

Multi Disciplinary Nature of Environment Studies

The word "Environment" is derived from the word "Environ" which means to encircle, or surround. Hence everything surrounding us is called environment.

Defⁿ -

Environment is the sum of all social, economical, biological, physical or chemical factors which constitute the surrounding of living organism of man.

Multi Disciplinary Nature of Environment studies -

① Environmental science is a multi disciplinary branch of science involving chemistry, physics, life science, agriculture, public health, medical science, geography, atmospheric science, sanitary engineering & many other fields.

② Environmental science is the study of characteristics, composition, function & systematic study of different components of environment. (The environment includes both non living (abiotic) & living (biotic) components.)

③ Economics, sociology, education & mass communication help in understanding the socio economic aspects of environment.

④ Magnetism, statistics & computer science help in modeling & management of environment. Thus environmental science is a multidisciplinary science.

✓ Scope of Environment -

Environment consists of all living & non-living things which surround us. Therefore the basic components surround us are -

- | | |
|---------------|---------------|
| ① Atmosphere | ⑤ Lithosphere |
| ② Hydrosphere | ④ Biosphere |

① Atmosphere :-

① Atmosphere is the protecting blanket of gases surrounding the earth. It sustains life on the earth.

② It absorbs most of the cosmic rays from outer space & a major portion of electromagnetic radiation of soil.

③ It regulates the temperature preventing the earth from becoming too hot or too cold.

④ Atmosphere is composed of Nitrogen, oxygen, besides argon, carbon dioxide & trace gases.

② Hydrosphere :-

① It comprises all type of water resources like ocean, sea, lake, stream, river, pond, glaciers & ground water.

② Oceans represents 97% of earth's water.

③ About 2% of water resources is locked in polar ice caps & glaciers.

④ Only about 1% is available as fresh surface water in river, lakes & ground water for human use.

③ Lithosphere -

① It is the outer mantle of the solid earth.

② It consists of minerals occurring in earth's crust & soil.

④ Biosphere -

① Biosphere indicates living organisms & their interaction in environment.

② Living beings are present upto a distance of 6km in the atmosphere from the surface of earth & upto a distance upto a distance of 7km depth in sea.

③ Thus this 13 km region where living organisms are present is called biosphere.

Scope of Environment studies -

The scope of environment studies is very wide. It deals with -

- ① Conservation of natural resource
- ② Ecological aspects
- ③ pollution of surrounding natural resources
- ④ Controlling the pollution.
- ⑤ Social issues connected to it.
- ⑥ Impact of human population on the environment.

Importance of Environment Science -

- ① It helps to gather knowledge about the environment & its compounds.
- ② It provides knowledge about the eco system.
- ③ It provides necessary information about bio diversity.
- ④ It helps to develop the sense why earth is called the only suitable habitat & why earth is called the environment should be conserved for the well being of the next generation.
- ⑤ It reveals the biological productivity of nature & how this may be utilised best for the benefit of mankind.

⑥ It helps to acquire knowledge about the bad effect of population explosion.

⑦ It helps to acquire knowledge about the cause & remedy of environmental diseases which is necessary for development of public health.

⑧ It indicates the existence of interrelationship betn the organism or population & community level.

⑨ It reveals how organisms are structurally adopted & functionally adjusted to their physical environment.

⑩ It suggest to develop various policies for the improvement through environmental management.

5m Need For Public Awareness

① In today's world because of industrialization & increasing population, the natural resources are rapidly-utilized & our environment degraded by human activities, so we need to protect our environment.

② Mega industrialization, Introduction of faster mode of transport, urbanisation, deforestation & decreasing agricultural land, wide spread use of insecticides, pesticides, improper use of fertilizers are some contributing factors which challenged the life of man & other animals.

③ Similarly water pollution, air pollution, soil pollution, marine pollution, noise pollution, global warming etc are some ^{major} ~~measure~~ factors for which public awareness is necessary.

④ The active co-operation of everyone is needed for issues concerning environment.

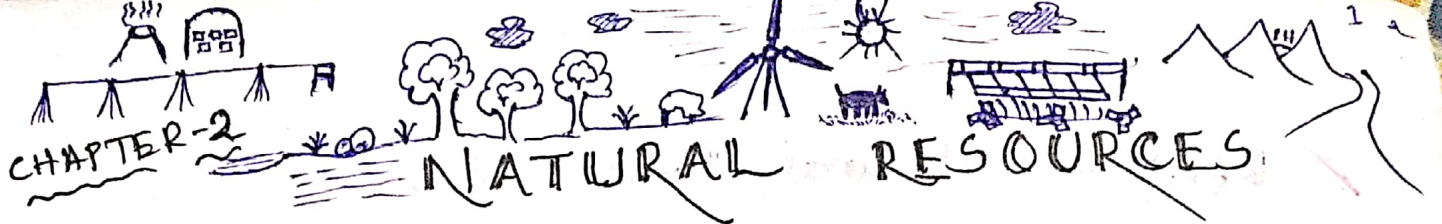
⑤ If population ~~is~~ grows ^{at the} ~~rate of~~ existing etc the food shortage will increase in frequency. Thus it is our duty to reduce the population & solve the problems of food.

⑥ By burning fossil fuels we release carbon dioxide gas & other harmful gases which cause global warming.

⑦ Diesel vehicles emit particles which are dangerous for health so we should discourage to fuel vehicles until it is not necessary.

⑧ Noise pollution affects human health's comfort & efficiency hence people should aware of it.

⑨ public should understand the fact that if we degrading our environment, we are harming ourselves hence it is necessary to check all the destructive processes.



CHAPTER-2

NATURAL RESOURCES

✓ Defⁿ - Natural resources can be defined as things or materials of the nature that can be put to some use by human beings for their growth, development, comfort & other necessities. ~~are~~ called as natural resources.

ex - air, water, forest, soil, minerals, animals, metals etc.

7m Types Of Natural Resources -

All the natural resources can be divided into 2 categories -

- ① Exhaustible
- ② In Exhaustible

✓ ① Exhaustible Natural Resources -

→ These are consumed or exhausted through continuous use or misuse.

ex - soil, forest, water, coal, petroleum, natural gas, minerals etc.

These resources can be further divided into -

- a) Renewable
- b) Non-Renewable

✓ Renewable Natural Resources —

→ Resources that can be renewed are called renewable natural resources.

Ex - soil, water, forest, animals, etc.

✓ Non-Renewable Natural Resources —

→ Resources that can never be renewed are called non-renewable natural resources.

Ex - petroleum, coal, natural gas & minerals, etc.

→ coal, petroleum & natural gas are called as fossil fuels & minerals are called as stock resources.

✓ Inexhaustible Natural Resources —

→ Resources that can't be exhausted are called inexhaustible natural resources.

Ex - Air, sunlight

Natural Resources And Associated Problems —

→ Being most highly developed animal, man possess some certain special characteristics.

→ He applies all his power & intelligence for food & development.

→ He adopts new ways to fulfill his needs more efficiently.

→ This is how he develops new technologies for utilization of ^{natural} resources. As the natural resources are ~~exhaustible~~ ~~exhaustable~~ therefore proper utilization of our natural resources is the need of today.

→ Human beings utilize most of the resources like air, water, land, minerals, flora, fauna, fuels, etc for their growth & development.

→ Now the problem is how & up to what extent human being should utilize the resources.

→ The use of natural resources depends on knowledge, availability, type, quantity, value & necessity.

→ The use of resources should be in limit so that the ecological balance in the nature is prevented & undisturbed.

→ At present due to human activities, misuse of natural resources & explosion of population, nature has lost its capacity of tolerance.

→ Fast growth in human population resulted in fast rate of consumption of natural resources.

→ Human activities of cutting trees, killing animals, mining poisons in air & water are creating severe crisis in environment & natural resources.

→ The effect of over exploitation of natural resources are - []

(1) Lowering of water level, extinction (निवृत्ति) of wild animals, soil erosion, climatic change, ozone layer depletion, global warming, acid rain, green house effect, shortage of food, problem of housing & various diseases.


→ Thus conservation of natural resources should be the priority of every citizen.

→ Awareness programme, forestry organising seminars, public programmes, etc are some means by which we can protect & conserve our natural resources.

→ Non-renewable resources should be used in sustainable manner so that they should remain available for future generation.

Forest Resources -

Forest are one of the most important natural resources on this earth predominantly composed of trees, shrubs & woody vegetation etc.

→ Approximately one-third ($\frac{1}{3}$) of  earth's total land is cover by forest.

→ Scientist estimate ^{that} India should have 33% of its land under forest but today we have only about 12%.

→ Thus we need not only to protect the existing forest but also to increase our forest cover.

Uses Of Forest -

The uses of forest can be broadly classified into -

(1) Local use -

→ Consumption of forest products by local people

a) Food -

→ Forest tribes use tubers, roots, fruits, leaves, seed etc as their food.

b) Timber -

→ Timber for household articles and

construction.

c) Fuel -

Fuel wood & Charcoal for cooking, heating etc.

(ii) Productive Use -

→ Most of the products used for consumptive purposes are also sold as source of income for supporting the lives of tribal people.

(iii) Ecological use -

a) production of oxygen -

→ Trees produce oxygen by photosynthesis.

b) Reduction In Global Warming -

→ CO_2 is absorbed by the forest for photosynthesis. Thus, forests reduce the problem of global warming which is caused by green house gasses.

c) Wild Life Habitat -

→ Forests are the homes for millions of wild animals & plants.

d) Soil Conservation -

→ Forests by ~~it~~ bind soil particles tightly in their roots & prevent soil erosion.

e) pollution control —

→ forests can absorb many toxic gases & help in keeping the air pure & fresh.

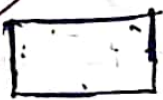
★ In addition to the above forests protect people from drought, flood & radiation.

Over Exploitation of forest —

→ Forests come under renewable resources which are replenished through natural cycles.

→ The highest rate at which the forest resources can be used indefinitely without reducing the forest available supply is called sustainable yield.

→ If the utilization rate exceeds the natural replacement rate, the available supply begins to shrink/reduce & leads to rapid environmental degradation.



Reason for Over Exploitation —

→ The use of forest product for instant profit without realizing the longer term.

→ When the forest resources are exploited, the supply of food and other products diminishes & ultimately the prices of wood & other products increase.

This leads to further over exploitation,

→ To meet the basic needs, people are forced to over exploit the forest resources.

→ Ignorance & lack of awareness also cause over exploitation.

Deforestation →



→ The conversion of forested area to non forest is called deforestation.

→ Deforestation is the result of removal of trees without sufficient reforestation.

→ Deforestation is the loss of forest habitat due to either natural or human related causes.

→ It can be the result of deliberate removal of forest for agriculture or urban development or it can be the result of uncontrolled grazing.

→ Natural deforestation can be linked to forest fire, volcanic eruption & desertification.

Causes of Deforestation :-

→ (1) population Explosion -

→ Due to population explosion the demand for timber, fire wood, etc increases & the forest have been exploited for meeting these demands.

→ Urbanisation, Industrialization, Buildings, dams, Construction of roads etc also contribute to deforestation.

(ii) Demand of Forest Product —

→ Timber & wood are required for making furnitures, doors, windows, railway sleepers, etc. which also cause deforestation.

(iii) Mining —

→ Forests have been cleared for mining of coals, minerals & different ores.

(iv) Fuel —

→ Forests are being cut on an extensive scale for fire wood.

(v) Hydroelectric Projects —

→ Several thousand km^2 of forests have been cleared for reservoirs in India.

(vi) Over Grazing —

→ Over grazing by cattle degrades the forest.

(vii) Weather Condition —

→ Sometimes lightening causes forest fires. Flood, land slides, volcanic eruption also cause deforestation.

(viii) Fire —

→ Human induced or nature induced forest fire are among the main causes forest degradation.

(ix) Pests —

→ Pest also destruct the forest.

✓ Effects of Deforestation —

a) Loss of cultural diversity —

→ forests are homes for millions of forest dwellers.

→ As a result of timber extraction there ~~peaceful~~ ^{peaceful} life is disturbed. Also animal & plant diversity are lost.

b) Loss of Carbon storage Capacity —

→ The concentration of CO_2 is regulated by forest. Now the world is experiencing a rapid increase

in atmospheric CO_2 due to deforestation.

c) Soil Erosion —

→ Deforestation generally increases the rate of soil erosion by increasing the amount of run off & reducing the protection of soil.

d) Land slides —

→ Tree roots bind the soil tightly; but if the soil is sufficiently shallow, the risk of landslide increases with deforestation.

e) Climatic Changes —

→ The climate becomes warmer due to loss of greenery which absorbs CO_2 .

f) Change In Rainfall Pattern —

→ The rainfall pattern may undergo change due to deforestation.

Forest Conservation Or Control Of Deforestation.

→ As far as possible forest should not be destructed for any purpose.

→ If a tree is removed from an area, ~~the same~~ a tree must be planted there.

→ Avoid using fire wood.

→ Reuse & Recycle paper.

→ use email & store information in digital form.

- Do not use wood for buildings.
- use minor forest products ^{those} ~~that~~ are collected by tribals.
- protect the forest from fires, pests & insects.
- prevent over grazing.
- Encourage afforestation.

Timber Extraction —

- wood used for engineering purposes like building houses, making furnitures, etc is called timber.
- Timber extraction results in deforestation & harms valuable species of birds & wild animals.
- inspite of these it is some time necessary to extract timber to meet the needs of a developing country.

Effects of Timber Extraction —

The major effects of Timber extraction are —

- ① Degradation of forest
- ② Loss of biodiversity
- ③ Climatic changes such as lower precipitation.
- ④ Timber extraction ^{also} results in forest fragmentation which promotes loss of biodiversity.

because some species of plants & animals require large continuous area of similar habitat to survive.

⑤ soil erosion occurs extensively.

⑥ Floods may be intensified.

Mining:-



→ Mining is the extraction of valuable minerals & other geological materials from the earth.

→ Materials recovered by mining include bauxite, coal, diamonds, iron, precious metals, Uranium, etc.

→ Mining in a wider sense can also include extraction of petroleum, natural gas & even water.

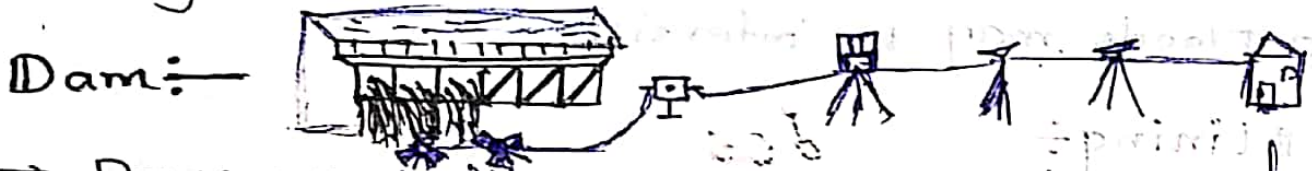
Effects -

→ The environmental effects of mining include erosion, formation of sink holes, loss of biodiversity & contamination of ground water by chemicals from the mining process & products.

→ Contamination resulting from leakage of chemicals can also affect the health of local population.

→ Mining can have adverse effects on surrounding surface water.

→ acidification Extreme example of pollution from mining activities includes coal fires which can last for a long period causing massive environmental damage.



→ Dams are built across rivers to store water for irrigation, hydro electric power generation & flood control.

→ The dams built to serve for more than one purpose are called multi purpose dams.

→ The dams are called temples of modern India by the countries first prime minister Jawaharlal Nehru.

Dam Benefits —

→ Dams are built to control flood to store water.

→ Dams are mainly used for agricultural purposes.

→ for generating electricity.

→ for recreational purposes.

→ Navigation & fishery can be developed in dam areas.

≡ Effects of Dams —

- Displacement of tribal people
- Loss of forest flora, fauna
- Land slide
- Water logging around dams which retards plants growth.
- salinity due to over irrigation
- silt deposition in rivers

✓ Mineral Resources :-

- Minerals are chemically content substances created through chemical processes betⁿ organic & inorganic matters present in earth's crust.
- Minerals being the vital raw material for many industries play an important role in industrialization & overall development of nation.
- These are generally called stock resources.
- Since the prosperity of a nation depends upon the proper use of minerals, hence they should ~~be~~ be conserved & shouldn't ~~be~~ be misused.

Types of Minerals —

→ Minerals available in earth's crust can be divided into 3 types —

- 1) Metallic
- 2) Non-Metallic
- 3) Mineral fuels

(1) Metallic Minerals —

→ According to the availability of metals, metallic minerals are further divided into —

a) Ferrous Alloys —

→ The most common metal is iron. Other than ~~iron~~ aluminium, lead, zinc, copper, etc are ^{also} found. Fe - haematite, magnetite, iron pyrite, etc are examples of ferrous alloys.

b) Non - Ferrous Alloys —

→ The alloys of this type contain the metals like titanium, antimony, arsenic, copper, lithium, etc.

→ Here iron is found as an impurity.

(2) Non Metallic Minerals —

→ These are non - metals like graphite, lime stone, borax, diamond, etc.

(3) Mineral Fuels —

→ These are the materials used to provide energy. For ex - coal, natural gas, petroleum, etc.

→ These are important sources of energy, hence they have tremendous importance for mankind.

Mineral Resources OF India —

- India has sufficient quantities of iron, al, titanium, copper, lead, zinc, etc.
- Iron minerals which are most important ingredient of today's economy are found in sufficient quantity in our country.
- our country ranks 5th among the aluminium rich countries rich countries.
- Zinc, lead, ore reserves in India are estimated to be about 340 millions tons.
- About $\frac{2}{3}$ of iron deposits lies in a belt along odisha & bihar border.
- India has world's largest deposit of coal.
- India is also rich in manganese ores which are found in MP, bihar, Maharashtra & odisha.
- Nickel & ^{bauxite} ~~berlyte~~ ores are also ^{found} ~~find~~ in India.
- Non metallic ores mica, gypsum & diamond are also found.
- petroleum deposits are found in assam & gujarat.
- India also possesses the valuable radioactive ^{varieties} ~~varities~~ of rare earth's.

✓ Environmental Effects OF Extracting & Using Mineral Resources —

→ The environmental effects of mining are -

- (1) Land degradation due to mining
- (2) Soil erosion i.e. the loss of top soil.
- (3) Adverse effects on ground water
- (4) The frequency of land slides are increases
- (5) The agricultural lands are affected
- (6) The disturbance caused adversely affects the well balanced pH & decreases the regenerative quality of soil.
- (7) It also causes damage to floral & faunal population
- (8) It reduces the recreational value
- (9) The mine drainage also pollutes rivers, lakes, streams & other water resources
- (10) Mining also causes air pollution
- (11) The people related with mining & extraction are affected by the polluted environment. (dust & poisonous gases) which leads to skin & lung diseases)
- (12) Dust & toxic gas from mining indirectly affect air, humidity & temp.
- (13) Mining also results in climatic changes causing poor rainfall.

Food Resources :-



- Food which is necessary for all living organisms consists of proteins, enzymes, carbohydrates, minerals, etc.
- We know that plants can produce food hence they are known as producers.
- Herbivores take plants directly as their food.
- Meat eaters ^{are called} carnivores & animals eating everything i.e. vegetable or meat are called omnivores. Thus agriculture & domestic animals are the principal sources of food.
- Fish is another animal which is an important source of food.
- For the last so many years our food production increased by 50%, at the same time the population growth is ^{also} increased.
- The land & water resources are limited, therefore to meet the ~~the~~ increasing demand of food it is needed to increase the productivity.

7m Effects of Modern Agriculture -

- At present all over the world productivity and farming methods were changed due to technological innovations.
- Although the intensification of agriculture has vastly increased productivity, it also had a number of ^(harmful) detrimental effects.
- The impacts of modern agriculture are -

(i) Damage to soil —

- Soil erosion threatens the productivity of agricultural fields & causes a no. of problems.
- Soil erosion affects productivity because it removes the surface/top soil containing most of the organic matter.
- The amount of erosion varies from 1 field to another, depending upon the soil type & drainage pattern of water.

(ii) Contamination of water —

- Surface run off carries fertilizers & pesticides into lakes, streams & rivers, causing unacceptable levels of bacteria, nutrients & synthetic organic compounds.
- Similarly, water percolating downward through the farm fields carries with it dissolved chemicals which includes nitrate fertilisers & soluble pesticides.

(iii) Fertilizers —

- The 3 major nutrients in fertilizers are Nitrogen, phosphorus & potassium.

- out of these, nitrogen is the most readily lost because of its high solubility in nitrate form.
- Leaching of nitrate from agricultural fields can elevate concentrations in the ground water to an unacceptable level.

→ phosphorus does not leach as readily as nitrate because it is more tightly bound to the soil particles. however, it is carried with the eroded soil into surface water bodies where it may cause excessive growth of aquatic plants.

→ potassium is the third major nutrient in fertilizers does not cause water quality problems. because it is not hazardous in drinking water and is not a limiting nutrient for growth of aquatic plants.

(b) Pesticides —

→ The trend towards intensive crop production in modern farming has ^{ed} led to increased potential for damage by pests & diseases.

→ One drawback to these is that pesticides generally kill not only the pest but also a wide range of other organisms including beneficial insects.

→ once the effects ^{of} the pesticides wears off the pests species is likely to recover more rapidly than its predators.

→ following 2nd world war, D.D.T. & other chlorinated hydrocarbons were introduced as new pesticides. throughout the war for protection of agricultural land.

→ In 1962 Rachel Carson's book "Silent Spring" brought public attention to the fact that the organic pesticides are highly persistent in the

environment & accumulate in animal tissues.

→ D.D.T. was banned for agricultural use in United States in 1973 & since that time similar chlorinated hydrocarbons have been replaced by less persistent but more toxic compounds.

Water Logging -

→ Another problem associated with excessive irrigation on poorly drained soils is water logging.

→ This occurs in poorly drained soils where water can't penetrate deeply.

→ This causes the rising in water table in the ground i.e., the upper level of the ground water from beneath.

Waterlogging or waterlogging

→ The raised water table results in the soils becoming water logged.

→ No plant can grow in water logged area as no aeration is possible in the root zone.

→ Coastal areas are vulnerable (vulnerable) for water logging.

→ World wide about 10% of all irrigated land suffers from water logging.

(A) Salinity -

→ Salinity rise or salinization is the phenomenon in which there is increase in the concentration of salts in the soil.

→ In arid ^(dry) regions of low rainfall & poor drainage, the applied water evaporates leaving behind the salts on the surface.

→ Moreover the soluble salts from the bottom layer rise to the surface due to capillary rise of water.

→ plants can not grow in saline soils. Salinization is also ~~caused~~ ^{caused} by the irrigation of soils with saline

water however salinization is the result of restricted drainage.

→ Rise in water-table within two metres of the surface due to irrigation, the obstructions of natural drainage due to developmental activities like roads & canals & the siltation of natural drainage may also cause ^{soil} salinity.

→ In India about 7 million hectares of land have become saline especially in Punjab, Haryana & Rajasthan.

→ The soil salinity has many adverse effects -

(1) causing low production

(2) The limiting of choice of crops because some crops are sensitive to salinity.

(3) creating difficulties in the construction of buildings & roads & their maintenance.

4 → salinity can be reduced by proper drainage & flushing the land with excess fresh water continuously

5 → The salts needed to be leached below the root zone & not allowed to come up.

(V) Over Grazing — 5m

→ over grazing can occur under continuous or rotational grazing.

→ It can be caused by having too many animals in the farm or by not properly controlling their grazing activity.

→ Over grazing reduces plant leaves which reduces plant growth.

→ plants become weakened & have reduced root length.

→ The reduced root length makes the plant more vulnerable to death during dry weather.

→ Under rotational grazing over grazed plants do not enough time to grow to the proper height betⁿ the grazing event.

→ over grazing can increase soil erosion, reduce the soil depth, soil organic matter & soil fertility, which affects the lands for future productivity.

→ Soil fertility can be corrected by applying appropriate fertilizers.

→ However the soil depth & organic matter take years to correct.

WORLD FOOD PROBLEM —

→ Before the 21st century it was felt that world food production is not sufficient for the present population.

→ Food production was less because of use of old techniques, seeds.

→ Later on, when population pressure started the new ways of food production using fertilizers, pesticides, insecticides, etc are discovered to increase the yield.

→ In 1999, International Food Policy Research Institute (IFPRI) reported the increase in world food consumption by 2020, discussing the impact of this both on developed & developing countries.

→ With respect to the crop production & agricultural growth, similar discussions on "goals", solutions & actions necessary to end hunger, were also held in IFPRI conference held in Germany in 2001.

→ All these show the awareness of people to

increase the food production in view of the increasing population growth.

→ Different scenarios have been examined to explore a no. of issues such as the expansion of

irrigated agriculture, the increase in food production in rainfed areas & the public acceptance of genetically modified crops.

→ Severe droughts & sharply rising food prices, spurred the national govt. & International agencies to address the food crisis of 1960s & 1970s.

X → According to some experts there is hunger in the world but i.e because the hungry can't translate their needs into demands.

→ However according to the authoritative Consultative Group of International Agricultural Research (CGIAR), the world is entering the 21st century on the brink of a new world food crisis i.e as dangerous, but far more complicated than that which it faced in 1960s. * → The 'green revolution', consisting of crop variety improvements, increased use of fertilizers & expansion of irrigation, prevented shortages in food production.

Dt - 31/08

✓ Energy Resource: →

→ Energy is needed for all living organisms & vegetation for biochemical reactions of their cells.

→ It is a power which is needed in one form or another for work done.

→ Long before most of the power available to human society was limited to solar energy, fire energy, but now due to developmental activities energy sources have their own importance.

→ Energy consumption of a nation is usually considered as an index of its development.

Renewable & Non Renewable Resources — ^{Energy}

Renewable Energy Resources (Non conventional or Inexhaustible source)

→ These sources are continuously replenished by natural process. For ex - solar energy, wind energy, etc. ocean, geothermal, tidal energy are also ex.

Non Renewable Resources (Conventional or Exhaustible source)

→ These are the traditional energy sources available to us.

→ All these sources are limited & take millions of years for formation.

Ex - coal, petroleum, natural gas, etc

Growing Energy Needs:

→ Energy is the prime input of a country. It is converted into heat & electricity.

→ For every activity to be performed energy is required in the form of heat, light, electricity & even food for our body.

• Food energy is measured in calories.

→ As the world population is growing, we need energy at a much faster rate to meet the industrial, residential, transport, agricultural requirements.

But it is realised that the energy source will not meet the requirements last long.

→ Therefore, trust was given for renewable sources of energy like solar, wind, Tidal energy etc.

✓ Various Forms Of Renewable Energy Sources :-

(1) Solar Energy →

→ It is the most readily available & free source of energy since prehistoric time.

→ It is estimated that solar energy equivalent to over 15000 times the world's annual commercial energy consumption reaches the earth every year.

→ It is not polluting & helps in lessening green house effect.

→ Solar energy can be utilised through two different routes.

- a) Solar Thermal
- b) Solar Electric

→ solar thermal energy is used for heating, cooking & drying, etc.

→ solar photovoltaic uses sun's ^{light} ~~heat~~ to produce electricity for lighting home & building, running motors, pumps & electric appliances.

→ solar cells converts solar energy into DC electricity ^{but} in

solar thermal route solar energy is converted into thermal energy with the help of solar collectors.

→ Different devices used by solar energy is solar water heater, solar cooker, solar dryer, solar air heater, etc.

→ solar cooker is a devices which uses solar energy for cooking & saves fuel to a large extent.

(2) WIND ENERGY -

DT - 01/09/17

→ Wind energy is basically harnessing of wind power to produce electricity.

→ The kinetic energy of wind is converted to electrical energy.

→ Since air flows from warmer to cooler region. This causes winds.

→ These air flows harnessed in wind mills & wind turbines to produce power.

→ Wind power is not a new development as these power was used in traditional wind mills for grinding corn, sailing ships etc.

✓ → The basic wind energy conversion device is wind turbine. The wind turbines are of two types -

(1) Vertical Axis Wind Turbine & Horizontal axis

wind turbine

→ Wind Electric Generator (WEG) convert kinetic energy to electrical energy by using motor or generator.

→ India has been rated as one of the most promising countries for wind power generation with a estimated potential of 20,000 megawatt

→ India ranks 5th in the world in wind power generation.

3) HYDRO ENERGY -

→ potential energy of falling water captured & converted to mechanical energy by water wheels.

→ Water under pressure flows through a turbine causing it to spin.

→ The turbine is connected to generator which produces electricity.

→ In India the potential of small hydro power is estimated about 10,000 mega watt.

→ It is non polluting & doesn't involve setting up of large dams or problems of deforestation.

4) BIO ENERGY-

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

→ It is derived from many sources including the byproducts from wood industries, agricultural crops, raw materials from the forests, household waste, etc.

→ Biomass doesn't add CO_2 to the atmosphere as it absorbs in the same amount of carbon

in growing as it releases when consumed as a fuel.

→ It can be used to generate electricity & it is the most important fuel world wide after coal, oil & natural gas.

→ Bio energy is used for cooking, mechanical applications, pumping, power generation, etc.

5) HYDROGEN ENERGY-

→ Hydrogen is a clean fuel & can be produced by biological conversions of various organic effluents like distillery & by products.

→ Hydrogen contained in metal hydrides can be used in vehicles.

6) TIDAL ENERGY -

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

→ The head of water is then used to drive turbines to generate electricity.

7) OCEAN ENERGY -

→ Ocean covers more than 70% of the earth's surface making the world's largest solar collector.

→ Ocean contains 2 types of energy, thermal energy from the sun's heat & mechanical energy from the tides & waves.

→ Ocean thermal energy is used for many applications including electricity generation.

8) GEOTHERMAL ENERGY -

→ The earth's population lives betⁿ two great sources of energy, the hot rocks beneath the surface of Earth & the sun in the sky.

→ Geothermal energy is based on the core of the earth, which is very hot.

→ There are areas containing volcanoes, hot springs, etc under the water in the oceans & seas.

→ In some count

→ Geothermal energy which is derived from high temp. geothermal fluid can be utilised for power generation & thermal applications.

Land Resources :-

→ In India land is generally called as motherland. It is because of our life depend on it for food, fibre, fuel & other basic amenities.

→ therefore it is the valuable gift of nature to human being.

→ Top layer of the land is called soil which is renewable resources & essential for survival of life.

Though it is ~~the~~ life support system but it is over used which causes environmental problems.

→ Out of the total geographical area of 328 million hectares the land use statistics are available for roughly 306 million hectares, constituting 93% of the total land available for cultivation which is approximately 14 million hectares.

→ But it is reducing day by day due to mismanagement.

→ The earth is made up of 3 principal layers - core, mantle, crust.

→ core is inner most fluid layer, mantle is the middle layer & crust is the upper most layer.

→ In 1950-51 the land area in India was classified into 9 categories. There are -

(1) Forest

(2) Land put to non agricultural use

(3) Barren land or infertile land

(4) permanent pastures & other grazing lands

(5) Miscellaneous tree crops & groves

(6) Culturable waste land

(7) Fallow land or ploughed or uncultivated land

(8) current fallow land

(9) Net area sown

Land Capability Classification :-

→ Land capability classification is a systematic arrangement of different kinds of land according to those properties which determine the ability of the land to produce crops on a virtually permanent basis.

→ The factors determining land capability are the texture of the top soil, its effective depth, permeability of top soil & the sub soil & associated land features.

for ex:- slope of the land, the extent of erosion, the degree of wetness, etc.

SOIL :-

- The word soil is derived from the latin word "solum" which means ground.

- Soil is defined as a thin layer of earth's crust which serves as a natural medium for the growth of plants.

- Soil is formed by weathering process of parental material of rocks.

- Soil differ from parental material in the mineralogical, physical, chemical & biological properties.

- Generally it is said that soil is a mixture of mineral constituents & organic matter,
- The most characteristic constituents of soil are the colloidal organic matter & colloidal clay.
- Some organic matter & particles conserved soil moisture for crops, plantation & soil living organisms.

Classification Of Soil In India -

The followings are different types of soils found in India -

(i) Alluvial soil -

- This includes the deltaic alluvium calcareous alluvial soils, coastal alluvium & coastal sands.
- It is the most important soil ~~soil~~ ^{group} in India contributing the largest share ^{to} through its agricultural wealth.

(ii) Black soil -

- These soils vary in depth from shallow to deep.
- It is common in Maharashtra, western parts of MP, Andhra Pradesh, Gujarat & Tamil Nadu.

(iii) Red soil -

- The ancient crystalline & metamorphic rocks on meteoric weathering have given rise to the red soil.
- The red colour is due to the wide diffusion of iron. The soils comprise vast areas of Tamil Nadu, Karnataka, Goa, Daman & Diu, MP, Odisha, Bihar, WB, etc.

(iv) Laterites & Lateritic soils -

- It is a mixture of hydrated oxides of aluminium & iron with small amounts of manganese oxide.

- These soils are poor in lime, magnesium, nitrogen, potassium oxide ~~but humous~~ & P_2O_5 (phosphorous oxide) but humous.

(v) Desert soils -

- The most predominate components at this soil is quartz.
- Some of these soils content 5% of soluble salts. causes high pH & are poor inorganic matter.

(vi) Problem Soils -

- These are the soils which cannot be economically used for cultivation of crops.

(vii) Acid Soil -

- soils having pH below 7 are considered to be acidic but those having pH less than 5.5 are ^{at} designed as acid soil.
- It occurs widely in Himalayan region & Ganga delta.

Soil Erosion -

- Soil erosion means the removal of material from the surface of soil by the agency of running water, wind & even by gravity.

- Since the superficial layers of the soil are the richest in plant food and thus the feeding ground of plant roots, the process of soil erosion will involves a definite loss of valuable plant nutrients.

- If soil erosion becomes sufficiently intense, may lead to the complete destruction of the soil.

- In India soil erosion is a serious problem chhota Nagpur,
- Gully erosion is well marked in Gwalior, Mandlaun, Shirpur of Madhyapradesh,

Types Of Soil Erosion —

(i) Normal or Geologic Erosion —

- Geologic erosion takes place steadily but so slowly that ages are required for it to make any marked alteration in the major features of earth's surface.
- There is always an equilibrium betⁿ the removal and formation of soil.

(ii) Accelerated Soil Erosion —

- The removal of the surface soil as a result of human & animal interference takes place at a much faster rate than that at which it is built up by the soil forming process.
- Nature requires on an avg. about 1000 years to built up 2.5cm of top soil but wrong farming methods may take only a few years to erode it.

(iii) Wind Erosion —

- Wind erosion takes place normally in arid & semi arid areas devoid of vegetation, where the velocity ^{of wind} is high.
- Moving wind is retarded soil are deposited on the surface & thus fertile lands will become unfit for cultivation.
- The soil particles on the land surfaces are lifted & blown off as dust - storms when the velocity of dust - bearing wind is retarded soil particles are deposited on the surface & thus fertile lands will become unfit for cultivation.

(iv) Water Erosion -

- soil erosion caused by water can be divided into 3 types -

(1) sheet erosion (2) Rill erosion (3) Gully erosion

(1) Sheet Erosion -

- sheet erosion removes a thin covering of soil from large areas uniformly during every rain which produces a runoff.

- it is generally neglected although the soil deteriorate slowly.

(2) Rill Erosion -

- When sheet erosion is allowed to continue unchecked, the

slit-laden run-off forms a well defined but ^{small} ~~wide~~ finger shaped grooves over the entire field. such thin channelling

is known as rill erosion

(3) Gully Erosion -

- when rill erosion is neglected, the tiny grooves developed into wider & deeper channels which may assume a huge size, this is called gully erosion.

- this erosion can cut-off large fields into small fragments & in moves of time make them unfit for cultivation.

(v) Land slides (Slip Erosion) -

- A land slide is defined as an outward & downward movement of the slope - forming material composed of natural rocks, soil, etc.

- the fundamental causes of land slides are topography of the region, & geological structure, the kinds of the rocks & their characteristics.

- the immediate cause of land slide may be an earthquake or a heavy rainfall.

✓ Mechanism OF Soil Erosion:—

Water Erosion.—

— Soil erosion caused by rainfall is the result of application of energy from two distinct sources namely—

- (i) The falling rain drops
- (ii) The surface flow

— The energy of falling rain drop is applied vertically from above where as the energy of surface flow is applied horizontally along the surface of the ground.

— The chief role of falling rain drop is to detach soil particles where as that of the surface flow is to transport the soil.

— More than 100 tons of soil per hectare can sometimes be lost yearly from a bare & for highly detachable soil on slopping land.

Wind Erosion.—

— Wind is responsible for 3 types of soil movement. These are —

- (1) Saltation
- (2) Suspension
- (3) Surface creep

(1) Saltation —

— The major portion of the soil carried by the wind is moved in a series of short bounces called saltation.

— The soil carried in saltation consist of fine particles ranging from 0.1 - 0.5 mm in dia.

— After being pushed along the ground surface by the wind the particles leave almost vertically in the first stage of saltation.

(2) Suspension —

- very fine soil particles less than 0.1 mm in dia. are carried into suspension.
- suspended material is carried long distances from its original location & is thus a complete loss to the eroded area where as the soil is moved in saltation & the surface creep usually remains within the eroded area.

(3) Surface Creep —

- Soil particles larger than 0.5 mm in dia. but smaller than 1 mm are too heavy to be moved in saltation but are sprayed along the surface by the impact of particles in saltation to form a surface creep.
- About 90% of the total soil movement in wind erosion is below the height of 30 cm & about 50% of it is within 5 cm of the ground level.

Remedial Measures To Arrest Soil Erosion —

The remedial measures to arrest soil erosion are —

- Deep Tillage, in order to facilitate the absorption of excessive ^{or} water into the soil
- Direct control process such as contour-bunding
- Under draining of the lands
- Reforestation

Land Degradation —

- The total land under agricultural use is around 58.4% i.e. the gross cropped area is 16.7 million hectares.
- The land not fit for cultivation i.e. the barren land is around 9.9%.

- The area under forest is 21.6% but it needs to be raised.
- In addition to water, land resources are precious resources.
- Food security depends on conservation & proper utilization of all resources. Due to use & over exploitation land resources are degraded which is due to the pressure of increasing population.
- In general formation of 1cm. of soil crust from parent material takes about 300-400 years.
- Fertile soil has high % of organic matter & each gram of fertile soil has 30 billion micro organisms.
- In India about 175 million land is effected by degradation problem.
- Land degradation is caused by erosion of soil, water run-off, etc.

Significance of the land degradation —

- Agricultural production has ^{or} ~~weakened~~ ^{extensive} dramatic rise in the last 3 decades.
- In India green revolution brought new technologies which lead to the use of short duration high yielding varieties helping intense use of land in a year.
- India being vastly agriculture oriented, it had policies in various phases for the development of agriculture.
- Large scale ecological losses were ~~rep~~ reported in crop land, grass land & forest land such as soil erosion, soil alkalinity & soil salinity, micronutrient

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deficiencies, & water logging & contamination of ground ~~water~~ water.

- these factors limit, future gains from land & water resources.

Land slide -

- A land slide is a sudden collapse of a large mass of hill side.

- there are many different types of land slides, not only earth but rock, mud & debris also flow down the side of a slope.

- since beginning of the monsoon season in June India has been hit by heavy rains & land slides affecting in particular arunachal pradesh, assam & bihar states.

- Land slides mostly occur-

(i) where land slides have occurred before

(ii) on steep slopes

(iii) on benches (चौड़े खण्ड)

(iv) where drainage is causing a problem

(v) where certain geologic conditions exist

Types of Land slides -

Land slides are 2 types -

(i) shallow or disrupted

(ii) Deep coherent land slides

Factors, Causing Land slides -

the main causes of land slides are as follows -

- Land slides can be triggered by earthquakes, by saturation with heavy rains.
- Excessive rainfall & snow-melt can also cause land to slide.
- Rapid temperature change causes land slide by shrinking & expanding soil formations.
- forest fires are indirectly responsible for land slides because they take away slope vegetation making erosion easier.
- Man can also cause land slides by mining the earth, underground excavation, pumping & draining ground water levels, etc.
- Man induced land slides are generally done for developmental purposes like industrial, forming roads, agricultural use, homes, etc.
- they use heavy explosives for that. In this case no serious damage occurs because ^{of} proper warning earlier to shift to safer places.

✓ // Desertification —

- Desertification is a process by which productive potential of arid & semi-arid area / land falls.
- The decrease in productivity varies from 10-50%. Thus desertification leads to the conversion of irrigated crop land to desert where productivity is min^m.
- It is characterized by devegetation, depletion of ground water, salinization & soil erosion.

- water has a binding capacity as well as it provides vegetal cover. Thus drought, climatic change & anthropogenic activities are responsible for desertification.
- During last so many years large agricultural land was destroyed by sahara desert.
- In India also so many places were affected by desertification.

Causes Of Desertification -

- Deforestation is one of the main cause of desertification.
- After loss of forests grasslands are used by human, so human activities are responsible for desertification.
- The increasing cattle population heavily grazed in grassland which results in desertification.
- Mining activities are also responsible for conversion of productive land into desertification.
- It is studied that in the last 50 years about 900 million hectare of land have under gone desertification over the world.
- Salinization is also one of the cause for conversion of agricultural land to desert.

Prevention Measures

- Govt. & world wide ecologists are seriously thinking about this problem.
- Govt. is planning to take some protects through which conservation of land & desertification can be checked.
- For salinization, farmers are advised to use organic fertilizers.
- It is also advised to use ecofriendly mining technology.

- awareness programmes should be conducted for affected people.

Role of An Individual ^{In} Conservation of Natural Resources —

- the Indian philosophy of conservation is to keep "Harmony with nature".

→ therefore we have to learn to live with nature. For this every individual has to play his role to conserve the

nature & natural resources. some important roles of individuals in maintaining peace & harmony with nature are —

(1) people should stop the overutilization of natural resources & instead they must be ^{used} properly.

(2) Instead of deforestation, plantation should be kept in mind. we should take help from govt. for plantation programmes.

(3) we should protect wild life. for this educated young should teach the lesson of wild life act.

(4) Mixed cropping, crop rotation & proper use of fertilizers, pesticides, insecticides, etc should be taught to farmers. Encourage the use of bio fertilizers.

(5) we should make habit for waste disposal.

(6) Try to educate ^{local} people for protection & judicious use of natural resources.

(7) Maintain a balance betⁿ resources & human needs

(8) we should recycle the waste & waste water for agricultural purposes.

(9) Install rainwater harvesting system in houses, colonies, etc.

(10) we should use lights, fans & other electric appliances when it is needed.

(11) The fossil fuels should be used when ^{no} other alternative source is available.

(12) prevent soil erosion by planting trees.

(13) we should remember energy saved is energy produced.

(14) Discourage the frequent use of cars, bikes, etc. &

encourage the walk & bicycle

(15) utilize ^{renewable} energy sources as much as possible

for ex - encourage the use of solar cooker, ^{solar} pump etc.



2m Ecology -

The scientific study of the interaction of organisms with their physical environment & with each other is called ecology.

The word "ECOLOGY" is derived from two greek words "oikos" means household/home & "logos" means study. Thus, ecology deals the organism & its place to live.

Eco system -

Eco system is defined as a community of organisms interacting with one another & the environment in which they live. i.e the study of home.

- ex. pond, lake, forest, river, ocean, aquarium etc

are examples of ecosystem.

Types of Ecosystem -

Ecosystems are of the following types -

① Natural Ecosystem

② Artificial Ecosystem

① Natural Ecosystem -

- These operate under natural conditions with any interference. (Even by human beings)

- These can be further divided into -

a) Terrestrial Ecosystem

b) Aquatic Ecosystem

a) Terrestrial Ecosystem -

- Terrestrial ecosystem operate on land hence forest, desert & grass land are included in this type.

b) Aquatic Ecosystem -

- Aquatic ecosystems operate in water.

- It can be divided into -

(i) Fresh water Ecosystem

(ii) Marine Ecosystem

(i) Fresh water Ecosystem -

- Fresh water ecosystems are usually named after the size & nature of the fresh water body.

em - pond, lake, river etc.

(ii) Marine Ecosystem —

- Marine ecosystem is the largest ecosystem on earth.

② Artificial Ecosystem (Antropogenic) —

herot - these are man made like crop lands, dams, aquarium etc.

5

Structure of Ecosystem —

The structure of an ecosystem consist of —

① Abiotic structure

② Biotic structure

① Abiotic structure —

- The physical & chemical components of an ecosystem deals with its abiotic structure.

- It includes two thing -

(a) chemical / Materials factor —

- The material like water, minerals, atmospheric gases, inorganic salts & organic factors like amino acid, lipids, carbohydrates, portion etc are the chemical factors.

The quantity of abiotic materials present at any given time in an ecosystem is known as standing state or standing crops.

(b) Physical factors -

- This is in the form of light, heat & stored energy in chemical bonds.

- Annual rainfall, wind, latitude & altitude etc. are also some physical factors.

(2) Biotic structure -

producers, consumers & decomposers are

components of biotic ecosystem. This can be distinguished on the basis of their nutritional behaviour.

(i) Autotrophic component / Autotrophs ~~are producers~~

- Autotrophic means self nourishing.

- By using light energy & inorganic substances they manufacture complex organic compounds. Hence, they are called producers.

(ii) Heterotrophic components -

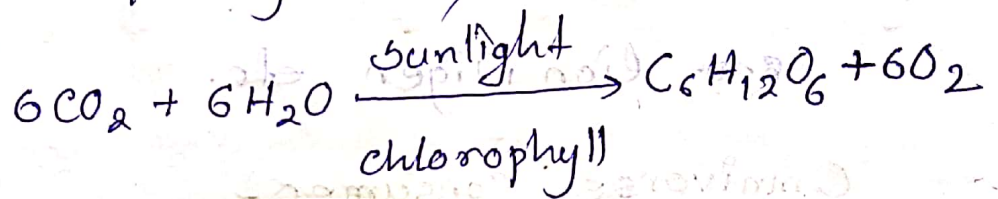
- Heterotrophic means other nourishing. The heterotrophs depend on the autotrophs directly or indirectly for their nourishment.

- They are also called consumers,

Producers -

- All green plants are producer. they

prepare their food themselves by making use of carbon dioxide in the presence of sunlight by the process of photosynthesis.



- A few microorganism can produce organic matter through oxidation of certain chemicals in the absence of sunlight & are known as chemo autotrophs.

Consumers -

Consumers are derived their food

directly or indirectly from producer. Consumers are of the following types -

primary consumer -

these are also called herbivores which feed directly on the producers.

ex - Deer, giraffe, cow, goat etc & some

insects are primary consumers / herbivores.

Secondary Consumers —

These are also called carnivores (meat eaters)

Ex - Snake, lizard, fox etc.

Tertiary Consumer —

They feed on both primary & secondary consumers.

Ex - lion, tiger etc.

Omnivore Consumer —

These consumers feed on both plant & animals.

Ex - human being

Top Carnivores —

• Some animals like lion, vulture etc which are not killed, eaten by other animal are called top carnivores.

Detritivores — (Eat waste material from decomposing dead plants or animals)

• Detritivores feed on dead organic matter on plants & animals.

Ex - Ant

Decomposer

• These are also living components mainly bacteria & fungi which breakdown the complex compounds

of ^{dead} producers & consumers into simple inorganic nutrients.

• the role of a decomposer in an ecosystem is very important because they are responsible for the completion of mineral cycle.

Function of Eco system —

• Function of an Eco system means how an eco-system operates under natural conditions. The rate of biological energy flow, the ^{rate of} nutrient cycle & ecological regulation play a major role in the function of ecosystem.

5^m Energy Flow in An Eco system —

• Energy is needed for every biological activity.

• Solar energy is transform into chemical energy by ^{the process of} photosynthesis which is stored in the plants tissue.

• This energy is transformed into mechanical & heat energy during metabolic activity.

• 1% of total sunlight falling on the green plants is utilised in photosynthesis which is sufficient to maintain all life on this earth.

- there is no 100% flow of energy from producer to consumer because some energy is always lost to the environment.
- Thus energy can't be recycled in an ecosystem it can only flow one way.
- the flow of energy follows the two laws of thermodynamics.

1st law of thermodynamics —

The law states that, "Energy can neither be created nor be destroyed, but it can be transformed from one form to another."

2nd law of thermodynamics —

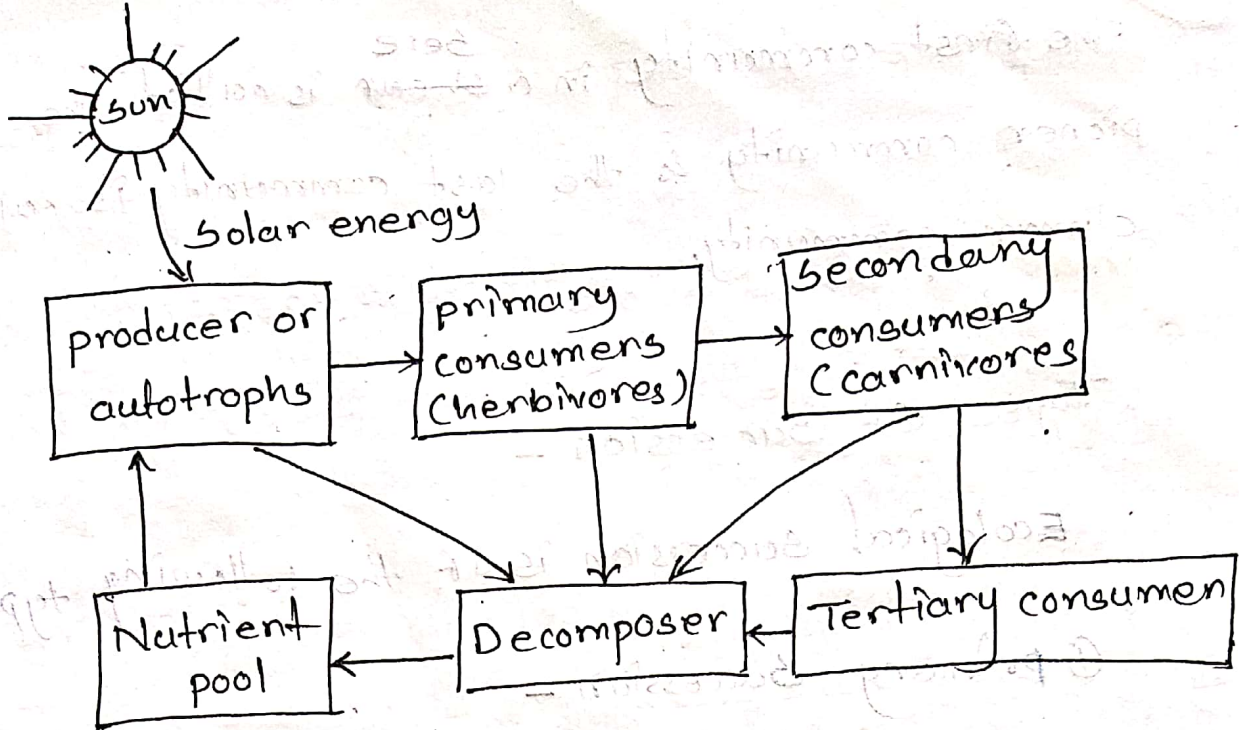
The law states that,

"Energy transformations ^{involves} degradation of energy (loss)

from a concentrated to a dispersed form."

→ Thus dispersion of energy occurs at each trophic level.

→ There is loss of 90% energy & only 10% is transferred from one trophic level to another.



(Energy Flow In Eco system)

✓ Ecological Succession —

(Progress) or sequence

• Ecological Succession is a natural process of community change over time. This phenomenon involves an orderly & progressive replacement of community by another until a stable community is developed.

• During succession, a community ~~is~~ developed, grows, increases its boundary, matures & finally allows another community to occupy its area.

→ A complete succession is called a ~~sera~~ ^{← changing} sere & a transitional community in a sere is called at a seral stage.

the first community in a ^{sere} stream is called the pioneer community & the last community is called climax community.

Types Of Succession -

Ecological succession is of the following types -

① primary Succession -

- primary succession occurs when a community begins to develop on a ^{site} ~~spot~~ previously unoccupied by living organisms.

- Ex- Succession on newly exposed rock surfaces from land slides or lava flows.

- the sere involved in primary succession is called pre sere.

② Secondary Succession -

- Secondary succession refers to community development on a ^{site} ~~spot~~ previously occupied by well developed community.

- Ex- It may be due to earthquake, clearing of forest by man etc.

- the sere involved in secondary succession is called sub sere.

Ecological succession can be classified into -

① Autotrophic Succession -

It is characterized by continued dominance of autotrophic organisms.

② Heterotrophic Succession -

It is characterized by continued dominance of heterotrophic organisms like bacteria, fungi etc.

Ecological succession is also classified into -

① Autogenic Succession -

The succession that results from changes brought about by the organisms themselves is called autogenic succession.

ex - the change from an abandoned (disused) agriculture field to a mature forest.

② Allogenic Succession -

Succession that results from factors external to the community is called allogenic succession.

ex - climate change, change in temp. etc.

✓ Food Chain —

→ The transfer of food energy from the producers through a series of organisms successively with the repeated activities of eating & being eaten is known as food chain.

→ In an ecosystem one organism is eaten by the 2nd, which is then eaten by third & so on.

→ This type of feeding relationship is known as food chain.

→ Each stage in a food chain is called trophic level.

Ex - plant leaf → eaten pillar → sparrow
→ Hawk / vulture

A eaten pillar eats plant leaf, a sparrow eats the eaten pillar & a hawk eats the sparrow.

• Types of Food Chain —

There are 2 basic types of food chains

① Grazing food chain

② Detritus food chain

① Grazing Food Chain -

A grazing food chain starts from green plants ^{plant eater} & ends to carnivores ^{meat eater} by passing through herbivores.

Ex - Autotrophs (producer) → herbivores (primary consumer) → primary carnivore (secondary consumer) → secondary carnivore (Tertiary consumer) → so on.

Grass → Rabbit → Fox → Lion

Grass → Grass hopper → Frog → Snake → Hawk

→ Energy for this food chain comes directly from the sun.

→ It consists of microscopic organisms.

② Detritus Food Chain -

→ The term 'detritus' means organic waste or dead matter derived from grazing food chain.

→ This food chain starts with dead organic matter to the detritivores & then to the detritivore consumers.

→ This food chain is less dependent on solar energy.

Ex -

Detritus \rightarrow Detritivores \rightarrow Detritivore consumer

\rightarrow Small carnivores \rightarrow large carnivores

Dead plant \rightarrow Soil mite \rightarrow Insect \rightarrow Frog \rightarrow Snake \rightarrow Hawk

57 ✓ Food web -

\rightarrow In nature the food chains are not isolated sequences. They are interconnected with each other.

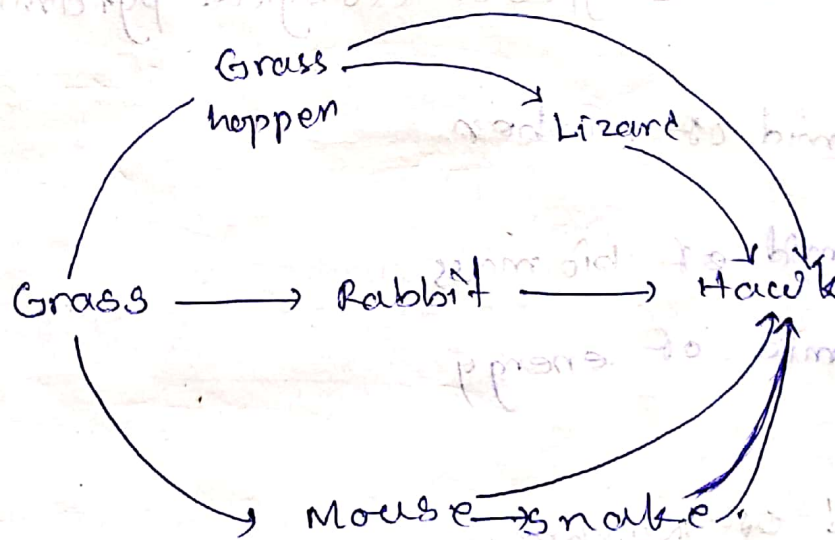
\rightarrow The interlinking pattern of different food chains is called food web.

\rightarrow The food web is defined as a network of food chains where different types of organisms are connected at different trophic levels, so that there are a no. of options of eating & being eaten at each trophic level.

Ex -

The following types of food chains are interconnected to form a food web.

- ① Grass → Grass hopper → Hawk
- ② Grass → Grass hopper → Lizard → Hawk
- ③ Grass → Rabbit → Hawk
- ④ Grass → Mouse → Hawk
- ⑤ Grass → Mouse → Snake → Hawk



5m Ecological Pyramid -

- Ecological pyramids were first studied by the British ecologist Charles Elton (1927). Hence these are also called eltonian pyramids.
- An ecological pyramid is a graphical representation consisting various trophic levels with producers forming the base & the apex.

occupied by the carnivores.

→ Hence all producers belongs to trophic level-1,
primary consumers belongs to trophic level-2,
secondary consumers belongs to trophic level-3,
& so on -

Types of Ecological pyramids -

There are 3 types of ecological pyramids -

① pyramid of number

② pyramid of biomass

③ pyramid of energy

① Pyramid of Number -

→ It shows the relationship among the producers, herbivores & carnivores at successive trophic levels in terms of their numbers.

→ Mostly the pyramid of number is straight up right.

→ The number of individuals in successive trophic levels goes in decreasing from base to apex.

→ The max^m no. of ~~carnivore~~ producers support a small no. of herbivores.

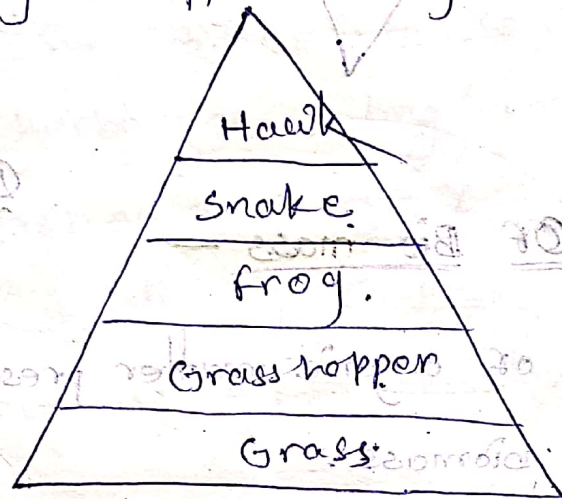
→ the herbivores support a fewer no. of carnivores & so on.

→ the top carnivores are very few in no. of

EM -

• In grassland ecosystem

grass → grass hopper → frog → snake → Hawk



→ The pyramid of no. may be inverted in some cases. for ex -

• In forest ecosystem,

→ a single plant can support the growth of many

herbivores & each herbivore provides nutrition

to several parasites which in turn may support

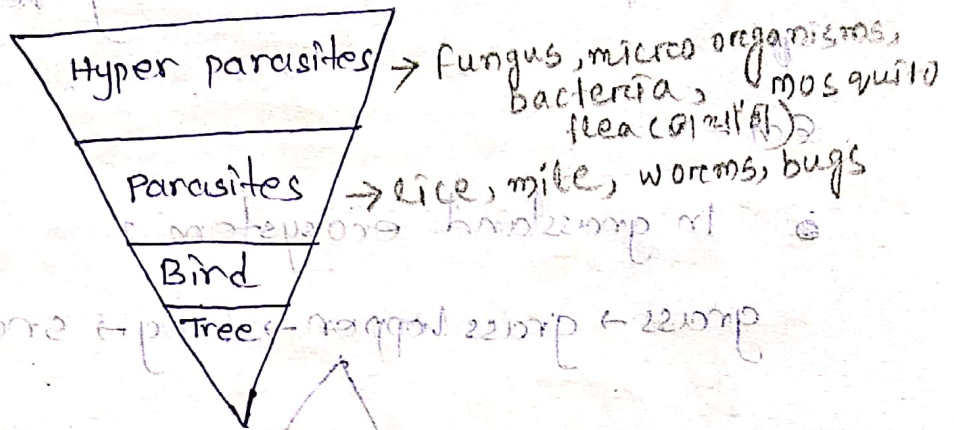
many hyperparasites. Thus from producer

towards consumers the no. of organisms

gradually increases.

Making the pyramid inverted in the shape

Em-



Q4 - 2/08/17

② Pyramid of Bio-mass

→ The amount of organic matter present in an ecosystem is called biomass.

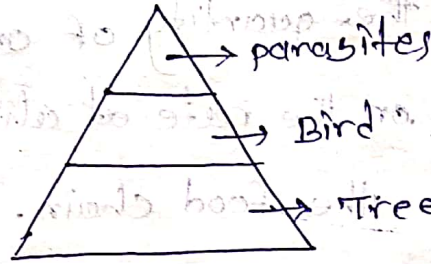
→ In pyramid of bio-mass, the relationship between different trophic levels is mentioned in terms of weight of organisms.

→ The pyramid may be straight up right or inverted.

• Em- In forest eco system the bio-mass of one tree is very high. The bio mass of a number of birds feeding on the tree is far less than that of the tree.

→ Similarly, the bio-mass of a large number of parasites on body of the parts is even less. Thus the pyramid of bio-mass becomes straight up right.

[Pyramid of biomass in forest eco system]



→ But In aquatic eco system the biomass of phytoplankton

is negligible as compared to the small herbivores.

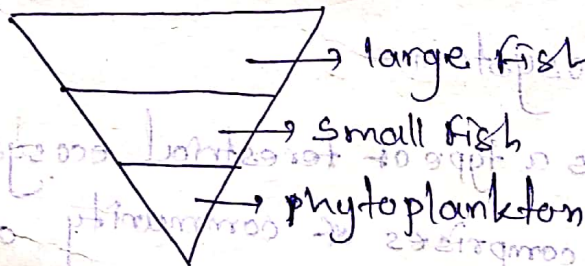
The small herbivores feeding upon them.

→ the biomass of carnivores feeding upon the small

herbivores is still higher. Thus, the pyramid of

biomass in an aquatic eco system is inverted in

shape.



(pyramid of biomass in aquatic eco system)

② Pyramid of Energy =

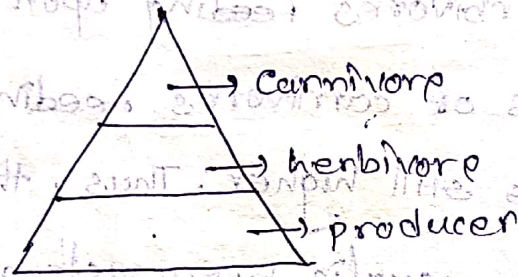
→ the pyramid of energy represents the total quantity of energy reutilized by different trophic level organisms of an ecosystem per unit area over a period of time.

→ the base upon which pyramid of energy is constructed is the quantity of organisms produced per unit time or the rate at which food material passes through the food chain.

→ pyramid of energy is always straight up right.

Ex -

pyramid of energy in grassland eco system



Some Major Eco Systems -

① Forest Ecosystem -

→ Forest is a type of terrestrial ecosystem.

→ A forest comprises of community of plants which are structurally defined as trees, shrubs, herbs, climbers & ground vegetation.

→ Roughly 40% of land is occupied by forest. But in

India it is 11%.

Different components of forest ecosystem are -

① Abiotic component -

→ These are the inorganic & organic substances present in the soil & atmosphere.

→ The light conditions are different due to complex stratification (92) in the plant communities.

② Biotic Component -

→ The biotic components include producer, consumer & decomposers.

Producer -

→ These are the green plants which produce their own food by the process of photosynthesis. Since they produce the basic food stuffs for other organisms, they are called producers.

Consumers -

① Primary Consumer -

→ These are the herbivores that include the animals feeding on the tree leaves such as ants, leaf hoppers, bugs, spiders, etc.

→ Many larger herbivores like deer, elephant, giraffe are also found on broadleaved developmental areas.

Secondary Consumer -

→ These are the carnivores like snake, birds,

lizards, fox etc. feeding on the herbivores.

Tertiary Consumers -

→ These are the top carnivores like lion, tiger, etc which feed on secondary consumers.

Decomposers -

→ These are wide variety of microorganisms like bacteria, fungi, etc.

→ These microorganisms obtain energy to carry on their life function by breaking the dead organic matter.

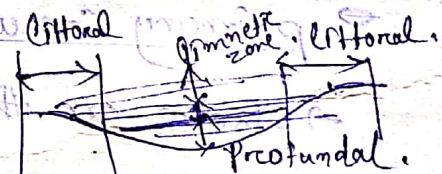
→ By decomposition they release the inorganic nutrient which is again used by the producers, thus the decomposers sustain the nutrient cycle of the ecosystem.

② // Aquatic Eco system :-

// ① Pond Ecosystem -

→ ponds are small bodies of water, in which the littoral zone is relatively large and the limnetic and profundal zones are small or absent.

→ ponds may be found in moist region or adequate rainfall.



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

Components of pond Ecosystem:

Abiotic Component -

→ Apart from heat & light, the basic inorganic & organic compounds are water, CO_2 , phosphate, Amino acids, nitrate, etc.

→ The amount of minerals present at any time in the physical environment of the pond is called standing state.

→ Other abiotic components are light intensity, turbidity index, pH of water, dissolved oxygen, carbohydrates, proteins, lipids, etc.

Biotic component -

→ The biotic component include producers, consumers, decomposers.

Producers -

→ These are autotrophic green plants & bacteria.

→ producers are of the following types -

① Macrophytes -

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

Ex - Typha, hydrilla, Trapa, etc.

② Phytoplankton -

These are minute floating lower plants like Spirogyra, Clostridium, etc.

Consumers -

→ Most of the consumers are herbivores except some insects and large fish.

→ The pond consumers are distinguished as

① primary consumers -

These are herbivores & also known as primary macro consumers.

These are further divided into -

a) Benthos -

These are the animals associated with the living plants which include fish, insect larvae, mollusca

b) zoo plankton -

These are mainly rotifers, protozoa

and crustaceans.

② Secondary Consumers —

These are carnivores like insects, fish etc.

③ Tertiary Consumers —

These are some large fishes which feed on smaller fishes.

Decomposer —

→ These are micro consumers, they decompose organic matter of producers & consumers into simple forms.

→ Some common decomposers are bacteria, fungi, etc.

② River & Stream Ecosystem —

→ River & streams are flowing fresh water

bodies. out of all natural resources rivers are most extensively used ecosystem by man.

→ The components of river & stream ecosystem

are —

Abiotic component —

→ It includes volume of water, CO_2 , oxygen, water current & other nutrients.

→ It also includes the flow of organic matter which is been imported from adjacent

26 → Because of small depth in stream ecosystem large surface is exposed to air.

terrestrial ecosystems.

→ Due to constant motion
Biotic Component

→ Due to constant motion streams generally contain an abundant supply of oxygen. For this reason, the stream animals are specially sensitive to reduce oxygen.

Biotic Component -

→ The biotic component include

Producers -

→ The producers are algae, grasses, etc.

Consumers -

→ It includes water insects, snails, leeches, fishes, crocodiles & other reptiles,

Decomposer -

→ The decomposers include bacteria, fungi, protozoa, etc.

③ Ocean & Marine Ecosystem :-

→ The marine environment is characterized by its high concentration of salts & minerals.

→ The major oceans of the world are Atlantic, Pacific, Indian, Arctic & Antarctic.

→ these are deep and life extends to all its depth.

→ The sea water contains ^{salts in the form of} sodium chloride and rest are potassium, magnesium & calcium.

→ Marine ecosystem plays an important role in regulating many bio-geochemical cycles, hydrological cycles & thereby regulating the earth's climate.

→ A marine ecosystem consist of the following components

Abiotic Component -

→ The abiotic component includes sodium, chlorine, fluorine, magnesium, calcium, sulphur, potassium, dissolved oxygen, light, temperature & pressure variation.

Biotic components -

→ The biotic component includes

Producer -

→ The producers are phytoplankton, marine plants, seaweeds & halophytes (मुर्खी रूख)

Consumers -

→ The consumers include mollusca fishes, crustaceans, etc which feed directly on producers and are called primary consumers.

→ Other consumers are carnivores like shark, cod, haddock, etc, fish.

Decomposers —

→ The major decomposers active in the decay of dead organic matter are chiefly bacteria & fungi.

④ Lake Eco system —

→ Lakes are inland depressions containing standing water.

→ In lake there are 3-5 well recognised horizontal strata. These are —

① Littoral zone —

→ It is the shallow water near the shore.

→ It contains the upper warm & oxygen rich circulating water layer which is called ~~epilimnion~~ epilimnion.

② Sublittoral zone —

→ It extends from the rooted vegetation to the non circulating cold water with poor oxygen zone, i.e. hypolimnion.

③ Limnetic zone —

→ This zone is upto the depth of effective light penetration.

④ Profundal zone —

→ This zone is beneath the limnetic zone & beyond the depth of effective light penetration.

④ Abyssal zone -

→ this zone is found only in deep lakes & ^{since} it begins at about 2000 m from the surface.

⑤ Estuaries Eco system -

→ Estuarine is derived from the ^{Latin} word aestus which means tide.

→ Pritchard in 1967 define estuarine as a coastal body of water which has every connection with the sea. Thus it is strongly affected by tidal action. Within it sea water is mixed with fresh water from land drainage.

→ River mouth & bodies of water behind barrier beaches are examples of estuaries

→ Estuaries differ in size, shape & volume of water flow.

Components of Estuarine Ecosystem -

→ Estuaries are transitional zones betⁿ fresh water & marine habitat.

→ The components of estuaries ecosystem are -

① Abiotic

② Biotic

Abiotic component —

→ The abiotic factors are dissolved oxygen, temp., pH of water & salinity.

→ The salinity varies vertically and horizontally & fluctuates betⁿ 0.5 - 0.35‰

~~→ current & salinity varies vertically & horizontally~~

→ current & salinity are both important abiotic factor in an estuarine ecosystem.

Biotic Component —

→ The biotic component include producer, consumer, & decomposer.

→ The producers are sea weeds, seagrasses, phytoplankton.

→ Consumers are zooplanktons, crustaceans & different varieties of fishes.

→ The decomposers are mainly bacteria & fungi.

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BIO DIVERSITY AND ITS CONSERVATION

2M

The word biodiversity is the combination of two words "biological" & "diversity"

→ Biodiversity means the existence of a large number of different kinds of animals & plants which make a balanced environment.

→ Biodiversity is neither the no. of organisms present in a natural ecosystem nor a resource but the property of living organisms.

→ Total no. of races, varieties or species i.e., the sum of total of various types of microbes, plants, animals present in a system is referred as biodiversity.

Genetic, Species & Ecosystem Diversity :-

Genetic Diversity -

Genetic diversity means the variations of genes within the species.

- The variation may be in shape, size, resistance to insects, pests & diseases.

- These differences are due to slight variations in their genetic organisation.

For ex - In human species genetic variation betⁿ an Indian & African & genetic variation within a population can be seen.

- The genetic matter decides whether the persons have brown or blue eyes, black or brown hairs & tall or short.

Species Diversity -

- The biotic component in an ecosystem may be composed of a few species or a large no. of species of plants, animals & microbes.

- These species react & interact with each other & with the abiotic factors of environment.

- The richness of species in an ecosystem is known as species diversity.

Ecosystem Diversity -

- Depending on the availability of abiotic resources & condⁿs of environment an ecosystem develops its own characteristic community of living organisms.

For ex - A pond ecosystem possesses a set of flora & fauna which is different from a river ecosystem.

VALUES OF BIODIVERSITY :-

The different values of biodiversity are -

(व्यवहारिक मूल्य)
(i) **consumptive value** -

- Biodiversity is an essential requirement for the maintenance of global food supply.
- The main sources of human food include plant products, fishes & animals.
- The tribal people use roots, fruits, tubers, seeds & meat of wild animals as their food.
 ← ~~potatoes~~ potato
- Fossil fuels like coal, petroleum & natural gas are the products of biodiversity.

(उत्पादक)
(ii) **productive value** -

- Some of the products of biodiversity are marketed & sold. bamboos, grasses, essential oils, gums, rocks, insecticides, tessen, some flowers & seeds are the forest products which have high commercial value.
- In addition to this some animal products like tusk of elephants, musk from deer are sold in the commercial market both at national & international level.
 ← teeth
 ← Oil for perfume

- About 75% of world population depend upon plant extract

- for medicine.
 penicillin ← made from penicillium blue green fungi
- ~~penicillin~~ & about 5000 antibiotics are extracted from microorganisms.

(सामाजिक)
(iii) **social value** -

- Goods & services provided by the ecosystem to our society includes -

a) provision for food, fuel & fibre

b) provision of building materials

c) purification of air & water

d) Detoxification & decomposition of waste

(iv) Ethical values

DT - 21/9/17

- Ethical or religious values are indirect values of biodiversity.

- Religious have an significant impact on our attitude towards natural resources. The buddhist perception of nature is based on different practices & approaches than that of Christian belief, though both are consistent with conserving biodiversity.

(v) Aesthetic value

- The aesthetic value of biodiversity is expressed in many ways through art, poetry, songs, literature, music & dance etc.

- Forest are closely linked with our religion & culture. Many types of trees ^{& animals} are worshipped by Hindus all over the world also many birds, colourfull butterflies, etc have great aesthetic values for human beings.

BIODIVERSITY AT GLOBAL, NATIONAL & LOCAL LEVEL

BIODIVERSITY AT GLOBAL LEVEL

- It is estimated that there exists 5-30 million species of living form on our earth, out of which 1.5 million have been identified.

- This includes 3 lakhs species of green plants & fungi,

8 lakhs species of insects, 40 thousands species of vertebrates & 3 lakhs 360 thousand species of micro organisms but present studies show that the number of insects alone mainly as highest 10 million.

- It is said that tropical rain-forest are earth's largest store house of biodiversity.
- Million of species of plants, birds, insects, etc are found in tropical rain forest.
- According to the opinion of scientist more than half of the species on the earth live in tropical rain forest which is only 7% of the total land surface.
- Biological diversity is the result of interaction betⁿ climate, organisms, topography, soil material, ~~etc~~ & heredity.
- The species diversity in tropics is very high because the conditions for evolution were optimum & for extinction are fewer.

BIODIVERSITY AT NATIONAL LEVEL -

- India is located in south asia betⁿ latitude 6° & 38° N & longitude 69° & 97° E.
- The Indian landmass extending over a total geographical area of about 3029 million hectares is bounded by Himalayas in the North, the Bay of Bengal in the East, the Arabian Sea in the West & the Indian ocean is south.
- The richness in biodiversity is due to wide variety of climatic conditions coupled with varieties of ecological

habitats.

- In India about 1 lakh 15 thousands species of plants & animals have been identified.

- Rice, sugarcane, Jute, mango, citrus, banana, some ornamental orchids, several medicinal & aromatics are found in the country.

- In flora the country accounts for 45 thousands species which is 15% of the known world plants.

- India is also very rich in faunal wealth & has nearly 15,000 animal species, about 80% of which are insects.

BIODIVERSITY AT LOCAL LEVEL -

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

- we can study the local biodiversity on the following lines -

- Richness of species at a given place
- physical characteristics of habitat & vegetation in a particular area
- change in species concentration across different habitats
- Local biodiversity based on climate, ecological, geographical & other processes responsible for creation.
- the rate of change across gradients & conditions
- It is said that environmental variables are responsible for diversity but temp. plays an important role in affecting the biodiversity of an area.

Threats to Biodiversity -

- Biodiversity is threatened by anthropogenic activities in many ways like destruction of forest, over hunting, conversion of grassland into industrialization, mining or

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mineral, construction of roads, pollution, extraction of timber, population explosion etc.

- Wilson in 1985 described the loss of biodiversity as crisis & this is more serious for developing countries like India.
- Human beings were directly responsible for extinction of many large & small mammals.
- Due to human population & its impact on ecosystems - thousands of species & subspecies become extinct every year.
- According to Wilson we are losing 10 thousand organisms a year i.e., 27 per day. If this will continue we may destroy millions of plants, animals & microbes in next few decades.
- Before man's appearance in this planet the rate of extinction was 1 species per thousand years.
- However the pressure of human activity has drastically changed the picture.

- Indian wild life act 1972 provides a list of about 150 endangered species.
- The disappearance of dinosaur is the best example of extinction.
- In India 23% of reptiles & 42% bird species are endemic (आदिवासी).
- The current extinction rates are probably 4 or 5 times more than the rates in the fossil record.

✓ Causes & Issues Related To Threats To Biodiversity:

(बायोडायवर्सिटी) Habitat Loss -

- Habitat loss due to human activities & other disturbances are well known factors.
- Due to habitat degradation wild population becomes more vulnerable to ^(परिपोषण) ~~the~~ ^(प्रादुर्भाव) predators & diseases.
- The natural forest and grasslands which were the natural homes of thousands of species are going cleared day by day, for conversion into agricultural lands or for other developmental projects.
- Thus thousands of species become ^(निवृत्त) extinct due to loss of their habitat.
- Due to pollution & presence of toxic pollutants our fresh water resources have suffered & many aquatic species, like fish, birds, etc have been threatened.
- Electric power plants which cause thermal pollution also affect the aquatic life.
- If the present rate of deforestation continue there will be loss of many species.
- problems of acid rain & global climate change are also well known for habitat loss.

(बायोडायवर्सिटी) Poaching Of Wild Life -

- poaching is another threat to biodiversity.
- As an ancient period hunters, collectors & smugglers are the major threat to a number of species including endangered species. They collected horns, tusks, herbar, furs & ^(उत्पाद) products smuggled to others for ~~the~~ millions of dollars.
- The alarming point in this case is that for one animal they killed more than one. It is an illegal trade & internationally banned.

- The cost of these animal parts are surprising. The cost of

bengal tiger coat is more than 1,00,000 dollars.

- The horn of rhinoceros cost their weight in gold.

- over collection & over exploitation are the main causes of disappearance of plants of scientific & medicinal value.

- thus it is advisable that do not purchase the parts & the products made from wild animals specially endangered

species.

Man Wildlife Conflict

- struggle for existence,

→ this is applicable for both man & wild animals.

→ Due to habitat loss animals come out of the forest & destroy the crops & later on they become danger to human beings.

- villagers & affected people kill them. In these cases forest department could not pacify which results in lack of non-co-operation for wild life conservation.

- Elephants & other wild animals suffer pain & turn violent when they come to destroy the electric fenced crop field.

- It is noted that ill, weak & injured animals have tendency to attack man.

- Man wildlife conflicts also occurs during human encroachment into forest area.

- There are number of cases where man eating tiger was reported because they like human flesh rather than other animal flesh.

BIO GEOGRAPHICAL CLASSIFICATION OF INDIA :-

- India is one of the 12 mega diversity countries in the world.
- The wide variety in physical features & climatic condⁿs have resulted in a diversity of ecological habitats like forest, grasslands, wet lands, coastal & marine ecosystems.
- Biogeographically India is situated at the trijunction of 3 realms namely Afro-Tropical, Indo-Malayan & Palearctic (Some part of Africa) (Some part of Asia) (Some part of Europe).
- Therefore it has characteristic elements from each of them. This assemblage of 3 distinct realms makes the country rich & unique in biological diversity.
- With only 2.4% of land area, India accounts for 7-8% of the recorded species of the world.
- The studies of the distribution of biota (Flora & Fauna) are collectively called biogeography.
- There are 2 major approaches to ^{the} study of biogeography.
 - (i) Descriptive or static biogeography
 - (ii) Interrelat^{ive} or dynamic biogeography

FLORISTIC (BOTANICAL) REGIONS OF INDIA -

- India has been divided into the following 9 floristic regions with respect to floral diversity -

- | | |
|---------------------------|----------------------|
| (i) Western Himalayas | (vii) Deccan plateau |
| (ii) Eastern Himalayas | (viii) Assam |
| (iii) Indus plains | (ix) Andaman |
| (iv) Gangetic plains | |
| (v) Central India | |
| (vi) Malabar (west coast) | |

(i) Western Himalayas -

- It extends from kumaon to kashmir & has an annual rainfall upto 200 cm.

- It is divided into 3 zones -

a) Submontane zone -

- It is constituted of tropical & subtropical parts & extends upto 1500 m's altitude.

- Snow fall does not occur here.

b) Temperate zone -

- Above submontane zone the temperate zone extends upto 3500 m's altitude.

c) Alpine zone -

- It extends from 3500 - 4500 m's altitude & is characterized by alpine forest vegetation.

(ii) Eastern Himalayas -

- It includes regions of sikkim & Nepal (North East frontier Agency) & is characterized by more rainfall, less snow & higher temp.

- It is also divided into 3 zones -

a) Tropical zone -

- upto 1800 m's altitude this zone has tropical semi evergreen or moist deciduous forest.

b) Temperate zone -

- This zone extends betⁿ 1800 - 3000 m's altitude.

c) Alpine zone -

- Beyond the temperate zone the alpine zone extends

upto 5000ms altitude,

(iii) Indus Plains —

- This zone includes the aride & semi aride regions of Punjab, Rajasthan, some parts of Gujarat & Delhi.
- The rainfall is less than 70 cm.
- The plants of these zone are primarily xerophytic.

(iv) Gangetic Plains —

- This region extends over Uttarpradesh, Bihar, Bengal & parts of Odisha.
- This is characterized by moderate amount of rainfall & most fertile soil.

(v) Central India —

- It comprises Madhyapradesh, parts of Odisha & Gujarat.
- The rainfall is 150 - 200 cm & its vegetation is thorny & mixed deciduous & teak type.

(vi) Malabar — (west coast)

- This region includes western coast of India from Gujarat to Cape Comorin & has heavy rainfall.

(vii) Deccan Plateau —

- This region extends all over peninsular India & has rainfall upto 100 cm.

(viii) Assam —

- This region is characterized by heavy rainfall 200 - 1000 cm.
- The vegetation is either dense 'evergreen forest' or sub tropical.

(ix) Andamans —

- This region possesses a varied type of vegetation, mangroves & beach forest & its coasts.

INDIA AS A MEGA DIVERSITY NATION -

- Mega diversity concept covers the broad frame of bio diversity concept but emphasizes more on species richness, threatened species & Endemic species
- Mega diversity is a term used by international organization
- The mega diversity nations are - Mexico, Colombia, Ecuador, Peru, Brazil, Zaire, Madagascar, China, Malaysia, Indonesia, Australia & India. Thus India is one of the "mega diversity" nations.
- These countries have been considered to have the largest fraction of world's species & with a high concentration of endemic species.
- Two areas in India have been identified as mega diversity hotspot areas which are - western ghat & Eastern Himalayan forest, though India as a whole has been marked as a mega diversity nation.
- The Eastern Himalayas form a humid region having high monsoon rainfall, milder temp & less snowfall.
- The mountain ranges of Sikkim, Bhutan, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Darjiling etc have a good no. of peaks which rise over 7000m.
- The wet lands of this region have more than 200 species of aquatic & semi aquatic plants.
- Huge diversity found in India is mainly due to favourable environmental conditions.

- India's biosphere are well placed, cultural diversity is well exemplified in its different religions, languages, traditions, festivals etc.
- Ayurveda, Homeopathys & Herbal preparation are all based on plants, these are parts of traditional biodiversity in India.
- out of world's 1 lakh species of insects 60,000 are found in India, the 2 hot spots of India have been identified ^{habitat} from ^{certain region} 5332 endemic species of mammals, reptiles, amphibians, birds & higher plants.
- Many crops like rice, sugarcane, mango, date, citrus, banana, ba^hra, etc are found in India & spread throughout the world.
- A large proportion of Indian biodiversity is still ^{un}explored
- Nearly 5000 species of flowering plants had their origin in India.
- Thus biodiversity is an important strength in India.

Hot spots of Biodiversity —

- The explosive population growth is one of the prime causes of biodiversity loss.
- The most threatened of all biologically rich areas are called hot spots.
- Hot spots are identified by 2 main criteria, 1st plant endemism & ^{2nd is} degree of threat.
- In India 2 major centres, ^{the} western ghats & Eastern Himalayas are identified as hot spots of biodiversity.
- Myers (1999) had included the western ghats & Sri Lanka as the 21st hot spot in his analysis.

though they are separated by 400 km of water. These areas are similar in their geology, climatic & evolutionary history.

- Several species (endemic) are found in both parts of the hot spot.
- About 18 million people rely on the resources from these spots.

Endangered & Endemic Species of India:-

Endangered Species -

- According to red data book & botanical survey of India about 427 endangered plant species have been identified. This is about 20% of India's total floristic wealth of higher plants.
- In India the no. of official endangered animal species has risen from 13 (in 1952) to 250 (Now). Some Indian crocodile, musk deer, blue whale, Tiger, pelican, white crane, etc are under great threat.
- A species is said to be endangered when its no. reduced to a critical level or whose habitat have being drastically reduced.

Endemic Species -

- Endemism of India biodiversity is significant.
- About 4900 ^{species} of flowering plants are endemic to the country.
- The western ghats & Eastern Himalayas are reported to have 16000 & 3500 endemic species of flowering plants respectively.

- It is also estimated that 62% of the known amphibians are endemic to India out of which a majority occur in western ghats.

- Endemic species are the plants or animals which are limited in their distribution i.e., they are restricted to a small area & not found elsewhere in the world.

✓ Conservation of Biodiversity —

- Due to human activities & over exploitation of ecosystem, the most severe extinction has occurred. Thus our first & most important requirement now is conservation of biodiversity.

- From biological point of view it is our responsibility to conserve plants, animals, domestic animals, etc.

- The conservation has to be ex-situ as well as in-situ

SM Em-situ Conservation —

- Em-situ conservation means the wildlife conservation in captivity under human care. In this the endangered plants & animals are collected & bred under controlled condⁿs in gardens, zoos, sanctuaries, etc.

- wildlife management in captivity have the following advantages —

(i) The organisms are assured of food, water & shelter & security & hence can have longer life span.

(ii) The chances of survival of endangered species increase because of human care under secure condⁿs.

- However, there are some disadvantages & limitations of wild life management in captivity

(1) Maintenance of plants & animals under captivity is very expensive.

(2) Wild life captivity under a set of favourable conditions deprives the organism's ~~the~~ opportunity to adopt the ever-changing natural environment. Therefore new life forms cannot evolve.

In-situ Conservation

- In-situ conservation includes conservation of plants & animals in their native ecosystem where they naturally occur.
- This type of conservation applied only to wild fauna & flora & not to domesticated animals & plants.
- In-situ conservation includes a system of protected areas of different categories for ex - national park, sanctuaries, biosphere reserve, etc.

National parks; Wild life sanctuaries & biosphere reserve

- National park or sanctuary is defined as ~~an area~~ an area declared by state for the purpose of protecting & developing wildlife therein for their scientific, educational & recreational value. Human activities like hunting, fire wood collection, timber extraction; etc are restricted in these areas.
- In national parks, private rights are non-existent & other usages such as grazing of domestic animals are prohibited. However the general public may enter it for

the purpose of observation & study.

- Certain parts of the parks are develop for tourism

in such a way that enjoyment will not disturb the animals.

- Sanctuaries are of ranges betⁿ 100 km^2 - 500 km^2 .

However biosphere reserves are usually large protected areas having more than 5000 km^2 areas.

ENVIRONMENTAL POLLUTION

Pollution → ²
 - pollution is defined as the addition of constituents to the environment which adversely alter the natural quality of the environment.

Water Pollution → ^{7m}

The addition of any inorganic, organic, radiological substances to water which change its natural qualities, so that water is neither suitable for drinking purposes nor suitable for any other purposes is known as water pollution.

Water pollutants & their sources —

- The various types of water pollutants are —

(i) Oxygen Demanding Wastes — (wastes which use oxygen from water for degradation)
 these include domestic & animal sewage, biodegradable organic compounds & industrial wastes from food processing plants, Meat-packing plants, slaughter houses, paper mills etc as well as agricultural run-off. ^{Animal Killing} All these wastes undergo degradation by bacterial activity which results in rapid decrease of D.O (dissolved oxygen) from water.

Any decrease in D.O value is an index of pollution.

(ii) Diseases Causing Waste —

- these include pathogenic micro organisms comprising mainly viruses & bacteria.

- These micro organisms ^{can} cause dangerous water-borne diseases such as cholera, typhoid, Dysentery, polio & infectious hepatitis in humans.

(iii) Synthetic Organic Compounds

- These are manmade materials such as pesticides, synthetic detergents, pharmaceuticals, ^{medicines} food additives, paints & other industrial chemicals.
- These chemicals may enter the hydrosphere either by spillage during transport or by use. These pollutants are highly toxic to plants, animals & human beings.

(iv) Sewage & Agricultural Run-off

- Sewage & run-off from agricultural lands supply plant nutrients which may enhance the growth of algae & aquatic weeds. This results in degradation of the natural quality of water.

(v) Oil

- oil pollution may take place because of oil spills from oil tankers on the seas.
- oil pollution results in reduction of light transmission through surface water thereby reducing photosynthesis by marine plants.

(vi) Inorganic Pollutants

- Inorganic pollutants comprise of inorganic salts, metals, acids, nitrates, sulphates, cyanides etc. These are highly toxic & cause water pollution.

(vii) Suspended Solids

- Suspended solids in water mainly comprise of silt, sand & minerals eroded by lands. These also cause water pollution.

(viii) Radioactive Materials

- The radioactive water pollutant may originate from:
 - a) Mining & processing of ores
 - b) Use of radioactive isotopes in research, industrial &

medical applications.

c) Radioactive materials from nuclear power plants

(ix) Heat -

- In some industries like thermal power plants water is used as a coolant & the waste hot water is returned to the original water body. Hence, the temp. of water body increases. This rise in temp. decreases D.O content of water which adversely affects the aquatic life.

Effects of Water Pollution

- Some important effects of water pollution are -

- (1) Tannery Effluents ^{← leather} contain several constituents which are deleterious ^{← discharge} irrespective of the fact that where they are discharged i.e., into river, stream, land or sea, ^{← harmful}
- (2) It imparts persistent dull brown colour to the receiving water. ^{← constant}
- (3) Highly repulsive odour ^{← bad} is imparted to the receiving water.
- (4) The acidic & alkaline effluents are corrosive to concrete & metal pipes.
- (5) Excess sodium chloride in the effluent is also corrosive which makes the water unsuitable for irrigation.
- (6) The effluent may contain ^(60101 9/2019 9) pathogenic bacteria.
- (7) Dissolved chromium present in the effluent is toxic to fish & aquatic life.
- (8) The suspended solids interfere with the photosynthetic activity of aquatic flora.
- (9) High amounts of fluoride present in the effluent enrich the fluoride content of receiving water which causes dental & skeletal fluorosis to humans.
- (10) Volatile ^{← explosive} substances such as alcohols, aldehydes, ethers, gasoline may cause explosion in sewers.

(11) presence of cyanide & ammonia are also harmful to aquatic life.

(12) suspended solids may also cause bad odour, taste & also may promote favourable cond^{ns} for growth of pathogenic bacteria.

(13) Radioactive isotopes are toxic to life-forms. ^{90}Sr may accumulate in bone & 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 & minimization. Therefore we should adopt some safety measures to achieve acceptable water quality at the least cost. Some of these are —

(1) Scientific techniques^{es} 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 operations.

(3) The possible reuse or recycle of treated sewage effluents & industrial wastes should be encouraged.

(4) Instead of throwing wastes to water, recycling^{should} be done for better use. For ex- gobar gas plant, composting, manufacture of hard board, paper etc are^{such} examples where wastes can be used.

(5) Min^m quantity of fertilizers, pesticides, insecticides should be used.

(6) Water resources should be used in the best possible economic way.

(7) There should be propaganda for water pollution control on radio, TV, Newspaper etc.

(8) Treatment plants should be constructed, & government should also help by funding for domestic sewage & industrial effluents.

(9) To conduct seminars & training courses for those, who are directly or indirectly engaged in water pollution control.

(10) Government should encourage people to participate ~~people~~ in research programmes like disposal of sewage & effluents.

(11) Destruction of forest should be discouraged & our goal should be "conservation of forest".

(12) ~~Local authorities~~ Techniques like adsorption, electro dialysis, ion exchange & reverse osmosis etc can be used for removal of water pollutants.
 ← addition of any fluid

THERMAL POLLUTION: - 2

- Thermal pollution can be defined as addition of excess of undesirable heat to water that makes it harmful for man, animal, plant or aquatic or otherwise causes significant dangers to the normal activities of aquatic communities in water.
- various industrial plants like thermal, atomic, nuclear, coal fire plants & meats utilize water for cooling purposes.
- The heated effluents are discharged at a temp. $8-10^{\circ}\text{C}$ higher than the temp. of intake water which reduces the concentration of dissolved oxygen.

♥ Sources of Thermal pollution: -

- The following sources contribute to thermal pollution.

(1) Nuclear power plants -

- Nuclear power plants including drainage from hospitals, institutes, nuclear experiments & explosions, discharge a lot of unutilized heat & trapped radionuclides into nearby

water streams.

- These heated effluents are discharged at 10°C higher than the receptor & severely affect the aquatic flora & fauna.

(2) Coal fire power plant -

- These thermal power plants utilize coal as fuel & constitute ~~a~~ ^{major} source of thermal pollutants.
- They discharge effluents having temp. difference of 15°C betⁿ the effluent & water body.
- This causes decreases in dissolved oxygen content of water & results in killing of fish & other marine organisms.

(3) Industrial Effluents -

- Industries generating electricity require huge amount of cooling water. For heat removal to cope with the increase demand of electricity & rapid industrialization the no. of installations are raised which results in discharge of more volume of water.

(4) Hydroelectric power -

- Hydro electric power plants also contribute to thermal pollution.

(5) Domestic Sewage -

- Domestic sewage is commonly discharge into river, lakes, canals etc with or without waste treatment.

- The municipal sewage normally has a higher temp. than receiving water. The organic matter present in the sewage utilizes the D.O. present in the water & hence the D.O. content decreases.

Effects Of Thermal Pollution: —

(1) Reduction In Dissolved Oxygen —

- Concentration of D.O decreases with increase in temp. of water. For em - The D.O content is 14.6 ppm in water at a temp. of 32°F & 6.6 ppm at 64°F thus the cold water fish which requires about 6 ppm to survive could not tolerate the high water temp.

(2) Change In water properties —

- A rise in temp. changes the physical & chemical properties of water.
- The decrease in density, viscosity & solubility of gases increases the settling speed of suspended particles which seriously affect the aquatic organisms.

(3) Increase In Toxicity —

- The rise in temp. increases the toxicity of poisons present in water.
- For em - A 10°C rise in temp. doubles the toxic effects of potassium cyanide.

(4) Interference With Biological Activities —

- Temp. is considered to be of vital importance to physiology & biochemical processes thus a rise in temp. affects the respiration, digestion, excretion & overall development of aquatic organisms.

(5) Increase Vulnerability To Diseases —

- Activities of several pathogenic micro organisms are accelerated by higher temp. thus aquatic animals are become more vulnerable to diseases at higher temp.

(6) Undesirable changes in Algae population —

- The life in an aquatic ecosystem is greatly influenced by algal growth. Excess nutrients from the wash out water from farm lands, thermal plants etc cause an excessive algal growth & cause undesirable changes.

(7) Interference with Reproduction —

- The increase in temp. of water body interferes with the reproduction rate of aquatic organisms.

(8) Effect On Bacteria —

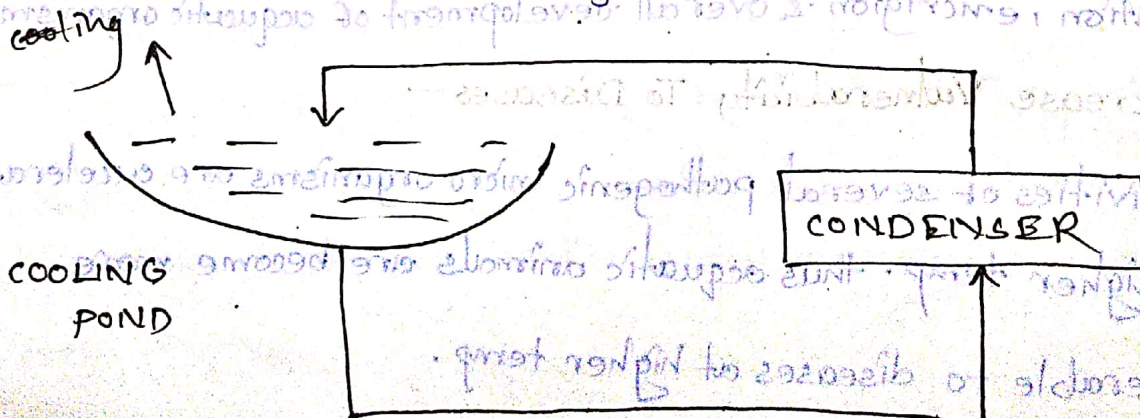
- Due to heated discharge from industries & plants, the bacteria are severely damaged.
- The effect includes coagulation of body proteins, melting of cell fats & toxic action of metabolic products.

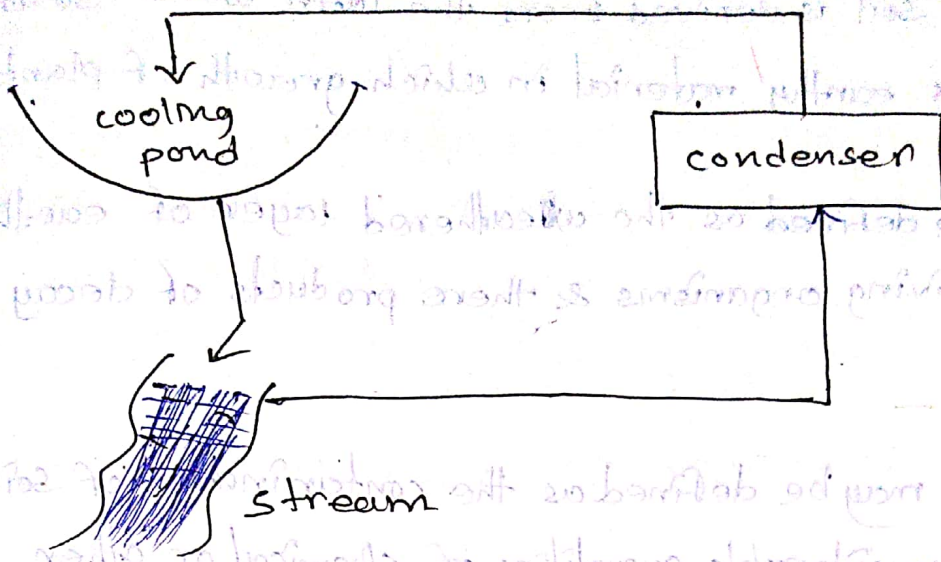
Control Of Thermal Pollution:—

The following methods can be adopted to control high temp. caused by thermal discharge,

(i) Cooling pond —

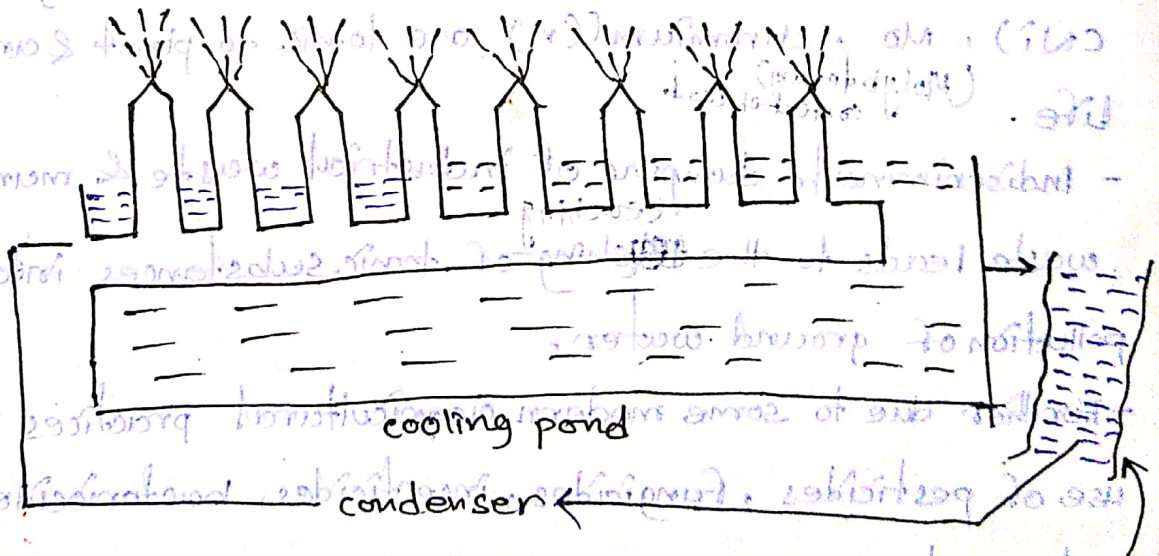
- The water from the condensers is stored in cooling ponds where natural evaporation brings down the temp.
- The water is recirculated again.





(2) spray ponds

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



(3) cooling Towers

- In wet cooling towers the heated water is brought in direct contact with continuously flowing air, the evaporation brings down the temp. to increase the surface area of contact. The water is broken down into droplets by the use of spray nozzles.

✓ SOIL POLLUTION?

- The word soil is derived from the latin word 'solum' which means earthy material in which growth of plants takes place.
- Soil may be defined as the weathered layer of earth's crust with living organisms & their products of decay.

Soil pollution —

- Soil pollution may be defined as the contamination of soil system by considerable quantities of chemical or other substances resulting in the reduction of its productivity with respect to qualitative & quantitative yield of crops.

Sources of Soil pollution —

- The major sources of metallic contamination of soils include mining, smelting, fertilizers, pesticides etc.
- Metals such as cadmium (^{Cd}), lead (Pb), Mercury (Hg), Nickel (Ni), Mo, chromium (Cr) are toxic to plant & animal life. (Molybdenum)
content of lead.
- Indiscriminate dumping of industrial waste & municipal waste leads to the ^{leaching} ~~leaching~~ of toxic substances into soil & pollution of ground water.
- Further due to some modern agricultural practices like use of pesticides, fungicides, insecticides, bacteriocides etc contaminate land.
- Direct pollution of soil by dangerous pathogenic organisms is also very important.
- Fly ash generated from thermal power plants & industrial waste discharged into streams or dumped into surrounding land. This ^{may} cause serious water & soil pollution.

- Commercial & domestic urban wastes containing materials such as plastics, glasses, waste paper, rubber, metal pans etc also contribute to soil pollution.
- Human & animal excreta, radioactive waste, farm waste etc were also cause soil pollution.

Effects Of Soil Pollution :-

- The major effects of soil pollutions are -

(i) Effect of Modern Agricultural practices -

a) ^{artificial} synthetic Fertilizers -

- synthetic fertilizers are employed to increase soil fertility & crop productivity.

- However excessive use of these fertilizers may result in the following undesirable effects -

(i) wheat, Maize, corn etc grown on soils fertilized with NPK fertilizers may result in reduction of protein content.

(ii) Excessive use of nitrogenous fertilizers leads to contamination of nitrates in the soil which in turn contaminate the ground water. Nitrate concentration exceeding 90 ppm in drinking water may lead to diarrhoea, blue jaundice etc.

(iii) Vegetation growth in nitrate rich soil may exert toxic effect in cattle.

(iv) Excessive use of chemical fertilizers may reduce the ability of plants to fix nitrogen.

(v) Excessive quantities of potassium fertilizers in soils may reduce the quantities of ascorbic acid or vitamin C

& carotene in fruits & vegetables. ~~The large size~~

(vi) ^{grown in} The large size fruits & vegetables highly fertilized soils may more vulnerably to attack by pests & insects.

b) pesticides —

- pesticides cause deleterious effect on soil fertility & crop productivity.
- some adverse effects of pesticides are —
 - (i) Arsenic pesticides may render the soil permanently infertile.
 - (ii) pesticides may be taken up by the plants from the soil & entered the food chain.
 - (iii) pesticides such as DDT, dieldrin etc may seep through the soil & contaminate drinking water supply.
 - (iv) fruits, vegetables, Rice, wheat, Barley etc may contain considerable quantities of toxic pesticides such as DDT, BHC etc.
 - (v) DDT can enter the food chain & can accumulate in human fats & may lead to various disorders.
 - (vi) persistent pesticides can damage human tissues & interfere with normal metabolic activities.
 - (vii) Chlorinated pesticides & herbicides are hazardous soil pollutants.
 - (viii) Herbicides such as diomane may cause congenital birth defects in off springs. ← seeds
Present source birth
 - (ix) Organophosphate pesticides may cause muscular disabilities & dizziness. ← head whirling
 - (x) Farmers are particularly prone to pesticide poisoning because of greater exposure while handling & spraying.
 - (xi) Contaminated soils may act as carriers of pathogenic bacteria which may endanger human health.
 - (xii) Volatile pesticides may cause air pollution in the surrounding areas.

(ii) Effects of Industrial Effluents —

- Solid, liquid & gaseous from various industries such as paper & pulp, iron & steel, fertilizers, automobiles, pesticides, tanneries, thermal power plants etc contain a variety of toxic pollutants.
- If they are not properly treated at the source they give rise to water, air & soil pollution.

(iii) Effects of Urban Waste —

- Million tonnes of urban waste are produced every year from polluted cities.
- The waste include plastic bags, garbage, dead animals, waste medicines, hospital wastes, tyres, shoes, etc which cause soil pollution.
- Apart from the above man-made sources, radioactive wastes from natural & man-made sources, soil erosion due to deforestation & unscientific agricultural practices also result in soil pollution.

Control Of Soil Pollution: —

- The various approaches to control soil pollution are —
 - (1) Launching extensive afforestation & community forestry programmes.
 - (2) Implementing different measures against deforestation.
 - (3) Banning the use of highly toxic ^{synthetic} chemical pesticides.
 - (4) Encouraging the use of bio pesticides in place of toxic chemical pesticides.
 - (5) Conservation of soil to prevent the loss of precious top soil.
 - (6) Effective treatment of domestic sewage by suitable biological & chemical methods.
 - (7) Municipal wastes should be disposed scientifically in land fills.

Recycling & reuse of materials should be done wherever possible.

- 8) Industrial wastes have to be properly treated at the source.
- 9) Avoiding excessive use of chemical fertilizers & providing more organic manures (OM) to the fields, thereby maintaining the soil fertility.
- 10) Imparting informal & formal public awareness programmes to educate people regarding the undesirable effects of environmental pollution.

MARINE POLLUTION:

- Seas are the unlimited source of water for man. They are the main source of food & earnings for persons living in coastal areas. When the marine water is polluted it affects the animals & other food chain components.

Sources of Marine pollution —

- The main sources of marine pollution are —

(1) Rivers are the main source of marine pollution. They carry wastes in their drainage & join the sea. The drainage includes industrial effluents, detergents, agrochemicals, plastics etc.

(2) ~~Catchment areas~~ A large amount of wastes from hotels, sewage from corporations & industries, waste from human activities from the catchment areas are mixed in the seawater.

(3) Ships which carry toxic substances, lubricating oils, paints, fuels & other chemicals from one place to another sometimes by accident or by leakage pollute the marine water.

(4) Testing of atomic weapons, space air crafts, missiles & other radioactive wastes will be dumped in seas, cause marine pollution.

(5) Marine pollution is also caused by oil drilling in seas, tourism activities & heat released from industries.

Effects of Marine Pollution —

- The major effects of marine pollution are —

(1) oil is the most dangerous pollutant which threat marine life especially fish, birds & invertebrates.

(2) oil of sea also affects sensitive flora & fauna, phytoplankton zoo plankton & other animals.

(3) plastic materials when dumped into sea by commercial ships, animals take it ^{through} their food in stomach. It causes ulser & reduces hunger.

(4) Marine pollution affects the food chain in sea which causes serious diseases like cancer.

(5) Detergents & other chemicals are also responsible for high mortality of marine life.

(6) Heavy metals, factory materials, acids etc also threat the marine life.

Control of Marine Pollution:

- suggested steps to control marine pollution are —

(1) Dumping of hazardous & toxic substances into sea should be banned

(2) Drainage sewage sludge & effluents from industries should not be discharged into rivers which join.

(3) Developmental activities on coastal areas should be minimize

(4) Toxic pollutants from industries & treatment plants should not be discharged into sea.

(5) ships & ports should have certain facilities for reducing pollution.

(6) Effective measures should be developed to check the leakage in ships & oil tankers.

- ⑦ Nuclear explosions & other nuclear activities in sea should be minimized.
- ⑧ Wastes from municipal, industries & thermal power plants should be recycled for reutilization.
- ⑨ Drilling should not be allowed in coastal areas.
- ⑩ We should develop awareness in people to reduce the amount of waste in their daily life.

NOISE POLLUTION:

- The term 'Noise' may be defined as an unwanted sound at a wrong time & at a wrong place.
- Whether a given sound is wanted or unwanted may depend upon the person involved, the loudness, the rhythm & the length of time for which one is exposed to it.
- A sound may be music to one person but noise to another, acceptable when soft rhythmic or for short time but unacceptable when loud, random or prolonged, reasonable when made by himself but unreasonable when made by others.
- Sound is characterized by the physical properties, frequency & intensity.
- Hertz or cycle per second is a measure of sound frequency.
- Human beings can hear only sounds ranging from 20 Hertz to 20000 Hertz.
- The range of frequency of human speech is 200 - 3000 Hertz.
- The loudness of sound is expressed in terms of decibel.
- Decibel (dB) $\uparrow = 10 \log \frac{\text{sound intensity measured}}{\text{Reference sound intensity}}$
- Sounds too high in frequency (above 20000 Hertz) is called ultrasound & sounds too low in frequency (below 20 Hertz)

is called infra sound,

Sources of Noise Pollution:

- Noise pollution is mostly caused by industries, vehicles, aeroplans etc.
- In our country urbanisation & industrialization have become the major sources of noise pollution.
- The cities & towns have led to residential, commercial & industrial areas being mixed ~~off~~ up.
- All the boons of modern civilization & industrialization such as motors, heavy machinery etc have become disturbing & irritating.

Effects of Noise Pollution:

a) physiological effects —

- At high levels of about 150 decibel (dB) permanent hearing impairment may be caused.
- sound levels in the range of 120-150 dB affects respiratory system causes dizziness & loss of physical control
- Loud sound can cause an increased secretion of many hormones of the pituitary gland. for ex- ACTH Hormone (Adreno Cortico Tropic Hormone).

b) psychological Effects —

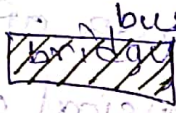
- Loud noise reduces the working efficiencies, interferes with communication, increases the frequency of errors which may at times cause accidents.
- Noise reduces the mental capability & interrupts sleep.

c) Hearing Loss —

- prolonged exposure to loud noise may cause temporary or permanent loss of hearing.
- longer exposure to louder noise may cause permanent shift in the threshold of hearing of an individual.

Control of Noise Pollution:—

Reduction of noise at the source —

- Noise level can be effectively reduced by replacement of noisy & rattling devices, proper oiling, greasing & by using effective silencer.
- Application of sound proofing techniques to diminish loud noise —
- Sound waves are absorbed by porous materials such as perforated sheets or objects. Just as putting cotton cloth in the ear reduces noise level for the individual concern, sound barriers placed around the source of noise drastically reduces the intensity of sound.
- Residential localities should be established away from the noisy industries,  busy highways, aerodromes etc.
- In most of the countries legal frame work against noise pollution has been developed, however in most of cases little efforts are made to enforce these rules & regulations effectively.
- Excessive noise is produced from various types of machines, petrols & diesel & electric motors etc. It is always advantageous, economical & effective to identify the noise sources & noise problems right in the design & incorporate necessary noise control measures.

✓ Radioactive Pollution: —

- An atom is made up of a nucleus which contains protons & neutrons surrounded by revolving electrons.
- A no. of atoms possess the ability to emit radiations & thereby cause radioactive pollution.
- Radiations originate from the instability of nuclei of an atom which lose subatomic particles & energy to acquire a stable state.
- The following types of radiations are emitted by radioactive isotopes:

α particles —

- α particles are positively charged He^{2+} .

β particles —

- β particles are high velocity electrons.

γ Rays —

- These are high energy electromagnetic radiations.

Sources Of Radioactive Pollution: —

- There are 2 main sources of radioactive pollution —

Natural sources —

- The natural sources of radioactivity are considered mainly of the cosmic radiation received from the space & naturally occurring radio isotopes present in our environment.

Manmade sources —

Nuclear weapons:

- Testing of nuclear weapons comprises the use of uranium ^{235}U & plutonium ^{239}Pu for fission.
(big - small)
- Also hydrogen or lithium are used as fusion material.
(small - big)

Atomic Reactors & Nuclear fuel:

- The most common fuels used for fission in nuclear

powerplants are uranium, plutonium & plutonium.

Radioactive Isotopes -

- Radioactive isotopes I^{125} , C^{14} , P^{32} etc are used widely in scientific research institutions.

- Radioactive iodine & phosphorus enter the food chain through water & finally reach man to fish.

Other sources -

- During different medical treatments ^{many radiations} enter the human body for ex. X-rays are common for detecting skeletal disorders & therapy for cancer patients ^{often} includes radium & other isotopic radiations.

Hazards Associate With Radioactive Pollution :-

- No physical, chemical & biological process can influence the process of radioactive emission. The unstable nuclei have to decay & acquire a stable state.

- A number of radioactive isotopes have a very long half-life. For ex - Th^{232} takes 14000000000 years to loose half of its radioactivity.

* Thus radioactive waste are permanent hazards for the biosphere.

- Most of the radiations have a high penetrating power,
- Nucleic acid (DNA & RNA) effectively absorb these radiations which cause carcinogenic & mutagenic effects.
- A biological system is unable to distinguish betⁿ a radioactive & a normal isotope. Therefore radioactive isotopes are absorbed & incorporated within the bodies of living organisms as normal isotopes.

- There is no other way to dispose these hazardous wastes ^{off}

except to store them for ~~thousands~~ or millions of years away from living beings. This is too long a period of human scale of time.

- In spite of all these hazards nuclear reactors & tests are still continuing. Thus an increasingly large amount of radioactive wastes are accumulating every day while ^{there is} no solution for their safe disposal.

Air Pollution : — (7)

- Air pollution may be defined as the excessive discharge of undesirable foreign substances into the atmospheric air thereby adversely affecting the quality of air & causing damage to human, plants & animal life.

Sources of Air Pollution:—

a) Gases —

(i) SO_2 (Sulphur Dioxide)

- when fuel is burned in different power plant, industries, oil refineries, petroleum industries & sulphuric acid plant, sulphur dioxide enters into environment.

(ii) SO_3 (Sulphur Trioxide)

- under the influence of sunlight a part of SO_2 changes to SO_3 . when the two oxides mix up with water vapour they form acid droplets which they remain suspended in air.

(iii) H_2S (Hydrogen Sulphide)

- It enters into atmosphere through the decomposition of sewage waste from various industries.

(iv) CO (Carbon Monoxide)

- CO is released by the partial combustion of fuel in automobile industries & oil refineries.
- Cigarette & domestic heat appliances are other sources of carbon monoxide.

(v) CO_2 (Carbon Dioxide)

- It is produced by burning of fuel such as coal, wood, petroleum products & gases fuel.

- CO_2 is also released into air by the respiration of plant & animal.

(vi) NO & NO_2 (oxide of Nitrogen)

- These are produced ^{from} the combustion of fuel, acid manufacture & explosive industries.

(vii) O_3 (Ozone)

- The air in upper atmosphere is rich in ozone. But if concentration of ozone increases in lower atmosphere, it is considered as an air pollutant.

(viii) HF (Hydrogen fluoride)

- It is discharged from fertilizer industries, aluminium industries & metallurgical process.

(ix) Photo Chemical Oxygen —

- In presence of sunlight different unburnt hydrocarbon react with oxides of nitrogen to form peroxy acetyl nitrate (PAN) which is a ^a major air pollutant.

(x) Hydro Carbon

- High concentration of hydrocarbon in atmosphere also causes air pollution.

b) particulate — (mixture of particles)

(i) Dust

- Main sources of dust ^{are} mines, power houses, vehicular traffic, house cleaning dust & engine exhaust.

(ii) Smoke

- Smoke is composed of tiny particles of carbon, ash, oil etc,

- The ^{major} sources of smoke ^{emission} are rails, roads, domestic wood, industrial power plant, diesel engines etc.

(iii) Smog

- Smog is a mixture of smoke & fog which causes air pollution.

(iv) Asbestos

- These are widely used in industries for their mechanical strength & resistant to heat.

- Tiny particles of asbestos in air are very dangerous to human health & causes air pollution.

(v) Lead

- Lead poisoning is one of the most serious environmental contamination but still it is widely used in our society.

(vi) Mercury

- It enters into the atmosphere from mercury vapour lamp & amalgams.

(vii) Cadmium

- It is the waste product from industrial process which causes air pollution.

c) Deforestation -

- Excessive cutting of tree causes indirect air pollution.

Effect of Air Pollution on Man & Its Environment: -

Damage to materials -

- The materials that may be affected air pollutant include metal building materials, rubbers, elastomers, paper, textile, leather dyes, glass, enamels & surface coating.

Damage to vegetation -

- Air pollutant such as sulphur dioxide, hydrogen fluoride, ozone, ethilin, NO_x , chlorine, herbicide & weedicide exert toxic effect on vegetation.

Damage To Farm Animals —

- Arsenic, lead & fluoride are the main pollutant which cause damage to live stock.
- These air born contaminants ^{which} accumulate in vegetation & poison the animals when they take the contaminate vegetation.

Darkening of sky & Reduction in visibility —

- sky darkening may caused by heavy smoke & fog.
- The reduction in visibility may be due smoke, fog & industrial fume which content particulates.

Effect On Human Health & Human Activities —

- Air pollution can affect the health of workers with in the industrial premises.
- sulphur dioxide causes respiratory irritation, sensory irritation, irritation of throat & eyes, Asthma & chronic bronchitis.
- oxide of nitrogen cause headache, respiratory disorder, loss of appetite & corrosion of teeth.
- sulphur trioxide create an acidic atmosphere which has harmful effect on materials like paper, cloth, leather, building et.
- It is also very destructive to lungs tissue & even cause heart failure,
- carbon monoxide causes headache, visual difficulty, paralysis & even death in human being.
- carbon monoxide reacts with hemoglobin to form carboxy-hemoglobin which reduces oxygen carrying capacity of blood,
- Carbon monoxide also affect a cardio-vascular system which causes heart diseases.

- Excess of carbon dioxide in the atmosphere causes respiratory disorders.
- Hydrochloride causes irritation, bone, teeth & skeleton disorder.
- photochemical oxidants cause irritation of eyes, nose, throat.
- High concentration of hydrocarbon affects lungs & causes swelling when they enter into the lungs.
- The incidents of cancer is being increasingly related with smoke.
- Lead enters to the body either as Pb^{+2} or tetra ethyl lead.
- when lead particle is enhanced it is concentrated with blood tissues or bones.
- When the concentration lead exceed 40 ppm then it is dangerous which causes anemia.
- mercury adversely affects the human nerves system.
- cadmium is toxic to living organism even in low concentration of less than 1 mg/l.

Measure To check Air Pollution :-

- The general method for control of air pollution are -
1. controlling the air pollution at source
 2. site selection / zoning
 3. Controlling air pollution by device / equipments / process modification
 4. Air pollution control by growing vegetation.
 5. Air pollution control by fuel selection & utilization.

1. Controlling the air pollution at sources —

- This is the best ^{method} to check air pollution at source. This can be achieved by —

□ Modifying the process in such a way that pollutants do not form at all beyond the permissible limit.

- Before releasing the pollutants they should be reduced to tolerable levels which can be done in 2 ways.

a) First we should select the raw material in such a way to release minimum pollutant.

b) Secondary we should use suitable fuel avoiding Sulphur fuel.

2. Site Selection / zoning —

- To install the industries site selection is very important while setting the factories the meteorological & micro-meteorological condition should be considered.

- For improvement of people health, zoning should be done properly i.e. the industries responsible for air pollution should be located far away from the residential area.

3. Controlling air pollution by devices/equipments/process modification —

■ Method or equipment used for control of gaseous pollutants —

- For gases pollutants the following methods are used —

a) Absorption —

- Scrubbers are mostly used for the removal of gases pollutant. They have suitable liquid absorbents to remove the pollutants.

b) Adsorption —

- Here the gases influent are passed through pores of solid adsorbents taken in suitable container.
- The efficiency of adsorption depend upon the surface area per unit weight of the adsorption.

c) Combustion —

- The flame combustion or catalytic combustion of organic gases, pollutant convert them in water & carbon dioxide.

■ Method or equipment used to particulate matter —

- The various method used to particulate matter are —

Filteration —

- The particulate matter is passed to filter, the particles trapped & collected in filter.
- After filteration the gas free from the particles is discharged out.

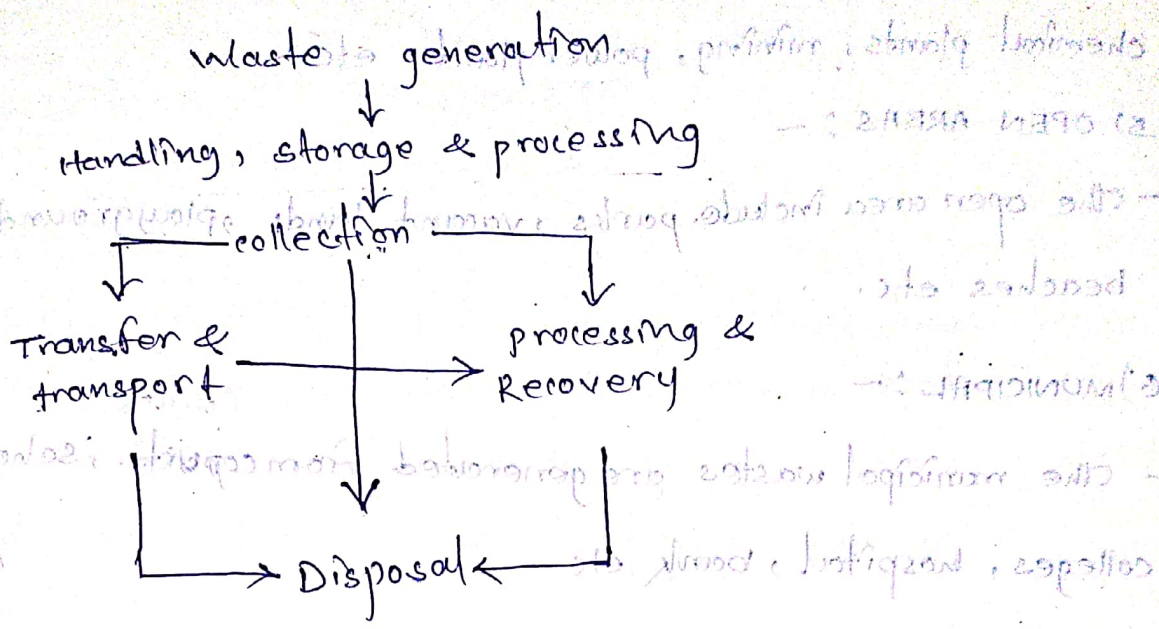
SOLID WASTE MANAGEMENT:—

3rd Nov. 2017

- Any material is thrown away or discarded as useless & unwanted by human or animal activities is considered as solid waste.
- The activities involved with the management of solid waste from the point of generation to final disposal can be grouped into 6 functional elements.

~~Waste Generation:~~

~~Handling, storage & processing~~



SOURCES OF SOLID WASTE? -

→ Sources of solid waste can be divided into following categories -

- (1) Residential
- (2) Commercial
- (3) Municipal
- (4) Industrial
- (5) open areas
- (6) Treatment plants
- (7) Agriculture
- (8) Hazardous wastes
- (9) construction sites

(1) RESIDENTIAL: -

- waste generated from single family & multi family houses, flats
 low, medium & high rise apartments etc.

(2) COMMERCIAL: -

- wastes generated from restaurants, markets, stores, hotels, institutions, office, workshop etc.

(3) INDUSTRIAL: -

- wastes from construction, light & heavy manufacturing etc.

chemical plants, mining, power plants etc.

5) OPEN AREAS :-

- the open area include parks, vacant lands, playgrounds, beaches etc.

6) MUNICIPAL :-

- the municipal wastes are generated from ~~markets~~, schools, colleges, hospital, bank etc.

7) TREATMENT PLANT :-

- these ~~way~~ includes waste generated from industrial treatment processes.

8) AGRICULTURAL :-

- wastes generated from fields, orchards, dairies, farms etc.

9) HAZARDOUS WASTES -

- waste generated from hospitals, research laboratories etc.

4) Construction sites -

- wastes from demolition & construction sites.

TYPES OF SOLID WASTE:

1. Garbage -

- food wastes are the animal, fruits or vegetable residues resulting from handling, preparation, cooking & eating of foods.

It is known as garbage.

2) Rubbish -

- Rubbish consist of combustible & non combustible solid wastes of households, institutions, commercial activities, etc including food wastes.

2. Combustible - paper, cardboard etc

3. Glass, Metal cans, etc

3. Ashes & Residues -

- materials remaining from the burning of wood, coal & other combustible wastes are categorized as ashes & residues.

4. Demolition & Construction waste -

- wastes from buildings & other structures are classified as demolition waste.

- wastes from construction, remodeling & repairing of individual residences, commercial buildings etc are classified as construction waste.

5. Special wastes -

- waste such as street sweepings, road side litter, ^{garbage} dead animals & abandoned vehicles are classified as special waste.

6. Agricultural Wastes -

- wastes & residues are resulting from agricultural activities such as planting, production of milk, production of animals for slaughter etc.

7. Hazardous waste -

- chemical, biological, flammable, explosives or radioactive wastes that are harmful to human, plant or animal life are classified as hazardous waste.

EFFECTS OF SOLID WASTE: -

- The accumulation of waste at any place is a bad & risky situations.

- varieties of microorganisms like fungi, algae, virus etc creep into the accumulated waste & start its decomposition.

- various types of germs develop in the waste. they reach us through air, water & food.

most of the infectious diseases like cholera, diarrhoea, dehydration etc spread in this ways.

- water pollution, air pollution & soil pollution are caused due to accumulation of different types of waste.
- Harmful fumes from industries & other wastes affect skin, eye, historical monuments etc.
- Asbestos particles from asbestos industry cause asbestosis.
- Mercury can cause ^{mental or brain} Minamata diseases.
- waste materials when accumulated here & there disturb the drainage system.
- Decomposing wastes reach underground & contaminate the underground water.
- Improper disposal of municipal waste & throwing the household wastes here & there affects the community.
- waste like cans, pesticides, plastics, batteries, cleaning solvent papers which can be recycled cause serious effects on mankind.
- Animals were also affected by taking poisonous wastes & polythenes.

Management of Solid Waste —

- waste management is the collection, transport, processing & disposal of waste materials so as to reduce their effects on their local environment & community.

Methods of Solid Waste Disposal — 5M

(1) Physical Removal —

- It is done by manual activities like collection of wastes & sorting out into re usable, decomposable & nondecomposable.
- Dustbins should be used in homes, offices & dispose accordingly i.e. to khabadi or for reuse or recycle.

(w) Dumping —

- transfer of solid waste from place of collection to the site of disposal is called dumping.

(z) Compaction & Baling —

- the solid wastes are sprayed on a plain & hard surface & later pressed by bulldozer. This is called compaction.
- these compacted layers are rolled & piled. This is called baling. Then these are wrapped by plastic or wires.

3R ⇒ OR Reduce, Reuse & Recycle

Solid Waste: —

Each generation of

- Reduce ~~of~~ waste material —

- we should reduce household waste by using max^m part of the goods.

- Before throwing outside we should select the parts for reuse or recycling.

- while purchasing things we should avoid polythenes & heavy packages. Thus every individual has a responsibility of creating less waste & managing it properly.

Reuse of Waste Materials —

- After selecting the waste ^{which can be reused} use ~~them~~ ^{them} after proper treatment.

- we should not use cups, plates, utensils etc of paper.

- plastic bags, wrap, foils, etc shouldn't be used.

- we should discourage use & throw policy.

- sell or donate goods instead of throwing them out

- we should develop quality of borrow, share & rent in ourselves.

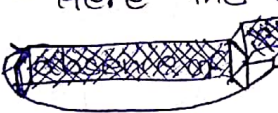
- one should take lessons from poor, villagers who reuse their materials to the max^m due to their

financial condns.

Recycling of Waste Materials —

- principal operations of solid waste disposal include ^{sewage treatment} ~~sewage treatment~~ ^{recycling} ~~recycling~~ ^{composting} ~~composting~~ , sanitary land filling , thermal process ^{of} ~~of~~ incineration.

(i) Sewage Treatment —

- The sewage is sent through settling chambers where lime is mixed with it.
- The neutralized sewage is passed through upflow anaerobic sludge blanket (UASB).
- Here the decomposable material is decomposed by the  bacterial activities in absence of oxygen.
- Dissolved substances are removed by the process of chlorination , evaporation etc.

(ii) Pulverisation —

- The volume of solid waste is reduced through grinding for easy handling to transport & disposal.

(iii) Composting —

- The process of making manure of decomposable waste with the help of microbial activities is called composting.
- It is of 2 types —
Aerobic → i.e. in presence of air & anaerobic i.e. in absence of air.
- For this different size pits are dug in the ground & all the biodegradable solid wastes are dumped & fully filled pits are covered with a layer of soil.
- Water is added time to time. Average time for composting is 1-6 months.

Sanitary Land Filling —

- In this process wastes are scientifically filled into low lands.

Thermal process —

- Burning of solid wastes under controlled condⁿs is called thermal process. This can be carried out by both ⁱⁿ presence or absence of air.

- Burning in presence of air is called incineration & in absence of air is called pyrolysis.

★ However we shouldn't throw or dump wastes in open or burn illegally because it affects the environment therefore recycle & reuse are very important.

Role of An Individual In prevention of Pollution: —

(1) one should start first in the field of environmental awareness to protect the pollution

(2) we should go place to place to teach the lesson of awareness & prepare volunteers.

(3) Give the message to save environment through papers, magazines, TV & radio.

(4) To promote for plantation & conservation of forest

(5) To organize seminars, on the subject related to pollution

(6) one should go in rural areas during festivals, functions, local gatherings, & religious occasions to convince people for prevention of pollution.

(7) Awareness is very effective in childhood, hence we should go to schools, organize rallies to teach the lesson of environment

(8) world forest day, world environmental day &

other such functions should be organized for general

awareness. on these functions, Govt. should also take interest in this regard but we should not depend on Govt.

- (9) population growth should be reduced.
- (10) we should use & promote mass transport system. If possible go on foot or use bicycle for short distances
- (11) we should not use materials containing CFC eg.

Refrigerators, cups, etc.

- (12) we should discourage the use of more fertilizers, insecticides & pesticides but should encourage the use of bio fertilizers.

Disaster Management.

It is defined as the organization and management of resources and responsibilities for dealing with all aspects of emergencies, in particular preparedness, response and recovery in order to lessen the impact of disasters.

✓ EARTHQUAKE: —

- Earthquake may be defined as natural phenomenon which tends to create panic due to the trembling vibration of sudden undulation of a portion of earth's crust caused by splitting of mass of rock or by volcanic or other disturbances.

General Characteristics: —

- Impact of earthquake is sudden with little or no warning following a major earthquake, the after shocks may give warning of a further earthquake.

- (1) It is not yet possible to predict magnitude, time & place of occurrence of an earthquake.
- (2) The onset is usually sudden.
- (3) Earthquake prone areas are generally well identified & well known on the basis of geological features & past occurrences of earthquakes.
- (4) The obvious effects include damage to buildings & infrastructures.
- (5) On the average about 18000 people die each year due to this disaster throughout the world.
- (6) About 200 large magnitude earthquake ($M > 6.0$) occur in a decade.
- (7) The world's earthquake problem seems to be increasing with increased population, high rise buildings & crowded cities.
- (8) The exact spot underneath the surface of the earth at which earthquake originates is known as "focus" while the point lying vertically above the focus is defined as "epicenter" of the earthquake.

(9) The power of an earthquake is reckoned in terms of its ^{← counted}

"magnitude" which is measured on an open-ended

Richter scale from 1 to 9.

VULNERABILITY

- Disaster result from vulnerable societies being exposed to

a hazard. There can be physical vulnerability, social vulnerability

& economic vulnerability on account of an earth disaster.

- Physical vulnerability relates to buildings, infrastructure &

agriculture. The vulnerability of building is dependent on

their sets, shape, materials used, construction techniques,

maintenance & proximity of buildings to others.

Social vulnerability

(1) Single parent families

(2) Women, particularly when pregnant & lactating

(3) Mentally & physically handicapped people

(4) Children &

(5) The elderly

Economic vulnerability

- It measures the risk of hazards causing losses to economic assets & processes.

Impacts & Effects

- In general terms, typical impacts & effects of earthquake disaster.

a) Loss of life

- b) Injury & ~~decession~~ ^{decession}
- c) Damage to & ~~destruction~~ ^{destruction} of property
- d) Damage to & destruction of subsistence ^{essential needs} & each crops.
- e) Disruption of production
- f) Disruption of life style
- g) Loss of livelihood
- h) Damage to national infrastructure & disruption to administrative & organizational systems
- i) National economic loss
- j) sociological & psychological after-effects,

Nature of Damage —

- Damage due to earthquakes are the related terms & depends upon various factors listed belows:

- | | |
|---|---|
| <ul style="list-style-type: none"> 1) Nature of earthquake 2) Geological & soil conditions 3) Quality of construction 4) Sociological factors | <p style="text-align: center;"><u>Remedial measures</u></p> <ul style="list-style-type: none"> → Build homes with proper building code. → Stock water & food → Participate in disaster training. → Discuss it with your family. |
|---|---|

✓ CYCLONE: —

- cyclones are one of the most disastrous natural hazards in the tropics & are responsible for deaths & destruction more than any other natural calamities.
- cyclones form over the warm ocean waters little away from the equator within the belt of 30°N & 30°S. In our area, cyclones form in the Bay of Bengal & the Arabian sea.

Characteristics —

- Tropical cyclones are large, rotating, atmospheric, phenomena extending horizontally from 150 - 1000 km & vertically from

Surface to 12-14 km.

- cyclones generally move 300-500 km in 24 hours over the ocean.
- The severest category of cyclones have wind speeds of 115 kmph.

- A well developed cyclone consists of a central region of light winds known as its "Eye". The eye has average radius of about 20-30 km, but it can be 40-50 km in large cyclones. The eye is an almost cloudfree zone & it is surrounded by a ring of very strong winds extending on an average up to 30-50 km beyond the centre.

- This area is known as zone of minimum wind. Surrounding this region, winds spiral in the counterclockwise direction in the northern hemisphere, extend outward to large distances, with speeds gradually decreasing as one moves further away from the centre.

- on an average, about 5-6 cyclones form in the Bay of Bengal & the Arabian sea every year, out of which 2-3 may be severe.

Warnings →

- cyclone warnings are provided through six cyclone warning centres located at Calcutta, Bhubaneswar, Visakhapatnam, Madras, Bombay & Ahmedabad.

- cyclone warnings are issued to the All India Radio (AIR) & the Doordarshan for broadcast / telecast in different languages.

- cyclones are tracked with the help of INSAT, ^{Indian National Satellite System} powerful cyclone detection radars & conventional meteorological observations including weather reports from ships.

- At present cyclone detection radars are installed at (i) Calcutta, (ii) Paradip, (iii) Visakhapatnam, (iv) Machilipatnam, (v) Chennai, (vi) Karakkal on the east coast; & (vii) Goa, (viii) Cochin, (ix) Mumbai & (x) Bhub along the west coast.

- cyclone warnings are provided in 2 stages. In its first stage, a "cyclone alert" is issued 48 hours before the anticipated time of commencement of adverse weather along the coast in the 2nd stage, a "cyclone warning" is issued 24 hours before the cyclone's anticipated landfall. Warnings for the ports & fisheries start much earlier.

- cyclone warnings are disseminated through the following means:

- (i) Telegrams with highest priority
- (ii) Telecast through Doordarshan
- (iii) Broadcast through AIR → All India Radio
- (iv) Bulletins to the press
- (v) Broadcast through Department of Telecommunications, coastal Radio stations for ships in the high seas & coastal areas &
- (vi) INSAT based Disaster warning system

Preparedness: —

- The preparedness means measures which enable government organizations, communities & individuals to respond rapidly & effectively to disaster situations.
- The preparedness actions have to be planned ahead of disaster.
- The action plan would indicate how evacuation of people would be effected & the places where they could be evacuated to.
- The ^{safe} storage of non-perishable food & other essential needs, adequate collection of stocks of drinking water & medicines, have to be made.

Risk Reduction Processes —

- The prevention of tropical cyclone formation is not within the realm of possibility. However, the loss of human lives & destruction of properties can be minimized by adopting prescribed short & long term measures for risk reduction.

- cyclone warning system is the most important constituent of short term risk reduction measures against cyclone disaster.
- structural measures like construction of cyclone shelters, embankments, dykes, reservoirs & coastal afforestation are some of the long term risk reduction measures for cyclone disasters.

Effects —

- Severe tropical cyclones are responsible for large casualties & considerable damage to property & agricultural crop.
- principal dangers from a cyclones are : (i) very strong winds, (ii) torrential rain, & (iii) high storm tides.
- They are often responsible for much loss of life & damage to property : Death & destruction
- The collapse of buildings, falling trees, flying debris, electrocution, aircraft accidents & disease from contaminated food & water in the post-cyclone period also contribute to loss of life & destruction of property
- Floods generated by cyclone rainfall are more destructive than winds.
- However due to significant improvement in cyclone warning system, & adequate & timely steps taken by the government & other agencies, the loss of human lives is in the decreasing trend, although, loss of properties shows an increasing trend. The increase in the loss of properties is due to increased activity but unplanned human activities & non-engineered construction along the coast.

Landslides —

- often it is not realized that a large part of India consists of mountainous terrain. In the north, there is the extensive Himalayan mountain system extending all along from the west to the east. Its lofty peaks rise to more than 8000 metres height.
- The middle ranges of the Himalayas are about 5000 metres high on the average while the foothills rise to about 6000 metres. The Himalayas abound in glaciers & are the origin of many rivers & streams.
- The peninsular region of India starts from the Vindhya range & consists of the Deccan plateau which slopes eastwards.
- On its edges, this great plateau is bound by the mountain ranges of the Eastern Ghats & the Western Ghats.
- The Nilgiri mountains are in the southern parts of the plateau. The west central parts of the country have the ranges of the Aravali mountains.
- Given these special geological & geographical features & combined with the heavy rainfall system. It is but natural that the mountainous areas of India are vulnerable to the hazards of landslides.

Areas struck with Frequency and Intensity —

- Landslides are a frequent & recurring phenomenon in the various hill ranges of India from Kerala to the Himalayas.
- Areas prone to landslides also include the Eastern & Western Ghats, the Nilgiri, the Vindhya ranges, the mountains in the northeastern states & the great Himalayan range.

Landslides: ^{reflects} More often, the major landslides are combinations of rockslide & rockfall. They all involve movement of mass. The process of movement of mass may vary from slow soil creep to abrupt & sudden rockfall.

- Based on the type of movement, relative rate of movement & kind of material involved, landslides can be designated into 5 kinds as follows:

- Slump with earthflow
- Rock slide
- Debris slide
- Rock fall
- Debris fall

- Landslides, being more widespread in different mountainous or hilly regions of the country, cause damage which is more varied & more widespread. Increased population, quarrying, mining & construction activities near unstable hill slopes, have resulted in more landslides & greater damages.

Relief & Rehabilitation: -

Essentially, the relief steps comprise the following:

- (1) Search & Rescue
- (2) Medical assistance to the injured
- (3) Disposal of the dead
- (4) Food & water
- (5) Emergency shelter for the homeless
- (6) opening up access roads if blocked; & restoration of communication channels
- (7) Psychological counseling of the survivors who have lost their close relatives
- (8) repair of houses & facilities
- (9) Assistance to restart economic activity to restore regular work & income
- (10) Reconstruction through proper planning

Floods

It is a temporary inundation of large regions as the result of an increase in reservoir, or of rivers flooding their banks because of heavy rains, high winds, cyclones, storm surge along coast, tsunami, melting snow or dam bursts.

Effects

Floods may happen gradually and take hours, or can happen suddenly due to breach of the structures, spillover, etc. heavy downpour can cause flash floods in the region.

Physical damage

- Structures damaged or collapsed by washing waters
- Land slide triggered on account of water getting saturated.
- Boats & fishing equipments may be lost or damaged in coastal areas.

Casualties & public health

- People & livestock deaths caused by drowning, very few serious injuries.
- Outbreak of epidemics, diarrhoea, viral infections, malaria.

Water supplies

- Contamination of water (wells, ground water, piped water supply).
- Clean water may be unavailable.

Crops & food supplies

- Sudden food shortage can be caused due to loss of entire harvest, spoiling of grains when saturated in water along with loss of animal fodder.

→ The crop storage facilities and godowns may get submerged resulting in immediate food shortage.

→ Floods may also affect the soil characteristics. The land may be rendered infertile due to erosion of top layer, or may turn saline if sea water floods the area.

Remedial measures

→ Embankments along the rivers, sea walls along the coasts may keep water away from the flood plains.

→ water flow can be regularized through construction of the reservoirs, check dams, alternate drainage channels/routes, increasing vegetation cover & by providing storm drains.

→ mapping of the flood prone area according to historical ~~data~~ records and warning can be issued looking into the earlier marked regions.

→ Land use control will reduce danger of life & property when water inundates the flood plains & the coastal areas.

→ Construction of engineered structures in the flood plains & strengthening of structures to withstand flood forces & seepage.

→ Reforestation, protection of vegetation, cleaning of debris from streams & other water holding areas, conservation of ponds & lakes etc.

Dissolved Oxygen :-

- oxygen is necessary for all living & non living organisms but D.O in water is vital to fish & other aquatic life.
- D.O is defined as the number of moles of molecular oxygen (O_2) present dissolved in a litre of water at a temp.
- It is expressed as $mg(O_2)/Ltr.$
- It can range from 0-18 $mg(O_2)/Ltr.$
- Most natural water systems require 5-6 $mg(O_2)/Ltr.$
- A lower % or a higher % of D.O is conducive to aquatic flora & fauna.

Factors Affecting D.O. :-

- a) water temp.
- b) water flow
- c) Aquatic plant population
- d) Human activity
- e) Atmospheric pressure
- f) organic waste, etc

Chemical Oxygen Demand [C.O.D] - ✓

- It is defined as the amount of oxygen consumed under specified cond^s in the oxidation of organic & oxidisable inorganic matter.
- It is expressed in mg/L or ppm.

Biological Oxygen Demand [B.O.D] - ✓

- It is defined as a measure of oxygen needed by bacteria & other microorganisms for oxidation of organic matter present in the water sample over a period.
- The BOD of drinking water is less than 1 while sewages have more than several hundreds.
- Greater the BOD greater the pollution

✓ Human Rights Related To Environment:—

- Human rights empower everyone simply because they are human min irrespective of their race, caste, nationality, gender or language.
- Environmental issues & human rights are inseparable in their ends & objectives.
- we have observe that the developed countries having 20% of world's population consume more than 80% of natural resources release 80% of the waste into the geosphere.
- Here comes the problems of human rights.
- Natural resources, fuels, materials, foods & water must be equitably distributed.
- philosophically every citizen of any country has equal rights over the resources available anywhere in the world.
- The gulf countries have enormous resources & natural gas & have rights over those resources but when the same is burnt or utilized, the CO_2 affects every nation & every man.
- They do not have the right to pollute the atmosphere which is everybody's property.
- Similarly the industrial nations purchase raw materials & fuels from poor countries & pollute the geosystem.
- They advice developing nations to conserve forests & absorb the CO_2 emitted by that industries.
- Rich people build huge concrete & marble houses spending their ^{own} money. Huge dams are built displacing several millions from their natural habitats.
- By this they loose their dear land & environment & which kills their enthusiasm to live.
- so rights of every individual must be safe guarded irrespective of their class or nationality.

UN Declared Human Rights:-

- (1) All human beings are born free & equal in dignity & rights.
- (2) Everyone is entitled to all the rights & freedoms without distinction of any kind of race, colour, language, sex, religion, property, nationality, birth & other status.
- (3) Everyone has the right to life, liberty & security of person.
- (4) No one shall be held in slavery i.e. the slave trade should be prohibited.
- (5) All are equal before the law.
- (6) Everyone has the right to recognition everywhere as a person before the law.
- (7) No one shall be subjected to torture or to cruel or inhuman treatment or punishment.
- (8) Everyone has the right to live any country including his own & return to his country.
- (9) Everyone has the right to a nationality.
- (10) Everyone has the right to own property alone as well as in associations with others.
- (11) Everyone has the right to freedom of opinion & expression.
- (12) Everyone has the right to work to free choice of employment.
- (13) Everyone has the right to education.

CH-6 SOCIAL ISSUES & THE ENVIRONMENT

From unsustainable to sustainable development →

More and more natural resources were consumed in the process of satisfying the rapidly growing needs of the habitat. Every developmental activity has some impact on the environment.

- unsustainable development means the development of a few privileged nations both in science and technology. Such developments are at the cost of our life supporting systems like air, water and soil.

- If growth continues in the same way, very soon we will be facing a "dooms day" ^{destruction} ~~end~~ of earth & last day of human being

- To be sustainable, development must possess both economical and ecological sustainability. The Brundtland (1987) has defined that sustainable development is the development that meets the needs of the present without compromising the ability of the future generations to meet their own needs.

- There are 2 aspects of sustainable developments:-

(1) Intra-generational Equity ^{Do Justice} - during generation change means father, son, grandson etc.

- This emphasizes that technological development should support economic growth of the poor countries so as to reduce the wealth gap within & betⁿ the nations.

(i) Inter-generational equity - betⁿ generation means past & future generation
- this emphasizes that we should stop over-exploitation of resources, reduce waste discharge & emissions, maintaining an ecological balance, which will help the future generation.

2. Measures For Sustainable development -

(i) To promote environmental education and awareness - we should develop awareness by introducing environment as a subject in education from primary stage.

(ii) Three 'R' approach - Three R mean reduce, reuse & recycle are should reduce the excessive use of natural resources & reuse them instead of passing on to the waste stream, Recycle the materials where ever possible.

(iii) Appropriate technology - the technology should use less resources and produce minimum waste. It should be locally adaptable, ecofriendly, resource efficient & culturally suitable.

(iv) To utilize resources as per carrying capacity of environment - If the carrying capacity of a stream is crossed, environmental degradation continues until it reaches a point of no return.

Urban Problems Related To Energy -

- urban areas are developing very fast. In most of cities there is influm of populations from surrounding areas, mostly in search of employment and better living conditions.

- Therefore, it is difficult to accommodate all the industrial, commercial & residential facilities within limit. As a result, cities are spreading into sub-urban or to rural areas. Energy is required in energy walk of life like industry, transport, defense, agriculture, trade, education, domestic etc. Hence, energy is the most important input for development. The energy requirements of urban population are much higher than that of rural ones.

Energy problems become more severe due to the

limited amount of non-renewable resources of energy.

Rapid utilization of fossil fuels produces increased production of wastes which causes environmental pollution. Also people are facing for 'power cut' because energy demand is higher than production.

→ The main causes of energy problems are -

(i) Increasing use of energy for domestic & commercial purposes.

(ii) Industrial plants using big proportion of energy

(iii) Non-renewable energy resources like coal, petroleum & natural gas are decreasing

(iv) Increasing of transport means

(v) Decreasing production of hydro electricity due to insufficient rains

insufficient rains

Steps to solve energy related problems —

- (i) To control urbanization
- (ii) To develop renewable sources of energy like solar radiation, wind power, nuclear power etc.
- (iii) Non-renewable energy resources should be used only when no non-conventional sources of energy is available.
- (iv) Welcoming the awareness programmes to save energy.

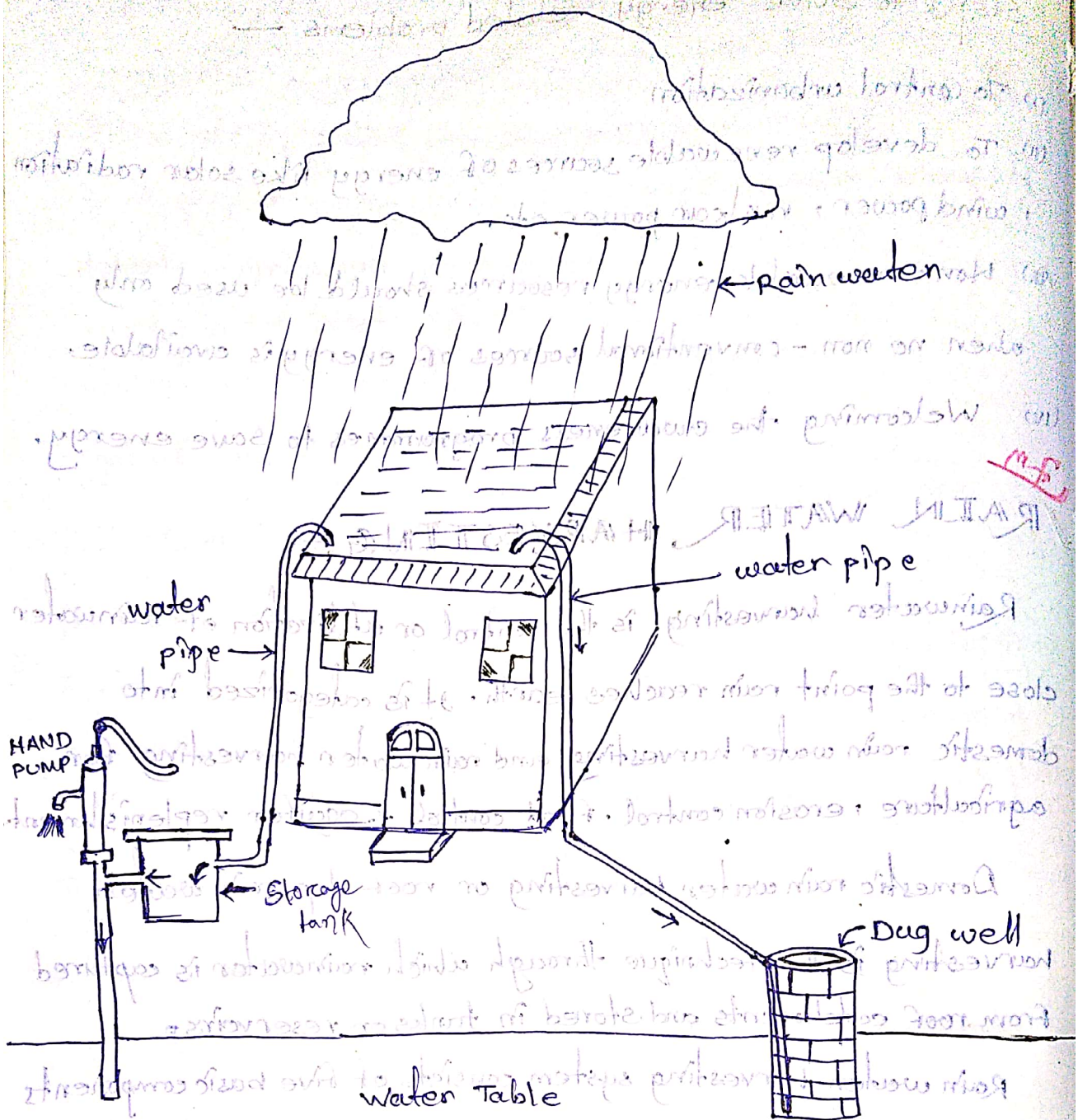
7M RAIN WATER HARVESTING :-

Rainwater harvesting is the control or utilization of rainwater close to the point rain reaches earth. It is categorized into domestic rain water harvesting and rain water harvesting for agriculture, erosion control, flood control & aquifer replenishment.

Domestic rain water harvesting or roof top rain water harvesting is the technique through which rainwater is captured from roof catchments and stored in tanks or reservoirs.

Rain water harvesting system consists of five 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) Roof washers, systems that remove contaminants
- (d) Cisterns or storage tanks, where rainwater is stored
- (e) Water treatment, the filters and additives to settle and disinfect



The main objectives of rain water harvesting are →

- a) To restore supplies from the aquifers depleted due to over exploitation.
- b) To store excess water for use at subsequent times
- c) To improve physical and chemical quality of ground water
- d) To reduce soil erosion
- e) To prevent salinity ingress in coastal areas
- f) To increase hydrostatic pressure to prevent land subsidence

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

The 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 & consequently the costs
- e) Reduction in flood hazards & soil erosion
- f) Improvement in water quality
- g) Arresting sea water ingress
- h) Mitigating the effects of droughts
- i) Upgrading the social & environmental status etc.

✓ Watershed Management →

watershed is a drainage area on earth's surface from which run off resulting from precipitation flows to a single point into a large stream, a river, a lake or the ocean. Damodar valley corporation in 1949 adopted first integrated watershed management.

The main objectives of watershed management are →

- a) To increase agricultural production
- b) The ^{perfect} rational utilization of natural resources like water, soil & vegetation.
- c) To minimize the risks of floods, droughts & land slides
- d) To manage the watershed for developmental activities like domestic water supply, irrigation, hydropower generation etc.

e) To develop the rural areas and their life style.

Various Measures Necessary for watershed management are →

a) Scientific mining & quarrying must be done in the watershed areas.

b) water harvesting in the watersheds to be used in dry

season. in low rainfall areas, ^{combination of trees & crops}

c) Afforestation & agro forestry should be promoted.

d) To promote soil binding plants like vitem, shrubs, grass etc.

e) people's participation should be ensured including farmers & tribals in the watershed management programmes.

Resettlement And Rehabilitation Of People →

Sometimes for the development of projects like construction of dams, mining, creation of parks etc & during natural calamities like earthquakes, landslides, flood, cyclones etc. The problem of resettlement & rehabilitation arise.

(1) Displacement due to dams —

Sardar Sarovar project (Gujarat), Hirakud (Odisha),

Bhakra Nangal Dam (Punjab), Tehri Dam (Uttaranchal),

Indira Sagar project (Madhyapradesh) etc are some examples

which displaced more than 25 million people.

Case Study —

a) Indira Sagar project (1000 MW) is in Khandwa district of MP.

The reservoir of ISP dam is the largest reservoir in India with storage capacity of 12.22 billion m^3 . A large no. of people were affected by this project & a separate township ^{Chhanera} ~~Chhanera~~ was developed for the displaced people.

b) Tehri Dam is on meeting point river of river Bhagirathi &

Bhilangana. It is world's most controversial project. More than 1.25 million people were affected by this project. The people displaced are called Eco-Refugee & are rehabilitated in Dehradun & Haridwar.

(2) Displacement due to mining -

people displaced due to mining activity are poorest & mostly tribal. They lost much more than they get from the projects.
case study -

• Jharia coal field is in Jharkhand. In this project thousand hectares of land were affected. The problem of resettlement & rehabilitation is still there.

(3) Displacement due to Natural parks → To conserve Flora & fauna, some times large forest area is covered under national parks & Sanctuary. It is declared as core area & entry of local tribals are prohibited.

case study - (a) Valmiki Tiger Reserve area in west Champaran districts displaced 142 villages of Tharu community tribals. → Bihar

(b) Wayabana Sanctuary displaced about 53470 tribal families. → Kerala
The rehabilitation is still incomplete.

Rehabilitation →

- 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 etc.

- Therefore National Rehabilitation policy is needed to honour the human rights of the displaced people.

- Govt. under Land Acquisition Act 1984 has power to vacate the land from people by giving notice for govt. use.
- Therefore, there is need of public awareness in resettlement & rehabilitation plans.

GLOBAL WARMING :-

- Global warming is defined as the increasing temp. of earth that causes change in climate.
- The last few century have been an increase in industrial, agricultural & other human activity resulting the release of more green house gasses into the atmosphere.
- The green house gasses trap the heat energy making the plant warmer than usual.
- The global temp. is now 1°C higher than in 1900.

EFFECTS OF GLOBAL WARMING :-

- (1) More heat waves
- (2) Expansion of desert area
- (3) Natural fire in forest
- (4) More evaporation of water from water bodies
- (5) Melting of ice-caps in Arctic & Antarctic regions
- (6) More cloud formation in the atmosphere, change in rainfall pattern, rise in sea level.
- (7) Flooding of low lying coastal area
- (8) More droughts
- (9) Impact on plants, animals & humans
- (10) Shorter & warmer winters coupled with longer & hotter summers

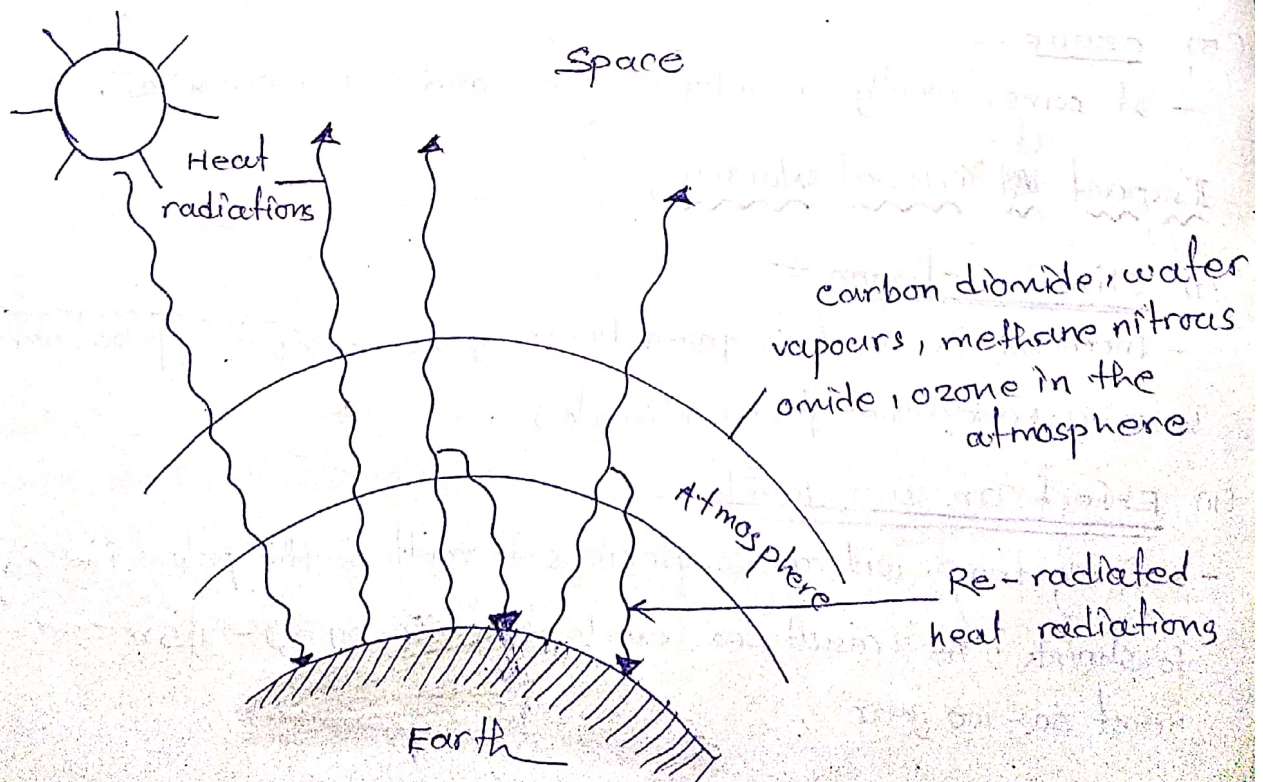
Summers

Control And Remedial Measures:

- (1) Reduction in consumption of fossil fuels
- (2) use of bio-gas plants
- (3) use of nuclear power plants
- (4) Increasing forest cover
- (5) Installation of pollution controlling devices in auto-mobiles & industries

✓ Green House Effect — 2^m

- The average global surface temp. is ~~10~~ 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, ChloroFluro carbon (CFC) and water vapours.
- In absence of these gases the temp. (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.



Major Green House Gases:

(1) Carbon dioxide (CO₂) -

- The CO₂ is considered as the most dominant factor responsible for the green house effect.
- clearance of forest is the major factor for the increase of CO₂.

(2) Chloro Fluoro Carbon (CFC) -

- The main sources of CFC include leaking air conditioners & refrigerators, evaporation of industries at solvent production of plastic foams etc.
- The concentration of CFCs is rising 5% per year.

(3) Methane (CH₄) -

- It is produced by the action of anaerobic bacteria on vegetation, decomposition of organic matter etc.
- It is rising approx 2% every year. It absorbs 20-25% times more ^{heat} than CO₂.

(4) Nitrous Oxide (N₂O) -

- The N₂O concentration in atmosphere is 0.3 ppm & is increasing 0.2% annually.

(5) Ozone -

- It comes mostly from hydrocarbons and nitrogen oxides.

Impact of Global Warming:

(i) Climatic change -

- Increase the level of green house gases causes the global warming have affected the global climate,

(ii) Effect on sea levels -

- Rising temp. will causes glaciers to melt & the polar ice caps to shrink. As a result sea levels may rise by 0.2 - 1.5 m over the next 50-100 year

(iii) Reduction Of Biodiversity -

- Green house effect 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.
- with rise in temp. soil moisture will decrease the evapo-transpiration and pest growth will increase. this will effect certain crops.

(v) Effect on Human Health -

- the global warming will lead to changes in the rainfall pattern in many areas, thereby effecting the human health.

(vi) Ecological Disturbance -

- Global warming increase the desert causes desertification.

Measures To Check Global Warming -

To check the global warming following steps are necessary -

- (1) plant more trees (Afforestation)
- (2) control population growth
- (3) cut down the current rate of CFCs and fossil fuel
- (4) shift from coal to natural gas
- (5) To trap, use methane as a fuel
- (6) Reduce beef production
- (7) Efficiently remove CO_2 from smokes.
- (8) use photosynthetic algae to remove atmosphere CO_2
- (9) Adopt sustainable agriculture
- (10) use energy more efficiently

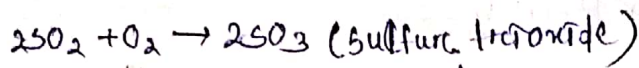
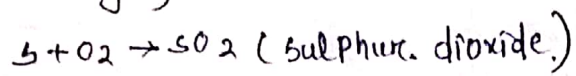
Acid Rain: — ^{2M}

- Literally acid rain means the presence of excessive acids in rain waters. Acid rain is a mixture of acids mainly H_2SO_4 & HNO_3 . H_2SO_4 is a major contributor (60-70%) HNO_3 ranks second (30-40%) & HCl third.

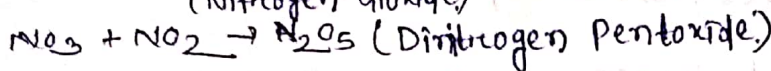
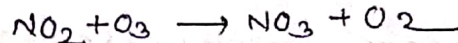
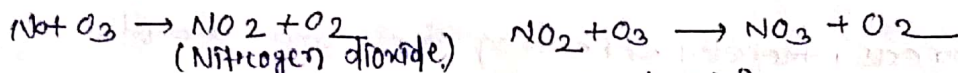
Handwritten notes:
Sulfuric acid
Nitric acid or Hydrogen nitrate
Hydrochloric

Formation of Acid Rain —

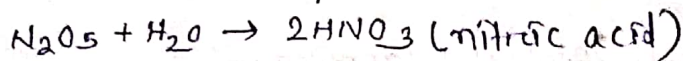
Fuel (solid, liquid) contains sulphur & nitrogen. These two elements when burnt in atmospheric oxygen get converted to SO_2 & NO_2 which are highly soluble in water.



In case of nitrogen following reactions are involved



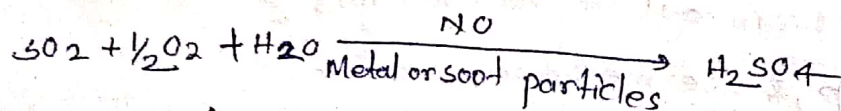
- under the humid conditions of air, N_2O_5 invariably react with water vapours to form droplets of HNO_3 .



Some HNO_2 is also formed, $N_2O_3 + H_2O \rightarrow 2HNO_2$ (Nitrous acid)

- HNO_3 & HNO_2 then return to the earth's surface. However, HNO can be removed as a particulate or as particulate nitrates after reactions with bases such as NO_3 .

SO_3 in humid atmosphere forms droplets of H_2SO_4



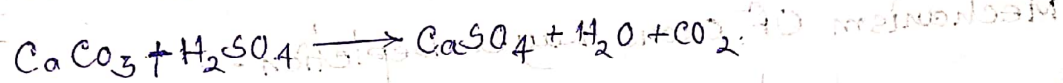
Acid Rain: —

Effects of ~~Acid Rain~~

Some of the effects may be described as:—

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

2. Many bacteria & blue green algae are killed due to acidification, disrupting the whole ecological balance.
3. In 1958 at Europe pH of rain water was 5.0 & in Netherland (1962) was 4.5. It damaged the leaves of plants & trees, because it makes the soil infertile.
4. Forests of west Germany, Switzerland, Czechoslovakia, Sweden were severely effected by acid rain.
5. In North AMERICA & EUROPE, acid rain destroyed crops & forests, reducing agricultural productivity.
6. The activity of bacteria & other microscopic animals is reduced in acidic water.
7. Acid rain causes extensive damage to buildings & structural materials of marble, lime, stone, mortar etc.
 - Lime stone attacked as -



The attack on marble is termed as stone - Leprosy. (Damage like spots & corrosion of marble)
 ~~infectious disease~~

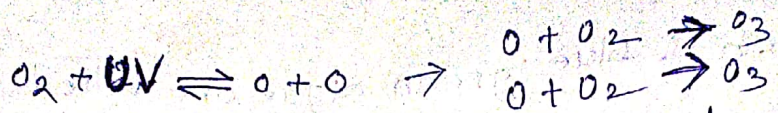
8. The Taj Mahal in AGRA is suffering from SO_2 , H_2SO_4 & other fumes, pollutants released from MATHURA refinery.
 ← oil refinery in U.P. by IOCL
9. Acid rain corrodes houses, monuments, statues, bridges, fences, railway etc.

★ Ozone Layer Depletion:-

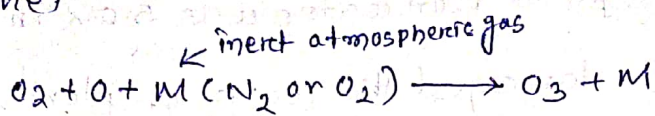
- The stratosphere at the height of 15 km. is rich with ozone which absorbs harmful ultraviolet radiation from the sun & raises the temp. Ozone acts as a protective shield for life on the earth, from ~~infectious~~ harmful effects of sun's ultraviolet ray.

How Ozone is Formed In The Stratosphere - (O_3)

- ozone is formed from oxygen by a photochemical reaction in which energy from sun decomposes the oxygen molecules into reactive atomic oxygen.



- Atomic oxygen then combine with molecules of oxygen to form ozone,



- The third body (M) absorbs the excess energy liberated by the above reaction & there by stabilize the O_3 molecule.

Causes Of Ozone Depletion —

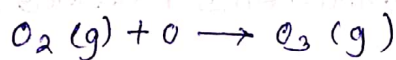
The main causes of ozone depletion is the wide spread use of chlorofluoro carbon, Because about the total production,

- 30% CFC used in fridge, Freezers & air conditioners
- 25% used in spray cans
- 25% used in blowing foams (cups, plastic, wall ^{sound} insulator)
- 20% used for ^{dry} cleaning & other purposes (fire fighting, aerosols etc.)

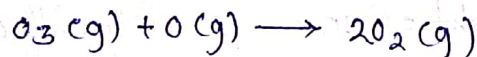
Mechanism Of ozone Layer Depletion —

- ozone molecules so formed in the stratosphere can be decomposed by so many methods are —

(i) collision betⁿ O_2 molecules & oxygen atom ozone is formed due to the reaction.



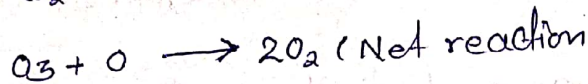
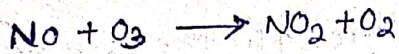
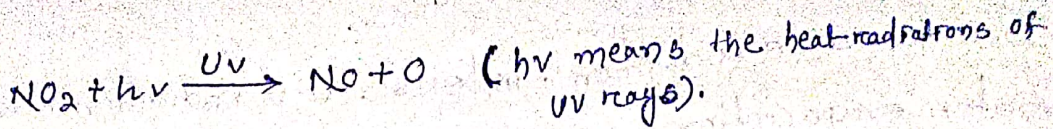
And the ozone molecule is again decomposed by the most important mechanism



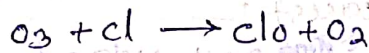
this reaction takes place at a slower rate by direct collision betⁿ an O_3 molecule & nascent oxygen atom.

(ii) Decomposition of ozone by oxides of Nitrogen.

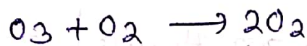
The oxides of nitrogen destroy ozone layer by converting ozone into oxygen.



(iii) Destruction of ozone layer by chlorofluoro carbon.



Chlorine
monoxide



Effects Of Ozone Layer Depletions -

1. With the depletion of ozone layer a flux of U.V radiation enters to the earth's biosphere which is dangerous to human life.
2. Though U.V spectrum is a narrow spectral band yet it causes patches in skin and destroy the immunological power of the skin.
3. It causes three kinds of skin cancer.
4. U.V. radiation when falls on human skin breakdown the defence in the skin ^{↑ resistance.}
5. The blood vessels near the skin's surface which carry more blood come in contact with U.V light become hot & swollen to red causing sun burns.
 ^{forming tissue}
6. U.V radiation causes leukemia & breast cancer.
 ^{← one type of blood cancer}
7. U.V radiation are also absorbed by cornea & lens in the eye leading to photo keratitis & cataracts.
 ^{← Top layer of eye}
 ^{← blurred vision}
8. Many micro-phytoplankton die because of their exposure to use solar radiation.
 ^{↑ Inflammation of cornea would.}

9. Due to ozone reduction, intense u.v radiation causes ^{↑ pores} greater evaporation of water through the stomata of the leaves & decreases the soil moisture content.

10. Depletion of ozone layer productivity of the ecosystem, enormously decreases by which there is a physiological changes in man and animals. (changes means change in ^{↑ biological} normal functions of man & animals)

// Nuclear Accidents And Holocaust :-

^{↑ Destruction due to fire}
Japanese towns of Hiroshima & Nagasaki :-

- The 1st atom bomb was exploded about 580 metres in the atmosphere over ill fated Hiroshima on August 6, 1945.

- The 2nd atom bomb was detonated 507 metres high in air over Nagasaki. At least 100,000 people were reported killed.

In Hiroshima alone, where the bomb virtually demolished all structures and buildings in about 15 square km area. In Nagasaki 119000 civilians were killed, injured and disappeared which an area of 6-7 km was devastated.

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

- The first hydrogen bomb was exploded in 1954 on Bikini island in the Pacific.

- In 1957 and 1958 the USA, Soviet Union & Great Britain detonated nuclear weapons whose total yield was about 85

megatons. These weapons were ^{time of} 4250 Hiroshima sized atom bombs.

- In 1961, Russia ~~detonated~~ ^{detonated} a bomb of 57 megatons that could

obliterate a city more than 300 times the size of Hiroshima.

Case study —

Chemobyl Accident: —

- ^{Nuclear} Chernobyl was the 1st officially acknowledged nuclear accident in USSR & 1st reported to the world. April 26, 1986 was a sad day for nuclear power generation when a major accident occurred at 1.234m in the nuclear reactor at Chernobyl, in the Ukraine area of the Soviet Union.
- It resulted in clouds of radioactive smoke over a large area in Scandinavian countries which are 2000 km away in the Russian region itself. (Denmark, Sweden, Norway) The explosion at the Chernobyl power plant in Soviet Ukraine, USSR confirmed the worst nuclear disaster. Poor design of the reactor magnified with operator negligence caused the ~~disaster~~ ^{hazard}. Neutrons went out of control & enormous steam built up in pipes.
- Twenty percent of the plant's radioactive iodine escaped along with 15-20% of radioactive caesium, hazardous plutonium & a mixture of several radioisotopes. The Soviet Union reported in a statement on April 29, 1986 that 2 persons were killed & a few injured. But the senior US official told that the death toll was probably much higher on May 2nd, the Soviet authorities admitted that 18 persons affected by the leakage of chronic radiation. The Chernobyl nuclear disaster has not only affected human being but has been drastically changed the life of worms. The Chernobyl power plant, the worst nuclear accident best symbolised the potential dangers of atomic ~~disaster~~ ^{disappeared} while an area of 67km

energy, has been officially closed on december 15, 2000 → 14 years after the plant exploded & sent a cloud of radioactive dust over Europe.

✓ The Air (Prevention and control of pollution) Act, 1981 (14 of 1981) 29th March 1981 ! —

- An act to provide for the prevention control and abatement of air pollution for the establishment, with a view to carrying out the aforesaid purposes, of boards for conferring on and assigning to such boards, power and fund relating there to and for matters connected there with.
- where-as decisions were taken the united nations conference on the human environment held in Stockholm ^{← Capital of Sweden} in June, 1972 in which India participated, to take appropriate steps for the preservation of the quality for air and control of air pollution.
- And whereas it is considered necessary to implement the decision aforesaid in so far as they relate to the preservation of the

quality of air & control of air pollution. Be it enacted

by parliament in the ~~30th~~^{thirty} second year of the Republic

of India as follows —

~~Short~~^{Short} ~~title~~^{title}, extent & commencement.

a) This act may be called as air (prevention & control of pollution) Act 1981.

b) It extends to the whole of India.

c) It shall come into force on such date as the central Government may, by notification in the official gazette, appoint.

The Water (prevention and control of pollution)

Act, 1974 (6 OF 1974) 23rd March 1974 : —

— An act to provide for the prevention & control of water pollution & the maintaining or restoring of wholesomeness of water, for water, for the establishment, with a view to carrying out the purposes aforesaid of boards for the prevention & control of water pollution, for conferring on & assigning to such boards powers & functions relating there to & for matters connected therewith.

to make laws for the states with respect to any of the matters aforesaid except as provided in articles 249 & 250 of the constitution.

- And whereas in pursuance of clause (1) of article 252 of the legislatures of the states of Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Rajasthan, Tripura & West Bengal to the effect that the matters aforesaid should be regulated in those states by parliament by law;

Be it enacted by parliament in the Twenty-Fifth year of the Republic of India as follows —

Preliminary

(1) Short title, a application and commencement —

a) This act may be called the water (prevention & control of pollution) Act, 1974.

b) It applies in the 1st instance to the whole of the states of Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Rajasthan, Tripura & West Bengal & union territories; & it shall apply to such other state which adopts this act by resolution passed in that behalf under clause (1) of article 252 of the constitution.

c) It shall come into force, at once in the states of Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Rajasthan, Tripura & West Bengal & in the union territories, & in

any other state which adopts this act under clause (v) of article 252 of the constitution of the date ~~of the date~~ of such adoption & any reference in this act to the commencement of this act shall, in relation to any state or union territory, mean the date on which this act comes into force in such state or union territory.

Water Conservation:-

- Water is needed in almost every sphere of human activity. Without water life is not possible. Water is called the universal solvent & no other liquid can replace it.
- Water requirements have greatly increased due to rapid population growth, industrialization & agriculture. The demand for water is likely to exceed its supply by the 1st or 2nd decade of the next century. The shortage of water shall make many localities barren devoid of life. Fertile land become deserts. Conservation of water is therefore an absolute necessity of today.

The following steps should be taken for conservation of water —

(1) Water economy (Reuse & Recycling) —

- Water used once in industries may be used again for other purposes.

(2) Agricultural (run-offs from fields): —

- This can be used to irrigate croplands down the stream.

(3) Efficient distribution system: —

- Water resources are not distributed evenly. Some localities have plenty of water & others have little. Surplus of one basin can be used to make up the deficit at another.

(4) Enhancement of surface storage capacity :-

- About 27000 cubic kms of fresh water which rush down to the oceans through streams & rivers ~~are~~ ^{have} no. of uses to the mankind. we can store this water in tanks, reservoirs, dams for further use in ~~dry~~ seasons.

(5) Reduce evaporation loss :-

- Water losses through evaporation should be reduced.

(6) Improvement of underground storage capacity :-

- Every year about 10-15% of the total precipitation enters the ground water table. These deposits are cheap & easily obtainable.

(7) Desalination of sea water :-

- By desalination, plants, the salt content of sea water can be 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 for water pollution.

CH-7 HUMAN POPULATION & THE ENVIRONMENT

✓ Population:—

- A population may be defined as a group of organisms of the same species occupying a given area at the same time.

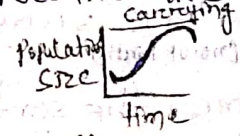
Biotic potential:—

- The innate ^{inborn} urge & capacity ^{desire} of populations to increase is called biotic potential.

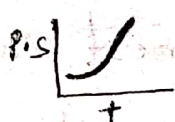
Population Growth:—

- The most important features of population is the growth i.e., the capacity of increase in individual members. The population growth may be logistic or exponential.

Logistic Growth:—

- when a population is allowed to grow in a limited space, it shows logistic growth. The logistic growth curve is s-shaped sigmoid curve.
- 
- (when population increases to a limit, then resource minimizes, population then decrease)

Exponential Growth:—

- when a population growth curve quickly begins to rise very steeply, the population shows exponential growth. It is J shaped. (when population low & resource high)
- 

- In natural ecosystems several biotic & abiotic factors prevent population explosion. The combined effect of biotic & abiotic factors in limiting the population increase is referred to as environmental resistance. There is a definite upper limit to the population of any particular animal, microbe & organism that an ecosystem can sustain. This limit is called the carrying capacity. So carrying capacity is

defined as the maximum number of an animal, that a particular habitat can sustain without degrading the habitat over a long period of time. If the population exceeds the carrying capacity of the habitat then it will undergo a J curve crash & the system will collapse.

Population Explosion - 2M

- The growth rate of a population is expressed as the no. of individuals by which the population increases divided by the amount of time that elapses.

$$\text{Growth rate} = \frac{\text{No. of birth (b)} - \text{No. of death (d)}}{\text{avg. population in time interval}}$$

$$= \frac{P_{\text{Now}} - P_{\text{Past}}}{P_{\text{Past}}} \times 100$$

if growth rate is asked per year then it will be divided by time interval

- There are many cases where b (no. of birth) is substantially larger than d (no. of death) for a period of time, the sort of variation is exponential & is called population explosion.
- In 20th century population growth increased too much.
- Economist Malthus said, resources increase 1, 2, 3, 4... while population increase 2, 4, 8, 16... respectively.
- In India population growth is much more than twice.
- World population growth is also increasing day by day i.e., 150 per minute or 2, 20, 000 in one day.
- Our resources like water, land, fuels, minerals, forest, grasslands are limited & due to population explosion these resources are getting exhausted.

- Social, economic, religious, all types of reasons are responsible for high birth rate in our country.

- The important reasons are lower marriage age, lack of education, joint family system, importance of male child, religious misbeliefs, declined in death rate, increased protection of life from natural risks & other facilities.

- Due to over population some serious problems like food supply, accommodation, unemployment, education, human health, energy crisis etc have arisen.

- However population explosion can be stopped by proper education, mass media, educational institutions, raising the marriage age from 18 to 22 etc.

National Family Welfare Programme :-

- previously this programme was known as national family planning programme.

- In the year 1997 the name was changed to National Family Welfare Programme.

- Family planning programme was launched in India in 1952. India was the first country to do so.

Importance of Family Welfare Programme :-

- The family welfare programme occupies an important posⁿ in the nation's socioeconomic development.

- Indian population which was 34 crore in 1947 has crossed 100 crores by 2000 A-D.

- India has only 2.4% of world's total land area but it supports 15.5% of world's population.

- The acceptance of family welfare service is made voluntary.

- The programme was 100% centrally sponsored scheme,

Value Education — SM

- Man acts to satisfy his needs or wants, anything which satisfies a human need becomes a thing of value,

- value is a dynamic term used in different aspects.

- Indian philosophy has used it in sense of "state which is free from pain & pleasure", psychologists in the sense of "psychic energy", "sociologists in the sense of time, energy & money."

- our 1986 national policy of education & its modifications have strongly advocated value education.

- The progress & develop of a nation depends upon the quality of values cherished by its citizens.

✓ Important Values —

→ some important values are —

(1) Religious Value —

- It is defined in terms of faith in god. This value includes acts like going on pilgrimage, living simple life, having faith in religious leaders, worshipping god, speaking truth etc.

(2) Social Value —

- It is defined in terms of love, kindness & sympathy for the people, efforts to serve god through the service of mankind, sacrifice personal comfort etc.

(3) Democratic Value —

- This value is characterized by respect for individuality, absence of discrimination among persons

on the basis of sex, language, religion, colour, race, family status.

(4) Aesthetic Value —

- It is characterized by appreciation of beauty, ^{love} ~~ledge~~ for fine arts, drawing painting, music, dance, poetry, love for literature etc,

(5) Economic Value —

- This value stands for desire for money & material gains,

(6) Knowledge Value —

- This value stands for love of knowledge & love of discovery of truth.

(7) Hedonistic Value —

- It is the conception of desirability of loving pleasure & avoiding pain.

(8) Power Value —

- It is defined as the conception of desirability of ruling over others & also leading others.

(9) Family Prestige Value —

- It is defined as the conception of desirability of such items of behaviour, roles, functions, relationships that would become one's family status.

(10) Health Value —

- It is consideration for keeping the body in a fit state for carrying out one's normal duty.

Role of IT in Environment & Human Health! —

- As in other compartments of human life, IT plays an important role. satellite communication, computers, television & such other systems have revolutionized human lives, through remote sensing & television, natural calamities such as

volcanic eruption, tsunami, landslides, floods, droughts & rainfall can be informed to the public immediately. Besides these, several other activities can also be brought to their attention.

- (1) places of rich fish catch, water & minerals can be found through remote sensing.
- (2) Data regarding birth & death rates, immunization & sanitation programmes can be transmitted to public.
- (3) Bird flu, dengue fever & other epidemics are brought to the attention of people through electronic media
- (4) preventive measures in such instances are also telecast & brought to public attention.
- (5) Through telemedicine help & expert opinion can be obtained from any part of the world,
- (6) online treatments also are possible now a days
- (7) online journals of any sort are possible now
- (8) world wide web facilities are available to reach, retrieve, arrange & display any information we want
- (9) Rainfall, & flood forecasts can save many lives through ENVIS.
- (10) World Health Organization maintains web sites with information on health, epidemics & their prevention.
- (11) status of ozone holes, tidal waves, ocean currents, tsunami & volcanic eruption are brought to public notice & preventive action taken up.

→ ENVIS (Environmental Information system) established in December 1982 has 70 centres to get updated information on pollution control, toxic chemicals, off shore ecology, ^{for} appropriate environment & technology and bio degradation, etc.