION
   - IMMUNIZATION
   - HEALTH CHECKING SERVICES
   - HEALTH EDUCATION
   - NON-FORMAL EDUCATION
   - OTHER RELATED SERVICES

ENVIRONMENT AND HUMAN HEALTH

- HUMAN POPULATION AND ENVIRONMENT:
  - DUE TO INCREASE IN POPULATION, WE STARTED DESTROYING NATURAL RESOURCES TO OBTAIN SOME OF THE SERVICES LIKE:
  - DESTRUCTION OF FORESTS FOR FIRE WOOD, CONSTRUCTION AND FURNITURE.
  - DRILLING THE BOTTOM OF THE SEA FOR OBTAINING OIL FOR TRANSPORTATION.
  - CONVERTING FORESTS INTO AGRICULTURAL LAND FOR GROWING AND INCREASING FOOD PRODUCTION.
  - USE OF WATER AT RESIDENTS AND INDUSTRIES, CONSTRUCTION OF DAMS FOR WATER STORAGE.
  - LAND POLLUTION DUE TO THE ESTABLISHMENTS OF TEXTILE AND DYING-BLEACHING INDUSTRIES.
  - IN THE PROCESS OF MAKING LIFE MORE COMFORTABLE, WE DEGRADED THE ENVIRONMENT.
  - THE ENVIRONMENTAL POLLUTION IS THE EFFECT OF ALL HUMAN ACTIVITIES LIKE, URBANIZATION, INDUSTRIALIZATION AND POPULATION DENSITY.
  - THE GREATEST POLLUTION IS THE POPULATION GROWTH.

- THE FOLLOWING ARE THE REASONS WHY THE POPULATION GROWTH IS THE GREATEST POLLUTION

1. AREAS WHERE THE DIGGING PROCESS IS UNDERTAKEN FOR EXTRACTING MINERALS, BECOMES USELESS FOR AGRICULTURAL AND VEGETATION PROCESS. THE PROCESS MAY EXCLUDE SOME USEFUL MINERALS AND MAKE LAND INFERTILE.
2. USE OF WOOD FOR COUNTLESS ACTIVITIES DESTROYS THE FORESTS. DEFORESTATION INCREASES THE LEVEL OF CO2. THIS CAN INCREASE THE CHANCES OF GREEN HOUSE EFFECT.
3. DUE TO ESTABLISHMENT OF DIFFERENT INDUSTRIES, SMOKE, DUST PARTICLES AND POISONOUS GASES ARE EMITTED FROM THE CHIMNEYS OF THE FACTORIES. THESE INCREASES AIR AND WATER POLLUTION AND ALSO INCREASES THE CHANCES OF WATER AND AIR BORNE DISEASES.
4. INCREASED TEMPERATURE WILL ALTER THE SEASON CYCLE AND ADVERSELY AFFECTS THE PRODUCTIVITY OF THE CROPS. EVEN SOME SENSITIVE LIVING SPECIES MAY FACE SURVIVAL PROBLEM.
5. TONS OF GARBAGE AND RUBBISH THROWN EVERYDAY, REDUCES THE SINKING CAPACITY OR GARBAGE STORAGE CAPACITY OF THE EARTH AND WE MAY FACE THE PROBLEM OF GARBAGE DISPOSAL IN NEAR FUTURE.

Arithmetic Increase Method

- This method is based on the assumption that population increase at a constant rate.
- Thus future population is given as
- $P_n = P + n I$
- Where,
- P_n – Future population
- P = Population at present
- n – No of decades between now and future
- I = average increment for a decade

This method of population forecasting is used for large cities which have reached their saturation population.

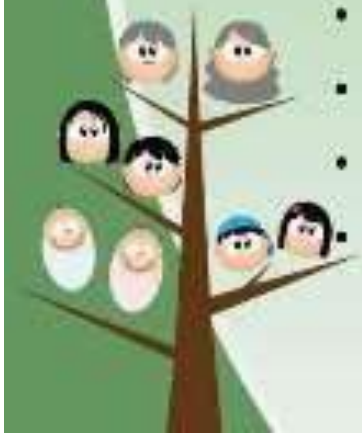
Geometric Increase Method

In this method per decade percentage increase or growth rate is assumed to be constant and the increase is compounded over the existing population every decade.

$$Pn = Po(1 + \frac{r}{100})^n$$

Where,

- P_n – Future Population
- P_o = Initial Population
- **r**– rate of growth
- **N**= no of decades



Incremental Increase Method

- In this method per decade growth rate is not assumed to be constant as in the arithmetic or geometric increase method but it is progressively increased or decreased depending on past data
- $P_u = P + nI + \frac{n(n+1)}{2} Y$

- P_u = Future Population
- P – Initial Population
- I = Average increase in population
- Y – Average of Incremental Increase
- n = no of decades

❖ HUMAN RIGHTS

- EQUITY
- NUTRITION,HEALTH & HUMAN RIGHTS

EQUITY

Have equality among people.

Have equal rights on use of natural resources.

NUTRITION,HEALTH & HUMAN RIGHTS

Proper health & nutrition among people.

Every human has right to life.

VALUE EDUCATION

- ENVIRONMENTAL VALUES
- VALUING NATURE
- VALUING CULTURES
- SOCIAL JUSTICE
- HUMAN HERITAGE
- EQUITABLE USE OF RESOURCES
- COMMON PROPERTY RESOURCES
- ECOLOGICAL DEGRADATION

ENVIRONMENTAL VALUES

We should have understanding between nature.

Protect the forest & wildlife.

Protect & improve environment.

VALUING NATURE

Protect natural ecosystem.

Protect the rights of local people.

VALUING CULTURES

We must value the cultures of tribal people.
We must respect their way of life.

SOCIAL JUSTICE

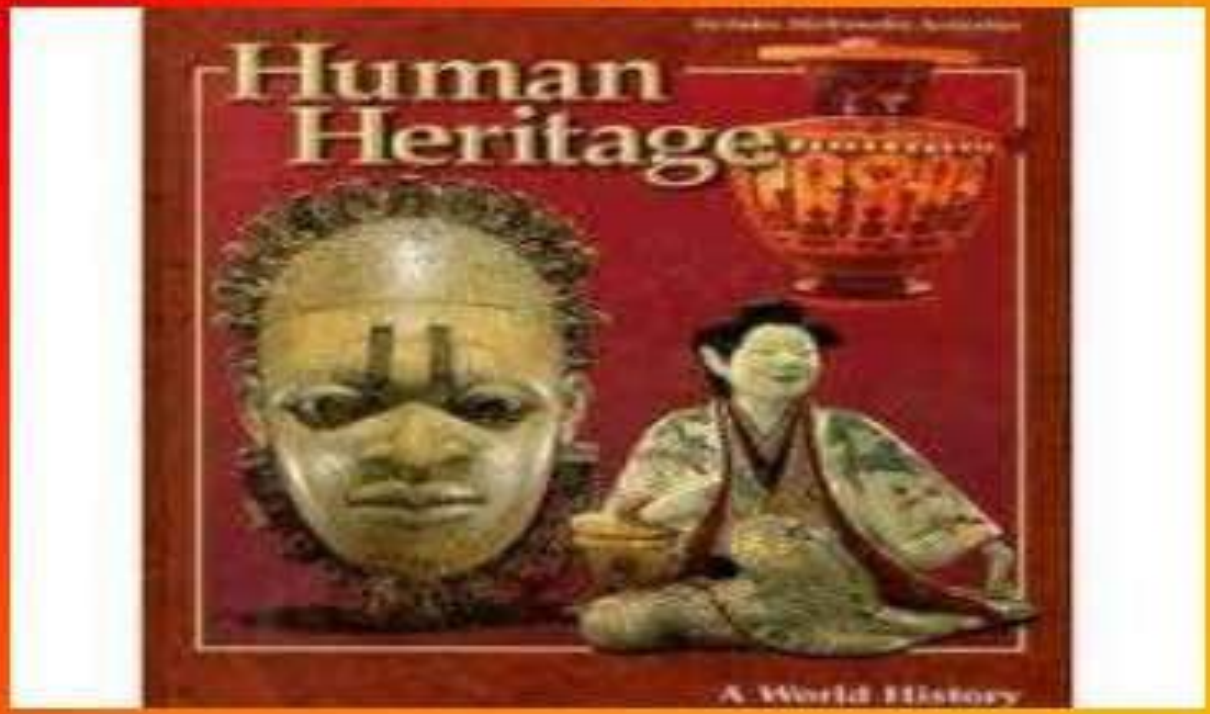
Safeguard the rights of poor people.

Respect & protect their tradition.

HUMAN HERITAGE

Heritage preservation is a growing environmental concern,because:

- we have undervalued this heritage.
- it is vanishing at an astonishing pace.



EQUITABLE USE OF RESOURCES

Less people use more resources & energy.
This leads to great pressure on the environment.
We must use the resources equally & sustainably.

COMMONLY OWNED RESOURCES

Common resources that we use:

Water that nature recycles,forests and

Grasslands which maintain our climate.


Thank you