LECTURE NOTES ON

ENVIRONMENTAL STUDIES

PREPARED BY

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AUTOMOBILE ENGINEERINGDEPATMENT

VISSION:

Todevelopcompetent,disciplinedimaginativeAutomobile engineers, equipped withcorecompetencyandtechnicalskillsusefultothelearning/teachingcommunityandtheindustrialfraternity.

MISSION:

M1: Toprovidewithoperationalandtechnicalinputstogetinnovativeandresearchideas inthefieldofautomotiveengineering.

M2: Togiveinputsforhighereducationwithmanagementqualitiesforthebettermentofthesociety.

M3: Skillingwithmodernengineeringtoolsnecessarytomeetandsolveengineeringproblems.

PROGRAMEDUCATIONALOBJECTIVES

PEO1: Toprovidetechnicalskillstodiagnoseandapplytheconceptofautomotivesystem

PEO2: Topreparetodesign,fabricateandinnovateinautomobilesectortofacetheindustrialchallenges.

PEO3: Toinculcatewithgoodcommunicationskills,ethicsand entrepreneurshipskillstoplaythekeyroleinautomotiveindustry.

UNIT-1

Definition:-

- Environmental studies deals with every issue that affects on living organism
- It is essentially a multidisciplinary approach that brings about an appreciation of our natural world and human impacts on its integrity
- It can be an applied science as it's seeks practical answers to making human civilization sustainable on the earth's finite re-sources
- Its components include biology, geology, chemistry, physics, engineering, sociology, health, anthropology, economics, statistics, computers and philosophy

Scope:-

- We see that our surroundings were originally a natural landscape such as a forest, a river, a mountain, a desert, or a combination of these elements
- Most of us live in landscapes that have been heavily modified by human beings, in villages, towns or cities
- Our daily lives are linked with our surroundings and inevitably affects them. We use water to drink and for other day-to-day activities. We breathe air, we use resources from which food is made and we depend on the community of living plants and animals which form a web of life, of which we are also a part
- The resources present in our environment should be used properly in order to have sustainable development

Importance:-

- We live in a world in which natural resources are limited
- Water, air, soil, minerals, oil, the products we get from forests, grasslands, oceans and from agriculture and livestock, are all a part of our life support systems
- As we keep increasing in numbers and the quantity of resource each of us uses also increases, the earth's resource base must inevitably shrink
- We waste or pollute large amounts of nature's clean water; we create more and more material like plastic that we discard after a single use; and we waste colossal amounts of food, which is discarded as garbage. Manufacturing processes create solid waste by-products that are discarded, as well as chemicals that flow out as liquid waste and pollute water, and gases that pollute the air
- Increasing amounts of waste cannot be managed by natural processes
- These accumulate in our environment, leading to a variety of diseases. Air pollution leads to respiratory diseases, water pollution to gastro intestinal diseases, and many pollutants are known to cause cancer

Need for public awareness:-

- As the earth's natural resources are dwindling and our environment is being increasingly degraded by human activities, it is evident that something needs to be done to save the natural resources

- If we go on endangering our environment, there is no use of studying the multidisciplinary Nature of Environmental Studies
- It is the prevention of environment degradation in which we must all take part to become a part of all our lives. Just as for any disease, prevention is better than cure
- To prevent ill- effects on our environment by our actions is economically more viable than cleaning up the environment once it is damaged
- Individually we can play a major role in environment management. We can reduce wasting natural resources and we can act as watchdogs that inform the Government about sources that lead to pollution and degradation of our environment
- If every individual can able to think the environment as their house and try to protect it from all types of endanger , then our future generation life could be little better

UNIT-2

Forest Resources:-

- Forests and other wooded lands have been recognized and highly valued as important natural resource for countries
- Forests are one of the most important natural resources on this earth
- Covering the earth like a green blanket these forests not only produce innumerable material goods, but also provide several environmental services which are essential for life

❖ Use:-

- Forests provide us a large number of commercial goods which include timber, firewood, pulpwood, food items, gum, resins, non-edible oils, rubber, fibers, lac, bamboo canes, fodder, medicine, drugs and many more items, the total worth of which is estimated to be more than $ 300 billion per year
- The trees produce oxygen by photosynthesis which is vital for life on this earth
- The main greenhouse gas carbon dioxide (CO_2) is absorbed by the forests as a raw material for photosynthesis. Thus forest canopy acts as a sink for CO_2 thereby reducing the problem of global warming caused by greenhouse gas CO_2
- Forest watersheds act like giant sponges, absorbing the rainfall, slowing down the runoff and slowly releasing the water for recharge of springs
- Forests bind the soil particles tightly in their roots and prevent soil erosion. They also act as windbreaks
- Forests can absorb many toxic gases and can help in keeping the air pure. They have also been reported to absorb noise and thus help in preventing air and noise pollution

❖ Over exploitation:-

- With growing civilization the demands for raw material like timber, pulp, minerals, fuel wood etc. shouted up resulting in large scale logging, mining, road- building and clearing of forests
- Excessive use of fuel wood and charcoal, expansion of urban, agricultural and industrial areas and overgrazing have together led to over-exploitation of our forests leading to their rapid degradation

❖ Deforestation:-

- Deforestation is the removal of a forest or stand of trees where the land is thereafter converted to a non-forest use. Examples of deforestation include conversion of forestland to farms, ranches, or urban use
- Felling of trees to meet the ever increasing demand of the cities
- Grazing by the local cattle, goats, sheep etc. They not only destroy the vegetation but also pull out the roots of plants
- Another major cause of deforestation has been the construction of hill roads. Road construction damages the protective vegetation cover both above and below roads

❖ Timber Extraction:-

- Timber is used as raw materials for various wood based industries like pulp and paper, composite wood, furniture etc. Timber is also used for various developmental activities like railways, boats, road construction etc
- However due to unsustainable extraction of timber, there are adverse effects on forest and tribal people. Some of which are
    - Loss of biodiversity
    - Climatic change
    - Soil erosion
    - Intensified floods and upstream watersheds

❖ Mining:-

- Mining is the extraction of valuable minerals or other geological materials from the earth, usually from an orebody, lode, vein, seam, reef or placer deposits
- The adverse effects of mining on forest are as follows
    - Vastareasofforestaredirectlyclearedtoaccommodateminingsites,construction of roads, processing unitsandtownshipsfor workers. Destructionisvastin case ofopencast mines.
    - Forestlandisalsousedtostorethewastematerialsthatremainaftertheextractionofusableores.
    - Miningalsofacilitatessoilerosion,therebydecreasingthefertilityoflandleadingtolanddegradation.
    - Pollutionofbothairandwaterisacommoneffectofmining

❖ Dam:-

- When a dam is constructed across any river a huge artificial lake is developed in thecatchment area of that dam
- Covering a large surface area it creates a lot of ill effectsonthe livingenvironment
    - Itcreatesthelossofforestwhicharesubmergedunderthebackwatersofthedam.
    - Itcreatesdangertothehabitatofwildlife.Thewildlifeareforcedtomigrate.
    - Italsoaffectsthelandundercultivationinthecatchmentarea,asthecropsgetsubmergedunder water.
    - Theroadalreadyunderexistencesubmergesunder-waterthusdisruptingtheroadnetwork.
    - Waterloggingandsalinisationaffectsthecanalirrigatedland,withvaryingdegreesofseverity.
    - Diseaseslikemalariaspreadrapidlyinthecommandareasofreservoirswhichseverelyaffect thehealthcondition oftriballivingnearby forestareas.

Water Resources:-

- Earth's water resources, including rivers, lakes, oceans, and underground aquifers, areunder stress in many regions
- Humans need water for drinking, sanitation, agriculture, and industry; and contaminated water can spread illnesses and disease vectors, so clean water is essential for an environmental to avoid public health issue

❖ Use:-

- As our country is essentially an agricultural based country, the crops are to be developed for the production of different types of food grains. The requirement of water varies from crop to crop
- Water is essential object which has lots of application in various field starting from washing , cleaning , drinking and sanitation. A part from this water is the largest use solvent

❖ Floods and drought:-

- The flood hazard itself cannot be prevented, but thorough understanding of the land conditions which are prone to a given hazard and the processes which could culminate in the damage to life and property it is possible to minimize the damage through preparedness for a particular eventuality
- The water control methods include flood proofing and catchment modifications. Schemes of drainage and flood protection, flood forecasting, flood warning and emergency preparedness systems, flood insurance, public information and education, and flood relief constitute the non-structural methods
- Drought is lack or insufficiency of rain for an extended period that causes considerable hydrologic imbalances and consequently water shortages, stream flow reductions and depletion of groundwater levels and soil moisture
- Even the shallow rooted crops do not grow in such areas. Getting sufficient drinking water is another problem needing immediate attention in these areas. Some measures like infiltration wells, underground dams, small watersheds, are being taken up to alleviate the sufferings of the people residing in the drought prone areas

❖ Dam's benefits and problem:-

- Dams are the major structures in any reservoir from the point of view of structural importance; design details and cost
- Dam are developed to supply water for different purpose, the projects are termed as multi-purpose projects
- The different purposes are irrigation and agriculture, hydropower generation, drinking water supply, water for Industries, flood control, navigation, recreation and amusement parks and afforestation
- There are some problem aligned with every dam also which is
    - Lossofnon-forestland
    - Landslides,sedimentationandsiltationoccurs
    - ReservoirInducedSeismicity(RIS)causesearthquakes
    - Waterloggingandsalinityduetooverirrigation
    - Sincethesedimentscarryingnutrientsgetsdepositedinthereservoir,thefertilityofthe land alongthe river gets reduced
    - Duetostructuraldefectsorfaultydesignofthedammaycausesuddendamfailureleadin g tocollapseanddestructiontolifeandproperty

❖ Conflict:-

- The dispute over the sharing of Cauvery river water has lasted for more than a 150 years during which Karnataka and Tamil Nadu, the two main states involved, have accused each other of reneging on several agreements
- Similar problems have been found recently between Odisha and Chhatishgarh for sharing Mahanandi river water. But due to the involvement of political parties the problem became more critical and seems to be unsolved

Mineral Resources:-

- A mineral is pure inorganic substance that occurs naturally in the earth's crust
- Our civilization is based on mineral resources. All materials (fuels, metals, water, etc.) needed for modern society are derived from the earth's crust. The naturally occurring materials (in form of ore) obtained below the earth's crust having a definite structure and chemical composition are called minerals
- Mining refers to the process of extracting metals and minerals from the earth. Gold,

silver, diamond, iron, coal, and uranium are just a few of the vast array of metals and minerals that are obtained by this process. Mining activities require the clearing of large areas of land

❖ Use:-

- Aggregates are composed of rock fragments that may be used in their natural state or after mechanical processing, such as crushing, washing, or sizing
- Antimony is used principally for flame retardants as well as in ammunition and automotive batteries and as a decolorizing agent in glassmaking
- Asbestos is a class of minerals that can be readily separated into thin, strong fibres that are flexible, heat resistant, and chemically inert. Asbestos minerals are used in fireproof fabrics, yarn, cloth, and paper and paint filler
- Barium is an element, derived primarily from the mineral barite, and used as a heavy additive in oil-well-drilling mud, paints, rubber, plastic and paper; production of barium chemicals; and glass manufacturing
- Boron is used to make glass, ceramics, enamels, fiberglass, make water softeners, soaps and detergents. Other uses are in agricultural chemicals, pest controls, fire retardants, fireworks, medicine, and various minor applications
- Calcium used in adhesives and sealants, cosmetics, foods, paint, paper, pharmaceuticals, plastics, rubber, for the production of lime, and as crushed stone in construction.
- Copper is used in electric cables and wires, switches, plumbing; heating, electrical, and roofing materials; electronic components; industrial machinery and equipment; transportation; consumer and general products; coins; and jewellery
- Gold is used in dentistry and medicine, jewellery and arts, medallions and coins, and in ingots
- Graphite is the crystal form of carbon. Graphite is used as a dry lubricant and steel hardener and for brake linings and the production of "lead" in pencils
- Mercury is extracted from the mineral cinnabar and is used in electrical products, electrolytic production of chlorine and caustic soda, paint, and industrial and control instruments

❖ Effects of Mining:-

- Mining has a great effect on the quality of the air. Since mines need to blast through rock to get to an ore, dust may be produced in the process
- Coal mines release methane, which contributes to environmental issues because it is a greenhouse gas
- Mines use a lot of water, though some of the water is reusable
- Sulphides-containing minerals negatively impacts groundwater. This happens from both surface and underground mines
- There are many environmental concerns about the effects mining has on the land. Trees need to be cut down in order to have a mine built, and whole forests could be destroyed
- Mining involves moving large quantities of rock, and in surface mining, overburden land impacts are immense. Mining activities also may lead to erosion, which is dangerous and bad for the land
- It destroys river banks, and changes how the river flows, where it flows, what lives in it, etc.
- Mines are highly damaging to the ecosystems surrounding them
- Mining can completely destroy ecosystems by adding or taking out something from the animals' everyday lives, therefore throwing the whole thing out of balance

Food Resources:-

- Food is an essential requirement for survival of life. Main components are carbohydrates, fats, proteins, minerals and vitamins
- Crop plants: Mostly produce grains about 76% of the world's food.
  e.g rice, wheat and maize
- Range lands: It produces 17% of world's food from trees and grazing animals.
  e.g fruits, milk and meat
- Ocean: Fisheries –7% of world's food

❖ World food problem:-

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

❖ Changes causes by agriculture:-

- The effect of agriculture on the environment is broadly classified in to the groups. Those are Global, Regional and Local
- Global: These include climate changes as well as potentially extensive changes in chemical cycles
- Regional: Regional effects include deforestation, desertification, large scale pollution, increase in sedimentation in major rivers and in the estuaries at the mouths of the rivers and changes in the chemical fertility of soils over large areas
- Local: These occur at or near the site of farming. These changes / effects include soil erosion and increase in sedimentation downstream in local rivers. Fertilizers carried by sediments can also transport toxins and destroy local fisheries

❖ Changes causes by overgrazing:-

- Reduction in the growth of vegetation
- Reduction in the diversity of plant species
- Increased soil erosion as the plant cover is reduced

❖ Effects of modern agriculture and fertilizers:-

- Chemical fertilizers used in modern agriculture contain Nitrogen, Phosphorus and Potassium (N,P,K) which are macronutrients. Excess use of fertilizers in fields causes micronutrient imbalance
- Several insecticides kill not only the target species but also several beneficial not target organisms
- Most pesticides are non-biodegradable and accumulis ate in the food chain. This is called bio-accumulation or bio-magnification. These pesticides in a bio-magnified form are harmful to human beings

❖ Water logging:-

- If water stands on land for most of the year, it is called water logging
- In such a condition the roots of plants do not get enough air for respiration. Water logging also leads to low mechanical strength of soil and low crop yield
- Causes
  - Excessive water supply to cropland
  - Excessive rain

- Pure drainage system

❖ Salinity:-

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

Energy Resources:-

- Energy may be defined as "**any property which can be converted into work**"
- Energy is available on earth in a number of forms and some forms may be used immediately while others might require some transformation
- Both energy production and energy utilization indicate a country's progress

❖ Growing energy need:-

- All industrial processes like mining, transport, lighting, heating and cooling in buildings need energy to complete the task
- Lifestyle change from simple to a complex and luxurious lifestyle adds to this energy deficit
- Almost 95% of commercial energy is available from fossil fuels like coal and natural gas

❖ Renewable and Non-renewable energy resources:-

- Renewable energy sources: These resources can be generated continuously and are inexhaustible
- Ex: Wood, Solar energy, Wind energy, Hydro power, tidal energy, Geo-thermal energy
- Non-renewable energy sources are natural resources ,that cannot be regenerated once they are exhausted. They cannot be used again
- Ex: Coal, Petroleum, Natural gas and Nuclear fuels
- The objectives of using alternate renewable energy sources are listed below
    - To provide more energy to meet the requirements of increasing population.
    - To reduce environmental pollution and
    - To reduce safety and security risks associated with the use of nuclear energy

❖ Case Study:-

- Wind energy India is generating 1200 MW electricity using wind energy. The largest wind farm is in Kanyakumari in Tamil Nadu, which generates 380 MW electricity
- Hydrogen-Fuel cell car General motor company of china invented experimental cars that run on electric motors run by hydrogen and oxygen. These cars produce no emission and the only waste products being water droplets and water vapour

Land Resources:-

- Human and natural activities need space for their location and development. This space is provided by land which is put to various uses like food and energy production, waste-disposal, industrial, commercial and residential purposes

❖ Use:-

- Land provides food, wood, minerals
- Land may be used as watershed or reservoir
- Land acts as a dustbin for the wastes generated by modern society
- Land is used for constructing buildings and industries

❖ Land Degradation:-

- Fertility or productive capacity of the soil depends on the minerals it contains. Minerals are mainly available to the top layer of the soil. Hence, the top layer is the best for vegetation

- Land degradation refers to deforestation or deterioration or loss of fertility or productive capacity of soil
- The factors contributing to land degradation are listed below
    - Soil erosion
        - Soil erosion is the loss or removal of the superficial layer of soil by the action of water, wind or human activities
        - Factors effecting soil erosion
            - Distribution of rain fall
            - Slope of the ground
            - Vegetation cover
            - Soil mismanagement
    - Soil pollution
    - Salination and water logging
    - Shifting cultivation
    - Desertification
        - Desertification is the degradation of land in arid, semi-arid and dry sub-humid areas.
        - It caused primarily by human activities and climatic variations
        - Desertification does not refer to the expansion of existing deserts
    - Urbanization

❖ Landslide:-

- Landslides are the downward movement of a slope composed of earth materials such as rock, soil or artificial fills
- Cause of landslides
    - Removal of vegetation
    - Movement of heavy vehicles in areas with unstable slopes causes landslides
    - Underground mining activities cause subsidence of the ground
- Effect of landslides
    - Destruction of communicative links
    - Loss of infrastructure and economic loss

UNIT-3

CONCEPT OF ECOSYSTEM:

- The term "Ecosystem" was coined by A.G.Tansley in 1935
- He defined the ecosystem as "thesystemresultingfromintegrationofallthelivingandnon-livingfactorsoftheenvironment"
- The natural ecosystem depends on its geological features.Ex.Grassland, forest, wetlandanddesert

Structureofanecosystemconsistsof:

- Compositionofbiologicalcommunity(eg:plants,animalsandmicrobes),biomass,lifecyclesand distribution in space.
- Quantity,distributionandcyclingofnon-livingmaterials(macroandmicronutrients, traceelements andwater)
- Variationofconditionsliketemperature,rainfall,sunlight,relativehumidity,windandtopography.

Functionofanecosystemconsistsof:

- Rateofbiologicalenergyflow(productionandrespirationrates)
- Rateofnutrientcycles
- Ecologicalregulation(Environmentregulationintheformofphotoperiodismand Organismregulation inthe formofnitrogenfixationbyorganisms)

Producer:

- In an ecosystem, producers are those organisms that use photosynthesis tocapture energy by using sunlight, water and carbon dioxide to create carbohydrates, andthen use that energy to create more complex molecules like proteins, lipids and starchesthat are crucial to life processes. Producers, which are mostly green plants, are also calledautotrophs.

Consumer:

- Consumers are organisms (including humans) that get their energy fromproducers, regarding the flow of energy through an ecosystem.
- For example, producers,(such as plants), make their own food by the process of photosynthesis. An organism atethisplant,thanitwouldbeaprimaryconsumer.
- Theanimalthateatsthisanimalisknown asthesecondorderconsumer

Decomposer:

- Decomposers eventually convert all organic matter into carbon dioxideand nutrients.
- This releases raw nutrients (such as nitrogen, phosphorus, and magnesium)in a form usable to plants and algae, which incorporate the chemicals into their own cells.
- Although decomposers are generally located on the bottom of ecosystem diagrams such asfood chains, food webs, and energy pyramids, decomposers in the biosphere are crucial totheenvironment.Ex.Microorganism, bacteria,earthwormetc

Energy flow in the ecosystem:

- Themannerinwhichenergyflowsinanecosystemisknownasenergyflow.Itisunidirectional. The following points are important with regard to understanding energyflowin an ecosystem:
    - Efficiencyofproducersinabsorptionandconversionofsolarenergy.
    - Usingtheconvertedenergy(chemicalenergy – starch)byconsumers
    - Totalinputofenergyasfoodandits efficiencyofassimilation
    - Energylostthroughrespiration,heat,excretion,etcateachtrophiclevel
    - Grossproductionandnetproduction
- Twoimportantpointstobenotedaboutenergyflowinecosystemsare:
    - Energyflowisunidirectionaland
    - Thereisa progressivedecreaseofenergyasweprogressalongthefoodchain.
    - Theenergyislostasheatinmetabolicactivitiessuchasrespiration,hunting,etc.

Social ecological succession:

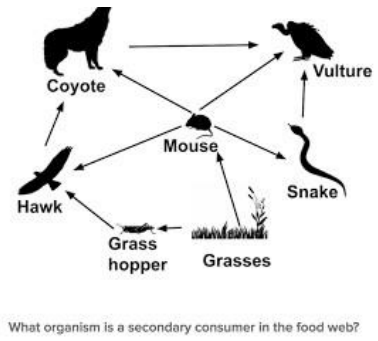
- Ecological succession is a series of progressive changes in the species that make up acommunityovertime.Ecologistsusuallyidentifytwotypesofsuccession,whichdifferintheirstartingpoints:
- In primary succession, newly exposed or newly formed rock is colonized by livingthingsforthefirst time.
    - Forexample,primarysuccessionmaytakeplacefollowingtheeruptionofvolcanoes, such as those on the Big Island of Hawaii. As lava flows into the ocean,new rock is formed.On the Big Island, approximately 32 acresof land are addedeachyear
- In secondary succession, an area that was previously occupied by living things isdisturbed,then re-colonizedfollowingthedisturbance.
    - A classic example of secondary succession occurs in oak and hickory forests cleared bywildfire. Wildfires will burn most vegetation and kill animals unable to flee the area. Theirnutrients, however, are returned to the ground in the form of ash. Since a disturbed areaalreadyhasnutrient-richsoil,itcanberecolonizedmuchmorequicklythanthebarerockofprimarysuccession

Food chain:

- The process of transfer of energy from the source in plant through a series of organism byeatingandbeingeatenisknownasfoodchain
- Afoodchainisalinearsequenceoforganisms through which nutrients and energy pass as one organism eats another
- At the base of the food chain lie the **primary producers**. The primary producers areautotrophs and are most often photosynthetic organisms such as plants, algae, orcyanobacteria
- Theorganismsthateattheprimaryproducersarecalled**primaryconsumers**.Primary consumers are usually **herbivores**, plant-eaters, though they may be algaeeatersorbacteria eaters
- The organisms that eat the primary consumers are called **secondary consumers**.Secondaryconsumers aregenerallymeat-eaters—**carnivores**
- The organisms that eat the secondary consumers are called **tertiary consumers**.Theseare carnivore-eatingcarnivores,likeeagles orbig fish

Food web:

- The inter linking of no of food chain in an ecosystem is called food web
- An organism cansometimes eat multiple types of prey or be eaten by multiple predators,



including ones atdifferenttrophic levelsformfoodweb.

Forest Ecosystem:

- **Temperateforestecosystem:**
  - Temperateforestsareinregionswheretheclimatechanges a lot from summer to winter.
  - Temperate forests are almost always made of two types oftrees, deciduous and evergreen.
  - Deciduous trees are trees that lose their leaves in thewinter.
  - Evergreens are trees that keep them all year long, like pine trees.
  - Forests can eitherbeoneortheother,oracombinationofboth.
- **Tropical rain forest ecosystem:**
  - Tropical rain forests are one of the most important areason Earth.
  - Tropical rain forests are in regions where the climatestays constant all year long
  - These special ecosystems are homes to thousands of species animals and plants.
  - ThefamousAmazon jungleis locatedinBrazil,inSouthAmerica.

Structure:

- Different organisms exist within the forest layers. These organisms interact with each otherandtheirsurroundings.

Producers:

- Plants produce their own food, in the form of carbohydrates. Plants are, therefore, calledthe primary producers, since they produce the basic foodstuffs for other organisms withinfood chains and food webs. Photosynthesis is the chemical reaction that allows plants toproducetheir ownfood.

Consumers:

- Animals cannot produce their own food. They must consume food sources for die energytheyneedtosurvive.Allanimals,includingmammals,insects,andbirds,arecalledconsumers.Consumersrelyonplantsandotheranimalsasafoodsource.

Decomposers:

- Leaves, needles, and old branches fall to the forest floor as trees grow. Eventually all

plantsand animals die. These materials are decomposed by worms, microbes, fungi, ants, andother bug

Aquatic Ecosystem:

- The term aquatic refers to water, so an **aquatic ecosystem** refers to living andnon-livingpartsofawater bodyandtheinteractionsthattakeplaceamongthem
- Abodyofwatercanbeclassifiedasbeingfreshwater,marine,orestuarine.
    - A freshwater body of water has fewer dissolved compounds, or salts, present,while a marine body of water has various salts dissolved in it, hence the term 'salt water'.
    - The average salinity of salt water is around 35 parts per thousand.
    - Estuarine areas arethose that experience a flux of both fresh and salt water, depending on the tides and watercurrents.
- Wecancategorize aquatic systems even further if we look at patterns of water movement.
    - Lenticwaterbodieshaveveryslow-movingorstagnantwater.Theseincludelakesandponds.
    - Loticwaterbodies have faster-movingwater, like riversandstreams

StructureandFunction:

Producer:

- Algaeareatypeofphotosyntheticplant.Macro algaearelargealgaethatconsistofaholdfast, a stipe, and blades. They are verydifferent from microalgae, the green specks that will grow in water. Seaweed is commonlyfound in ocean waters and is a type of macro algae.

Consumer:

- Primary consumers are thesecondlevelinthefood chain,feeding offof producerslikephytoplankton.Secondaryconsumers are the third level, and they eat primary consumers. Tertiary consumers are thefourth level, eating secondary consumers. Dolphins are an example of tertiary consumers.

Decomposer:

- Decomposers are: animal-like protists, bacteria and fungi.Decomposers ingest variousanimal, plant and microbial wastes and convert them into simple inorganic compounds.Thisconversionprocessrecyclesessentialnutrientsbackintotheoceanecosystem. Decomposersandthedead,organicmatterthattheyfeedonaresometimescalleddetritus

River Ecosystem:

- It is fresh water and freely flowing water system .Flowing water allows mixing of waterresultinginhigherdissolvedoxygen Riverdepositslarge amountof nutrients.

StructureandfunctionofRiverEcosystem:

- The abiotic components of river ecosystems are temperature, light, pH, nutrients, organicandinorganic compounds.

- Bioticcomponentsareclassifiedinto:
    - Producers: Phytoplankton,Algae,watergrasses,aquaticgrassesandother amphibious plants.
    - Consumers: Primaryconsumersfeedonphytoplankton.Examplesarewaterinsects, snailsandfishes. Secondary consumers are feed on primary consumers.
    - Decomposers: Decomposersdecomposedeadplantsandanimals.Examplesof decomposersarebacteriaandfungi.

Estuarine Ecosystem:

- Estuariesaretransitionzonesthatarestronglyaffectedbytidesofthesea.Waterinestuaries changes periodically. The organisms in estuaries have a wide tolerance .Salinityremainshighest in summerandlowest in winter.

StructureandfunctionofEstuarineEcosystems:

- Abiotic components of estuarine ecosystems are temperature, pH, sodium and potassiumsaltsandnutrients.

Bioticcomponentsareclassifiedinto:

- Producers: Examplesaremarshgrasses,seaweeds,seagrassesandphytoplankton.
- Consumers: ExamplesareOysters,Crabs,Seabirds,andsmallfishes
- Decomposers: ExamplesareBacteria,fungiandactinomycetes.

UNIT-4

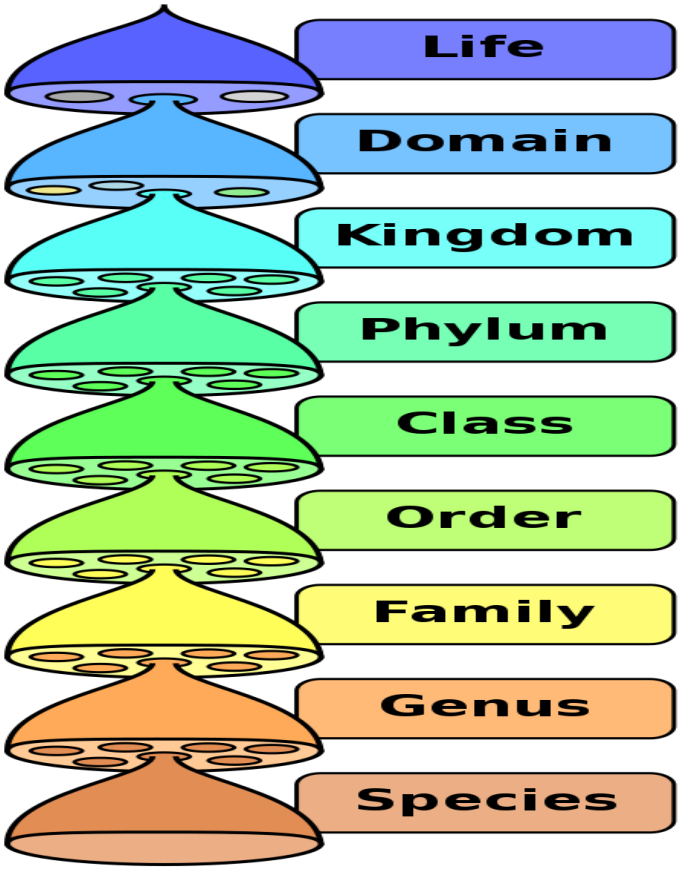
Introduction:-

Genetic:

- Genetics is defined as the branch of biology that deals with the study of genetic variation genes and heredity
- Gregor Mendel was a pioneer in this field
- He observe that organisms inherit traits by way of “discrete units inheritance”
- This term still used today that is referred to as a gene

Species:

- A group of living organisms consisting of similar individuals with same characteristic capable of exchanging genes is called species

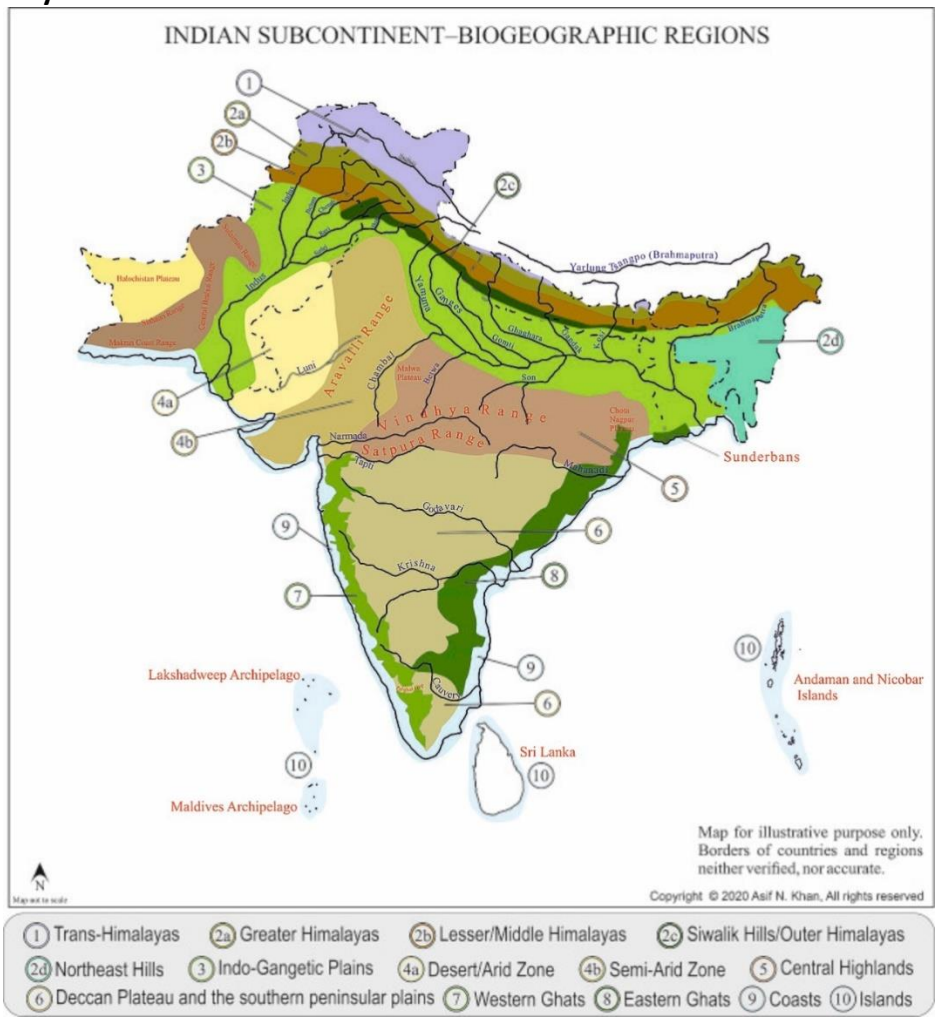


- A species is the basic unit of classification and a taxonomic rank of an organism, as well as a unit of biodiversity

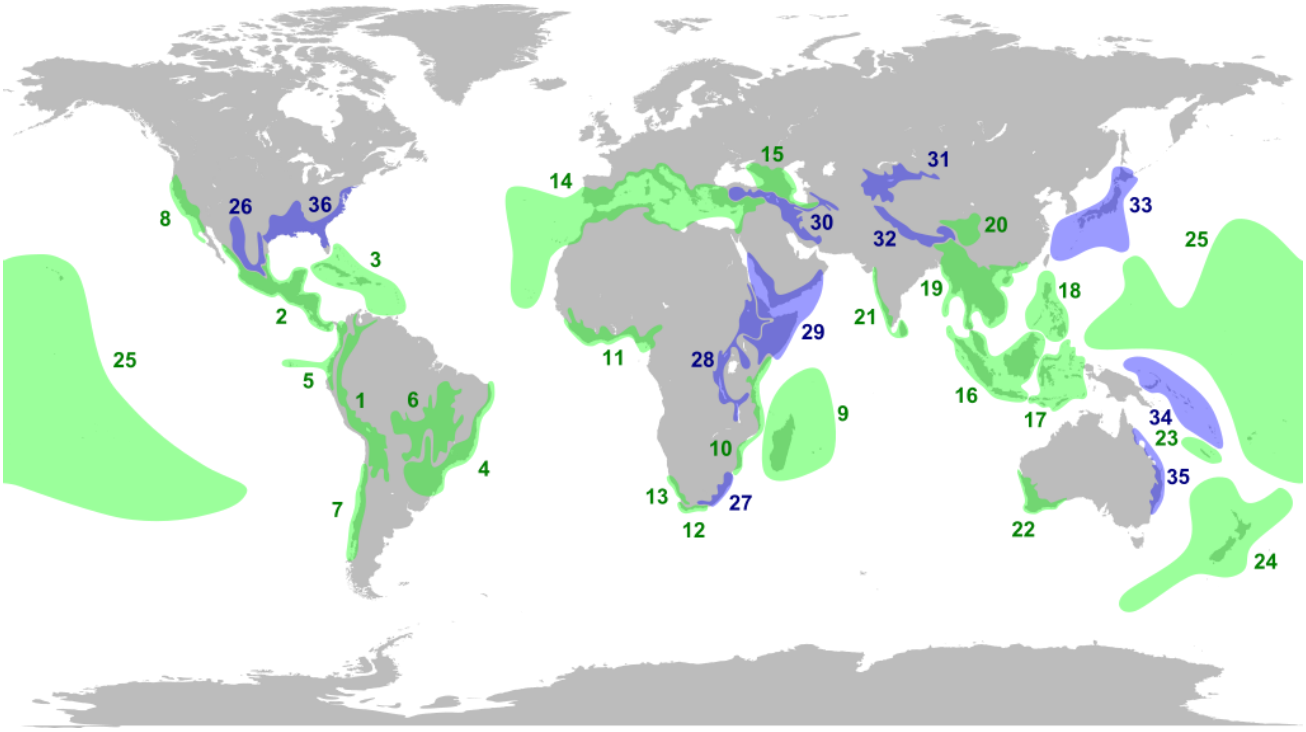
Ecosystem Diversity:

- Ecosystem diversity deals with the variations in ecosystem within a geographical location an its overall impact on human existence and the environment
- Some examples of ecosystems that are rich in diversity are:
    - Marine ecosystem
    - Rainforest
    - Old-growth forest
    - Tundra

Biogeographically classification of India:



- Biogeography is the study of the distribution of species, organisms and ecosystems in geographic space and through geological time
- India has a rich heritage of natural diversity. India ranks fourth in Asia and tenth in the world among the mega-diverse countries in the world
- India is also home to four biodiversityhotspots
    - Andaman & Nicobar island
    - Eastern Himalaya
    - Indo-Burma region
    - Western Ghats
- Biodiversity hotspots of India—Eastern Himalayas: 32; Indo-Burma: 19; Western Ghats and Sri Lanka: 21; and Sunderland (which includes Nicobar Islands): 16.



Value of biodiversity:

Consumptive use:

- This refers to natural products that are used for food, such as livestock feed, wood products, fuelwood, and other purposes.
- Humans consume 40,000 flora and fauna species daily. Many people remain dependent on wildlife for the majority of their necessities, such as nutrition, temporary housing, and clothing

Productive use:

- This implies products that are sourced and commercially marketed.
- Almost all of the crops grown today have evolved from wild varieties. Biotechnologists are continuously experimenting with wild plant species to create new, more productive disease-resistant variants

Social and ethical value:

- Biodiversity has enormous economic potential in terms of food, livestock feed, medications, etc. Biodiversity is vital for many areas of the economy

Aesthetic value:

- The beauty of our planet is due to biodiversity. Otherwise, it would have looked like any other deserted planet, which is scattered throughout the universe.
- Biological diversity enhances the quality of life and contributes significantly to some of nature's most beautiful aspects.
- Biodiversity makes a significant contribution to the gorgeousness of the landscape

Biodiversity at Global level:

- About 2.1 million species have been identified till date, while many more species are believed to exist
- According to UNEP (1993-94) (UN convention on environment protection) estimate, the total number of species that might exist on Earth range between 9.0 – 52 million
- Invertebrate animals and plants make-up most of the species.
- About 70% of all known species are invertebrates (animals without backbones such as

insects, sponges, worms, etc.); while, about 15% are plants. Mammals, the animal group to which man belong, comprise a comparatively small number of species

TOP 20 Global Biodiversity Index[4]

Country (or dependent territory)	Bird	Amphibian	Fish	Mammal	Reptile	Vascular Plant	Biodiversity Index
Brazil	1,816	1,141	4,738	693	847	34,387	512.34
Indonesia	1,723	383	4,813	729	773	19,232	418.78
Colombia	1,863	812	2,105	477	634	24,025	369.76
China	1,285	540	3,476	622	554	31,362	365.84
Mexico	1,105	411	2,629	533	988	23,385	342.47
Australia	725	245	4,992	355	1,131	19,324	337.18
Peru	1,861	655	1,583	490	510	19,812	330.12
India	1,212	446	2,601	440	715	15,000	301.63
Ecuador	1,629	659	1,111	392	492	18,466	291.58
United States	844	326	3,081	531	556	15,500	280.13
Venezuela	1,386	365	1,735	376	419	30,000	273.39

TOP 20 Global Biodiversity Index[4]							
Country (or dependent territory)	Bird	Amphibian	Fish	Mammal	Reptile	Vascular Plant	Biodiversity Index
Papua New Guinea	743	416	2,884	282	384	13,634	226.57
Myanmar	1,034	540	1,088	304	364	16,000	221.77
Vietnam	835	263	2,423	313	512	8,500	216.97
Malaysia	721	278	1,951	348	502	14,030	214.71
Democratic Republic of the Congo	1,110	227	1,528	465	313	8,860	214.43
Tanzania	1,074	207	1,773	412	346	10,100	213.10
Bolivia	1,435	259	407	382	315	14,729	209.55
South Africa	762	132	2,094	331	421	21,250	207.94
Thailand	936	153	2,150	314	468	6,600	200.77

National level:

- India has over 108,276 species of bacteria, fungi, plants and animals already identified

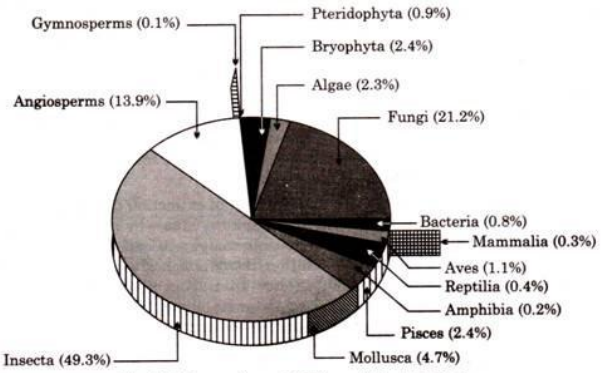


Fig. 4.1. Percentage of Different Biota in India.

- India is 10th among the plant rich countries of the world, fourth among the Asian countries, eleventh according to the number of endemic species of higher vertebrates (amphibia, birds and mammals), and tenth in the world as far as richness in mammals is concerned.
- Out of the 10 'Hot spots' identified in the world, India has four. These are Eastern Himalaya, North East India, Western Ghats and Andaman & Nicobar Islands

Threats to Biodiversity:

Habitat loss:

- Habitat loss includes habitat destruction, altering the physical environment such that a species can no longer live there, and habitat fragmentation, which involves dividing a habitat into discontinuous patches

Poaching of wild life:

- Poaching, in law, the illegal shooting, trapping, or taking of game, fish, or plants from private property or from a place where such practices are specially reserved or forbidden.
- Poaching is a major existential threat to numerous wild organisms worldwide and is an important contributor to biodiversity loss

Man wildlife conflict:

- Wildlife can threaten people's safety and livelihoods, which can lead to conflicts between groups of people over how to resolve the situation; experts call this 'human-wildlife conflict'.
- Human-wildlife conflicts are becoming more frequent, serious and widespread as human populations grow and habitats are lost

UNIT-5

Air pollution:

- Air pollution may be defined as the presence of one or more contaminantslike dust, mist, smoke and colour in the atmosphere that are injurious human beings, plantsandanimals
- Causes of air pollution
  - Rapid industrialization
  - Fast urbanization
  - Rapid growth in population
  - Growth the vehicle on the road
  - Activity of human being disturbed the natural balance of atmosphere
- Air pollutants are two type
  - Primary pollutant
    - Primary pollutant are those that are directly emitted in the atmosphere the harmful form
    - Example: CO_2, NO_2, SO_2
  - Secondary pollutant
    - Secondary pollutants are those that are formed by reacting withothercomponentsorsomebasiccomponentoftheatmospheretoformnewpollutants
    - Example: Oxides of Nitrogen (NO_2or NO_3) react with moisture in the atmosphere to give Nitricacid

Ozone:

- It is a highly reactive gas with an unpleasant odor occurring in the stratospherewhere it protects mankind from the harmful ultra-violet rays from the Sun. However onearth,it is apollutant.
- ItoccursonearthduetoreactionbetweenVolatileOrganicCompounds(VOCs)andNitrogenOxides.Itmoderates theclimate

Control measures:

1. Usingunleadedpetrol
2. Usingfuelswithlowsulphurandashcontent
3. Encouragingpeopletousepublictransport,walkoruseacycleasopposedtoprivatevehicles
4. Planttreesalongbusystreetsastheyremoveparticulates,carbondioxideandabsorbnoise
5. Industriesandwastedisposalsitesshouldbesituatedoutsidethecitypreferably

6. Catalytic converters should beused tohelpcontrol emissionsof carbonmonoxideandhydrocarbons
7. Emissionratesshouldberestrictedtopermissiblelevelsbyeachand everyindustry
8. Continuousmonitoringoftheatmosphereforpollutantsshouldbecarriedouttoknowtheemission levels

Water pollution:

- Waterpollutionmaybedefinedas"thealterationinphysical,chemicalandbiologicalcharacteristics of water which may cause harmful effects on surface living animals andaquatic life.
- Water pollution is any chemical, biological or physical change in water qualitythat has a harmful effect on living organisms or makes water unsuitable for desired uses

Types of water pollution:

- Organic waste present in the water required more amountof oxygen by the bacteria during decomposition of waste organic food material and hencethis types of contaminated water is known as oxygen demanding waste
- Most of the time it is observed that somewater soluble hazardous chemical are present in the water that causes harmful effect onliving organism. These are basically acids, compounds of toxic metals such as lead (Pb),arsenic (As) and selenium (Se), salts such as NaCl in oceans and fluoride (F^-) found in somesoils
- Presenceofsoil,siltinthewaterwhichmakethewaterunusefulfordrinkingandother sanitation purposes
- Due to the disposal of the radioactive waste in the sea and otherwater bodies, they come to the other water body during the rain with runoff water andwatergets contaminated

Effects of water pollution:

- Large populations of bacteria decomposing these wastes can degrade water qualitybydepletingwaterofdissolvedoxygen.Thiscausesfishandotherformsofoxygen-consumingaquaticlife to die
- Causeskincancerandneckdamage
- Damagenervoussystem,liverandkidneys
- Harmfishandotheraquaticlife
- Lowercropyields
- Acceleratecorrosionof metalsexposedtosuchwater
- Disruptionofaquaticfoodchain
- Carriespesticides,bacteriaandotherharmfulsubstances
- Settlesanddestroysfeedingandspawninggroundsoffish
- Clogsandfillslakes,artificialreservoirs,streamchannelsandharbours
- Geneticmutations,birthdefectsandcertaincancers

Counter measure:

- Activatedsludgeisabiochemicalprocessfortreatingsewageandindustrial wastewater that uses air (or oxygen) and microorganisms to biologically oxidizeorganicpollutants,producingawaste knownassludge
- The presence of such kind of inorganic substance can be removed by the variousprocesses such as solid-solid adsorption and reverse osmosis process. Reverse Osmosis,commonly referred to as **RO**, is a process where we demineralize or deionize water bypushingitunderpressurethroughasemi-permeableReverseOsmosisMembrane
- Basicallythistypesofwateristreatedwiththeprocesssedimentationandcoagulation. During the process water is allowed to settle for some time either by withoutaddinganychemicalorbyaddingchemicalknownascoagulatingagent

Soil pollution:

- Soilpollutionisdefinedas,“contaminationofsoilbyhumanandnaturalactivitieswhich maycauseharmfuleffect on livingorganisms”

Source:

- Industrial pollutants are mainly discharged from various originssuchaspulpand papermills,chemicalfertilizers,oilrefineries,sugarfactories,tanneries, textiles, steel, distilleries, fertilizers, pesticides, coal and mineral miningindustries,drugs,glass, cement, petroleumandengineeringindustriesetc
- Urban wastes compriseof both commercial and domestic wastesconsistingofdriedsludge andsewage
- Withtheadvancingagro-technology,hugequantitiesoffertilizers,pesticides,herbicidesandweedicidesareaddedtoincr easethecropyield. Apart from these farm wastes, manure, slurry, debris, soil erosion containingmostlyinorganic chemicalsarereportedtocausesoilpollution
- Radioactive substances resulting from explosions of nucleartesting laboratories and industries giving rise to nuclear dust radioactive wastes,penetratethesoilandaccumulategivingrise toland/soilpollution
- Soil gets a large amount of human, animal and bird excreta whichconstituteamajorsourceoflandpollutionbybiologicalagents

Effects:

- These pollutants affect and alter the chemical and biologicalproperties ofsoil. As a result, hazardous chemicals can enter into human food chain from the soilor water, disturb the biochemical process and finally lead to serious effects on livingorganisms
- This waste effect the physical and chemical properties of the soil and reducethefertilityofthesoil
- Excessutilization of fertilizer and pesticide reduces the fertility of the soilandthisalsoaffect on thehealth ofallthelivinganimal life
- All the radio nuclides deposited on the soil emit gamma radiations which hashazardouseffect on the lifeoflivingorganism
- Heavyapplicationofmanuresanddigestedsludgecancauseseriousdamagetoplants within a few years

Control:

- Reducing deforestation and substituting chemical manures by animal wastes alsohelpsarrest soil erosion in thelong term
- Tominimizesoilpollution,thewastessuchaspaper,plastics,metals,glasses,organics, petroleum products and industrial effluents etc should be recycled andreused
- Ban should be imposed on chemicals and pesticides like DDT, BHC, etc which arefatal to plants and animals
- Nuclear explosions and improper disposal of radioactivewastesshouldbe banned

Noise pollution:

- Noise is defined as "the unwanted, unpleasant or disagreeable soundthatcausesdiscomforttoallliving beings”

Source:

- Itissound withahighintensitysound caused by industrymachines
- Sourcesofsuchnoisepollutionarecausedbymachinesfrommachines in various factories, industries and mills. Noise from mechanical sawsandpneumaticdrills isunbearableandanuisanceto thepublic

- Transport noise mainly consists of traffic noise from road, railand aircraft

Effects:

- Emotionalorpsychologicaleffectssuchasirritability,anxiety,stress,lackofconcentrationandmentalfatigue
- It causes permanent hearing loss if exposed to longer period to noisy machinesproducingmore than 120db sound
- Noiseinterfereswithnormalauditorycommunicationandmaymaskauditorywarningsignalsincreasingtherateofaccidentsespeciallyinindustries

Control measure:

- Regularandthoroughmaintenanceofoperatingmachinery
- Isolatingmachinesandtheirenclosuresfromthefloorbyusingspecialspringmountsorabsorbing mounts andpads
- Usinghighlyabsorptiveinteriorfinishmaterialforwalls,ceilingsandfloorsdecreasesindoornoise levels
- Plantingoftreesaroundhousesastheyactaseffectivenoisebarriers

Marine pollution:

- Marine pollution can be defined as the introduction of exotic substances to the marineenvironment directly or indirectly by man resulting in adverse effects such ashazardstohumanhealth,obstructionofmarineactivitiesandloweringthequalityofseawater

Causes:

- Rivers,whichbringpollutantsfromtheirdrainagebasins
- Catchmentareai.e.coastlinewherehumansettlementsintheformofhotels,industry,agricultural practices havebeenestablished
- Oildrillingandshipment

Effects:

- HydrocarbonsandBenz pyrenegetsaccumulatedinfoodchainandconsumptionofsuchfish bymanmaycausecancer.
- Bioaccumulationinfoodchainalsoresultsinlossofspeciesdiversity.
- Oilpollutioncausesdamagetomarinefaunaandfloraincludingalgae,fish,birds,andinvertebrates.
- Detergentsusedtocleanupthespillarealsoharmfultomarinelife

Counter measure:

- Toxicpollutantsfromindustriesandsewagetreatmentplantsshouldnotbedischargedin coastalwaters.
- Seweroverflowsshouldbepreventedbyhavingseparatesewerandrainwaterpipes.
- Dumpingoftoxic,hazardouswastesandsewagesludgeshouldbebanned.
- Developmentalactivities oncoastalareasshouldbeminimized.
- Oilandgreasefromservicestationsshouldbeprocessedforreuse.

Thermal pollution:

- Thermalpollutionisdefinedasthedegradationofwaterqualitybyanyprocessthatchangesambientwatertemperature

Sources:

- Thermal pollution occurs when an industry removes water from a source, uses thewaterforcoolingpurposesandthenreturnstheheatedwatertoitssource.Thetemperatureof thedischargedwaterisgenerally15°-16°higherthantheinitialtemperature
- Natural causes like volcanoes and geothermal activity under the oceans and seas cantriggerwarmlavatoraisethetemperatureofwaterbodies.Lighteningcanalsointroducemass ive amountof heatinto theoceans

Effects:

- The dissolved oxygen content of water is decreased as the solubility of oxygen inwateris decreasedat high temperature.
- Toxicityofpesticides,detergentsandchemicalsintheeffluentsincreaseswithincreaseintemper ature.
- Thecompositionoffloraandfaunachangesbecausethespeciessensitivetoincreasedtemperatu reduetothermalshockwillbereplacedbytemperaturetolerantspecies.
- Metabolic activities of aquatic organisms increase at high temperature and requiremoreoxygen,whereas oxygenlevel fallsunder thermalpollution.

Control:

- Hot water from the thermal power plant should not be released to the water bodydirectly. But can be released after storing in the spray chamber or passing throughthecoolingtower

Nuclear hazards:

Causes:

- EmissionsfromradioactivematerialsfromtheEarth'scrust
- Miningandprocessingofradioactiveores.
- Useofradioactivematerialinnuclearpowerplants.
- Useofradioactiveisotopesinmedical,industrialandresearchapplications.
- Useofradioactivematerialsinnuclearweapons

Effects:

- Geneticdamagecaused by radiations, which induce mutations in the DNA, thereby affecting genesandchromosomes.Thedamageisoftenseenintheoffspringandmaybetransmittedupto several generations.
- Somaticdamage includes burns, miscarriages, eye cataract and cancer of bone, thyroid, breast,lungsandskin

Controls:

- Workersinnuclearplantsshouldbeprovidedwithnucleargadgetsandsafetymeasuresagainst accidents.
- Leakageofradioactiveelementsfromnuclearreactors,laboratories,transport,carelesshandlinga nduseof radioactive fuelsshouldbe checked
- Thereshouldberegularmonitoringandquantitativeanalysisthroughfrequentsamplingin theriskareas.
- Preventivemeasuresshouldbefollowedsothatbackgroundradiationlevelsdonotexceedtheper missiblelimits.
- Wastedisposalmustbecareful,efficientandeffective

Solid and industrial waste:

Causes:

- Domestic wastescontaining a variety of materials thrown out from homes Ex:

Foodwaste,Cloth,Wastepaper,Glassbottles,Polythenebags,Wastemetals,etc

- Commercial wastes: It includes wastes coming out from shops, markets, hotels,offices, institutions, etc. Ex: Waste paper, packaging material, cans, bottle, polythenebags
- Biomedicalwastes:Itincludesmostlywasteorganicmaterials Ex:Anatomicalwastes, Infectiouswastes
- Nuclearplants:Itgeneratesradioactivewastes
- Thermalpowerplants:Itproducesflyashinlargequantities
- ChemicalIndustries:Itproduceslargequantitiesofhazardousandtoxicmaterials

Effects:

- Due to improper disposal of municipal solid waste on the roads and immediatesurroundings, biodegradable materials undergo decomposition producing foul smellandbecome abreedingground fordisease vectors
- Industrial solid wastes are the source for toxic metals and hazardous wastes thataffectsoilcharacteristicsandproductivityofsoilswhentheyaredumpedonthesoil
- Toxicsubstancesmaypercolateintothegroundandcontaminatethegroundwater.
- Burningofindustrialordomesticwastes(cans,pesticides,plastics,radioactivematerials and batteries) produce furans, dioxins and polychlorinated biphenyls thatareharmfultohuman beings.
- During the process of collecting solid waste, the hazardous wastes usually mix withordinary garbage and other flammable wastes making the separation process evenharderandrisky

Control:

- Twoimportantstepsinvolvedinsolidwastemanagementare:
  - ThreeR's–Reduce**,**ReuseandRecycleofRawMaterials
  - ProperDiscardingof wastes
- Thefollowingmethods areadoptedfordiscardingwastes:
  - SanitaryLandfill
    - Modern landfills are designed in such a way that the bottom of the landfill is coveredwith an impervious liner which is usually made of several layers of thick plastic and sand.Thislinerprotectsthegroundwaterfrombeingcontaminatedbecauseofleaching orpercolation
  - Incineration
    - Inthismethodmunicipalsolidwastesareburntinafurnacecalledincinerator.Combustible substances such as rubbish, garbage, dead organisms and non-combustiblematter such as glass, porcelain and metals are separated before feeding to incinerators
  - Composting
    - Duetolackofadequatespaceforlandfills,biodegradableyardwasteisallowedtodecompose in a medium designed for the purpose. Only biodegradable waste materials areused in composting. Good quality environmentally friendly manure is formed from thecompostandcan be usedforagriculturalpurposes

Role of individual in prevention of pollution:

- Promotereuseandrecyclingwhereverpossibleandreducetheproductionofwastes.
- Industrialists should check for proper disposal of treatedwater from factory unitsas to avoid thermal pollution of water bodies. They should also deploy a watertreatmentplanttopreventtheflowofhazardousmaterial.
- Save electricity by not wasting it when not required because electricity saved iselectricitygeneratedwithoutpollutingtheenvironment.

- Use of mass transport system. For short-visits use bicycle or go on foot. Decrease theuseofautomobiles.
- Plantingofmoretrees,astreescanabsorbmanytoxicgasesandcanpurifytheairbyreleasingoxygen

UNIT-6

- Sustainable development can be defined as "meeting the needs of the present without compromising the ability of future generations to meet their own needs."
- **True sustainable development**: It aims at optimum use of natural resources with high degree of sustainity, minimum wastage, least generation of toxic byproducts and maximum productivity.

Urban problems related to energy:

Water conservation:

- Rain water harvesting:
  - The activity of collecting rain water directly recharging it into the ground to improve the ground water storage in the aquifer is called Rain Water harvesting. This may increase the level of ground water, reduce the ground water table depletion and arrest the sea water intrusion
  - Traditional methods→ Temple tanks of India, Ponds
  - Modern methods →Absorption pit method, absorption well method, Well cum Bore method
- Water shed management:
  - Principles factors influencing watershed operations
    a. Physiographic
    b. Soil and Geology
    c. Land use
    d. Criminological and meteorological information
    e. Design peak runoff rate
    f. Socio-economic factors

Resettlement and rehabilitation of people:

- The survival of human has now become an important issue to be concentrated, as human faces many threats for his survival too. He is disturbed to a maximum and at times, he needs resettlement too. Based on the causes, resettlement activities can be broadly grouped into 2 categories
- Voluntary Rehabilitation: Due to natural calamities such as Political, racial, religious disturbance, floods, cyclones, famines, earthquakes
- Involuntary Rehabilitation: Due to construction of various types of developmental projects

Environmental Ethics:

- Humans are members of Earth's living community in the same way and on the same terms as all other living things
- Humans and other species are inter-dependent
- Each organism is a unique individual pursuing its own way
- Humans beings are not inherently superior to other living things
- We should not harm any natural entity that has an intrinsic worth
- We should not try to manipulate, control, modify, manage or interfere with the normal

functioning of natural ecosystems, biotic communities or individual wild organisms

- We should not try to deceive or mislead any animal capable of being deceived or misled

Some Issues:

Green House Effect:

- The greenhouse effect is a warming of the earth's surface and lower atmosphere caused by substances such as carbon dioxide and water vapour which let the sun's energy through to the ground but impede the passage of energy from the earth back into space

Acid Rain:

- Acid rain is caused by emissions of compounds of ammonium, carbon, nitrogen, and sulphur which react with the water molecules in the atmosphere to produce acids.
- The various gases like sulphur dioxide and nitrogen dioxide react with water vapours in presence of sunlight and form sulphuric acid and nitric acid mist
- Sulphur dioxide being released into the atmosphere, such as rotting vegetation, plankton, sea spray, and volcanoes, all of which emit about 10% sulphur dioxide
- Industrial combustion is responsible for 69.4% sulphur dioxide emissions into the atmosphere, and vehicular transportation is responsible for about 3.7%
- Acid rain change the pH level of soil, water body
- It also corrode metal and make them toxic
- So Industrial power plants should attach devices known as 'scrubbers' in the chimneys of these plants which can reduce 90-95% of sulphur emission
- Automobile should use catalytic converter to control sulphur emission

Ozone layer depletion:

- The ozone layer is a thin layer in the atmosphere at an altitude of about 20-30 km that has a high concentration of ozone gas. It is made up of three atoms of oxygen and is represented as O3
- The ozone layer protects us from these harmful rays and is essential for life on earth
- The major cause of the thinning of the ozone layer is the use of chloro-fluoro-carbons or CFCs and Hydro- Chloro-fluoro-carbons or HCFCs. They are compounds of chlorine, fluorine, and carbon such as CF3Cl, CHCl2F
- These are used as refrigerants in refrigerators, ACs, and cooling plants. These molecules can destroy O3 molecules

Nuclear Accidents and Holocaust:

- The prime example of a "major nuclear accident" is one in which a reactor core is damaged and significant amounts of radiation are released, such as in the Chernobyl Disaster in 1986
- Causes:
  - Design fault in RBMK reactor
  - A violation, of procedures
  - Breakdown of communication

Air Act:

- Pollution beyond certain limits due to various pollutants discharged through industrial emission is monitored by pollution control boards set up in every state
- The board advises the central government on matters concerning quality of air. It also coordinates activities, provides technical assistance and guidance to state boards in addition to setting the standards for quality of air
- The state boards possess the right to inspect at all reasonable times any control equipment, industrial plant or manufacturing process and give orders to take necessary steps to control pollution
- Any person who contravenes any provision of the act is punishable with

imprisonment for a term extending to three months or a fine of Rs.10, 000 or both. If the offence continues, an additional fine may extend to Rs. 5000 per day foreveryday during which the contravention continues after conviction for the first contravention

Water Act:

- The water act of 1974 along with amendments in 1978 is an extensive legislation with more than sixty sections for prevention and control of water pollution
- The act empowers the board to take
    - water samples for analysis
    - govern discharge of sewage
    - trade effluents
    - study or inspect appeals
    - revision of policies
    - set minimum and maximum penalties
    - publication of names of offenders'
    - offences by companies or government departments
    - establish or recognize water testing laboratories and standard testingprocedures

UNIT-7

- The population growth or population change refers to the change in number of inhabitants of a territory during a specific period of time. This change may be positive as well as negative. It can be expressed either in terms of absolute numbers or in terms of percentage
- The following factors affect the population growth
    - Rise in the birth rate
    - Decline in the death rate
    - High production of food and better technologies for storage, processing anddistribution.
    - Illiteracy is another important cause of overpopulation. Those lacking educationfail to understand the need to prevent excessive growth of population. They areunable to understand the harmful effects that overpopulation has.
    - With scientific and technological advancement, life expectancy of humans haveimproved.
    - Immigration is a problem in some parts of the world. If the inhabitants of variouscountries migrate to a particular part of the world, then population increase there.

Variation among nation:

- At present the world's population has crossed 7 billions
- Less developed countries have 80% population while the developed countries have only 20%
- Africa – High population growth rate due to increased birth rate and decreasing death rate
- Asia – Densely populated. India and China together have 40% of the world's population
- America – Thinly populated. Population may increase only due to migration
- Europe – Population growth rate steady or declining
- Australia – thinly populated

Population Explosion:

- The enormous increase in population, due to low death rate (mortality) and high birth rate is termed as population explosion. Population increase can be better understood in terms of doubling time.
- Doubling time is the number of years needed for a population to double. It varies from about 25 years in developing countries to 100 years in developed nations

Family welfare program:

- Family welfare includes not only planning of births, but they welfare of whole family by means of total family health care. The family welfare programme has highpriority in India, because its success depends upon the quality of life of all citizens
- It was started in the year 1951

- In 1977, the govt. of India re-designated the “national family planning programme as the “national family welfare programme”, and also changed the name of theministry of health and family planning to ministry of health and family welfare
- It is aimed at achieving a higher end, i.e., to improve the quality of life of the people
- India is the first country in the world that implemented the family welfare programme at govt. level

Role of information technology in Environment and human health:

- Information technology plays a key role in human health
- Many health organizations are turning to package solution of IT to streamlining service oriented work in an effective manner
- The health service technology mainly involves three systems
    - Finance and accounting
    - Pathology
    - Patient administration-clinical systems
- With the help of IT packages, the data regarding birth and death rates, immunization andsanitation programme are maintained more accurately
- It helps the doctor to monitor the health of the people effectively- tools like CT scansultrasound Sonography uses IT for diagnosis
- One of the important fields of IT for environmental studies is Geometrics. Geometrics is a science and technology for collecting, analyzing, interpreting, distributing and using geographic information
- Geometrics involves the following
    - Geometrics involves the following
    - Remote sensing
    - Geographic information system(GIS)
    - Global positioning system(GPS)
- One of the important applications of IT in the study of global environment is the satellite remote sensing technology. Satellite remote sensing technology helps in the evolution of its data and interpretations offer potentially valuable information for assisting human dimensions of global environmental changes such as
    - Fossil fuel consumption
    - Biomass consumption
    - Land use change
    - Agricultural activities
    - Halocarbon production and release

Human Rights:

- Human rights are standards that allow all people to live with dignity, freedom, equality, justice, and peace
- Every person has these rights simply because they are human beings
    - provides for equality before law
    - Prohibits discrimination based on religion, race, caste, sex or place of birth.
    - Provides for equality in public employment.
    - Protects the right of freedom of speech
    - Provides protection of life and personal liberty.
    - Ensure the right of freedom of religion.
    - Provide for cultural and educational rights.

- Provides that this is the duty of the state, to raise the level of nutrition and the standard of living and to improve public health.

Value of education:

- To improve integral growth of human being.
- To create attitudes and improvement towards sustainable life style.
- To increase awareness about our national history, our cultural heritage, constitutionalrights, national integration, community development and environment.
- To create and develop awareness about values and their significance and role.
- To know about various living and non-living organisms and their interaction withenvironment.
- To understand about our natural environment in which how land, air and water interlinked.