GOVERNMENT POLYTECHNIC
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DEPARTMENT OF CIVIL ENGINEERING
LECTURE NOTES

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5. ENVIRONMENTALPOLLUTION

UNITVENVIRONMENTAL POLLUTION

Definition–Causes,EffectsandControlMeasuresof:-(A)AirPollution(B)WaterPollution (B) SoilPollution (D)MarinePollution (E)Noise Pollution (F) Thermal Pollution (G) Nuclear Hazards – Solid Waste Management:- Causes, Effects and Control Measures of Urban and Industrial Wastes – Role of an Individual in Prevention of Pollution–PollutionCase Studies–disasterManagement:-Floods,Earthquake,CycloneandLandslides.

INTRODUCTION

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

POLLUTANTS

Pollutants are by-products of man's action. The important pollutants are summarized below:

- **Depositedmatter—**Soot,smoke,tarordustanddomesticwastes.
- **Gases—**CO, nitrogen oxides, sulphuroxides, halogens (chlorine,bromine and iodine).
- **Metals—**Lead,zinc,ironandchromium.
- **Industrial pollutants—**Benzene, ether, acetic acid etc., and cyanide compounds.
- **Agriculturepollutants—**Pesticides,herbicides,fungicidesandfertilizers.
- **Photochemical pollutants—**Ozone, oxides of nitrogen, aldehydes, ethylene, photochemical smog and proxy acetylnitrate.
- **Radiationpollutants—**Radioactivesubstancesandradioactivefall-outsof the nuclear test.

Classificationof Pollutants

Natureofdisposal: Onthebasisofnaturaldisposal,pollutantsareoftwo types:

1. **Non-degradable pollutants:** Thesearethepollutants,whichdegradeatavery slow pace by the natural biological processes. These are inorganic compounds such as salts (chlorides), metallicoxides waste producing materialsand materials like, aluminum cans, mercuric salts and even DDT. These continue to accumulate in the environment.
2. **Biodegradable pollutants:** These include domestic sewage that easily decomposesundernaturalprocesses andcan be rapidlydecomposed bynatural/ artificial methods. These cause serious problems when accumulated in large amounts as the pace of deposition exceeds the pace of decompositionof disposal.

Natureofform: Onthebasisoftheforminwhichtheypersistaftertheirrelease intotheenvironment,pollutantscanbecategorized undertwotypes:

(i) Primarypollutants: Theseincludethosesubstances,whichareemitted directlyfromsomeidentifiablesources.Thisinclude-

a. **Sulphurcompounds:**SO2,SO3,H2Sproducedbytheoxidationof fuel.
b. **Carboncompounds:**Oxidesofcarbon(CO+CO2)andhydrocarbons.
c. **Nitrogencompounds:**NO2andNH3.
d. **Halogencompounds:**Hydrogen fluoride(HF) andhydrochloricacid (HCl).
e. **Particles of different size and substances:** These are found suspended in air. The fine particles below the diameter of 100u are more abundant and include particles of metals, carbon, tar,pollen, fungi, bacteria, silicates and others.

(ii) Secondarypollutants: Thesecondarypollutantsareproducedbythe combinationofprimaryemittedpollutantsintheatmosphere.

Ex: In bright sunlight, a photochemical reaction occursbetween nitrogen oxides; oxygen and waste hydrocarbons from gasoline that forms peroxy-acetyle nitrate (PAN) and ozone (O3), both of them are toxiccomponents of smogandcause smartingeyes and lungdamage.

TYPESOFPOLLUTION

AIRPOLLUTION

Introduction: Air pollution is one such form that refers to the contamination of the air, irrespective of indoors or outside. A physical,biological or chemical alteration to the air in the atmosphere can be termed as pollution. It occurs when any harmful gases, dust, smoke enters into the atmosphere and makes it difficult for plants, animals and humans tosurviveas the airbecomesdirty.

The WHO defines **air pollution** as the presence of materials inthe air insuch concentration which are harmful to man and his environment.Anumberof ingredients findtheirway intheairand thesearemostlygases,whichrapidlyspreadover wideareas.

CausesofAirpollution:

1. **Burning of Fossil Fuels:** Sulfur dioxide emitted from the combustion of fossil fuels like coal, petroleum and other factory combustibles isone of the major causes of air pollution. Pollutantsemitting from vehicles cause immense amount of pollution. Carbon Monoxideproduced by improper or incomplete combustion emitted from vehicles is another major pollutant along with Nitrogen Oxides that is produced from both natural and manmadeprocesses.
2. **Agriculturalactivities:**Ammoniaisaverycommonbyproductfromagriculture related activities and isone of the most hazardous gases inthe atmosphere. Use of insecticides, pesticides and fertilizers in agricultural activitiesemitharmful chemicalsinto the airandcause water pollution.
3. **Exhaustfromfactoriesandindustries:**Manufacturingindustriesrelease large amount of carbon monoxide, hydrocarbons, organiccompounds, and chemicals into the air thereby depleting the quality of air. Petroleum refineries also release hydrocarbons and various other chemicals that pollute theairandalso cause land pollution.
4. **Mining operations:** Mining is a process wherein minerals below the earth are extracted using large equipments. During the process dust and chemicals are released in the air causing massive airpollution.
5. **Indoorairpollution:** Household cleaningproducts, paintingsupplies emittoxic chemicals in the air and cause air pollution.

6. **SuspendedParticulatematter:**Suspendedparticulatematterpopularbyits acronym SPM, isanother cause of pollution.

TypesofAirPollutants

- **Primarilyairpollutants**canbecausedbyprimarysourcesorsecondarysources. Thepollutantsthat area directresultof theprocess can becalledprimary pollutants.Aclassicexample of aprimarypollutantwouldbethesulfur-dioxide emitted from factories
- **Secondarypollutants**aretheonesthatarecausedbytheinterminglingand reactionsofprimarypollutants.Smogcreatedbytheinteractionsofseveralprimary pollutantsisknown tobeassecondarypollutant.

Commonairpollutants

1. **Carbon Dioxide:** CO_2 content of air has increased by 20% during the last century. CO_2 causes nausea and headache. Its increase in the airmay cause green house effect, rise in the atmospheric temperature. This may melt the polar ice resulting in rise in level of oceans andfloodingof coastalregions.
2. **Carbon Monoxide:** Itisa very poisonous gasand isproduced byincomplete combustion of fuel. Ifinhaled. Itcombines with hemoglobin andreduces its oxygen-carrying capacity. This leads to laziness, reduced vision and death.
3. **Oxides of Nitrogen:** These include NO and NO_2 , which are released by automobiles and chemical industries as waste gases and alsobyburning of materials. These are harmfuland lower the oxygen carrying capacity of blood.
4. **Oxides of Sulphur:** SO_2 and SO_3 are produced by burning of coal and petroleum andare harmfulto buildings,clothing, plants and animals. High concentration of SO_2 causes chlorosis (yellowing of leaves), plasmolysis, damage to mucous membrane and metabolic inhibition. SO_2 and SO_3 react with water toformSulphuricand sulphurous acids.These mayprecipitate as rainor snow producingacidrainor acidprecipitation.

5. **Photochemical Oxidants:** Formed by the photochemical reactions between primary pollutants, viz. oxides of nitrogen and hydrocarbons. Nitrogen oxides in the presence of sunlight react with un-burnt hydrocarbonsto form peroxyacylnitrate (PAN), Ozone, aldehydesand some other complex organic compounds in the air.
6. **Hydrocarbons:** These are un-burntdischarges from incomplete combustion of fuel in automobiles. These forms PAN with nitrogen oxides, which is highly toxic.
7. **Particulate Matter:** Industries and automobiles release fine solid and liquid particles into the air. Fly ash and soot from burning of coal, metal dust containing lead, chromium, nickel, cadmium, zinc and mercury from metallurgical processes; cotton dust from textile mills; and pesticides sprayed on crops are examples of particulate pollutants in the air.These are injurious to respiratory tract.
8. **Aerosols:**Aerosolsarechemicalsreleasedintheairinvaporform.These include fluorocarbon (carbon compound having fluorine) present in emissions from the Jet aero planes. Aerosols deplete the ozone layer. Thinning of ozone layer results in more harmful ultraviolet raysreaching theearth,whichareharmful to skin,andcan leadto skincanceralso.
9. **Radioactive Substances:** These are released by nuclear explosions and explosives. These are extremely harmful forhealth.
10. **Fluorides:** Rocks, soilsand.mineralscontaining fluorides release an extremelytoxic gas calledhydrogen fluorideon heating. This gas ishighly injurious to livestock and cattle.

Controlmeasures

The atmosphere has several built-in selfcleaning processes such as dispersion, gravitational settling, flocculation, absorption, rain-washout, etc to cleansethe atmosphere. However, control of contaminants at their source level is a desirable and effectivemethod throughpreventiveor controltechnologies.

1. **Sourcecontrol:**Somemeasuresthatcanbeadoptedinthisdirectionare
    1. Usingunleadedpetrol

2. Usingfuelswithlowsulphurandashcontent
3. Encouragingpeopletousepublictransport,walkoruseacycleas opposed to private vehicles
4. Ensurethathouses,schools,restaurantsandplaygroundsarenotlocated on busy streets
5. Planttreesalongbusystreetsastheyremoveparticulates,carbondioxide and absorb noise
6. Industriesandwastedisposalsitesshouldbesituatedoutsidethecity preferablyon the downwind of thecity.
7. Catalyticconvertersshouldbeusedtohelpcontrolemissionsof carbon monoxide and hydrocarbons

2. Controlmeasuresinindustrialcenters:

1. Emissionratesshouldberestrictedtopermissiblelevelsbyeachand every industry
2. Incorporationofairpollutioncontrolequipmentindesignofplantlayout mustbemade mandatory
3. Continuousmonitoringoftheatmosphereforpollutantsshouldbecarried out toknowthe emissionlevels.

Equipmentusedto controlairpollution

Airpollutioncanbereducedbyadoptingthefollowingapproaches.

1. Ensuring sufficient supply of oxygen to the combustion chamber and adequate temperature so that the combustion is complete thereby eliminating much of the smoke consistingof partlyburnt ashes anddust.
2. To use mechanical devices such as scrubbers, cyclones, bag houses and electro-static precipitators in manufacturing processes. The equipment used to remove particulates from the exhaust gases of electric power and industrialplantsare shown below. All methods retain hazardous materials that must be disposed safely. Wet scrubbercan additionallyreduce sulphurdioxide emissions.
3. The air pollutants collected must becarefully disposed. The factory fumes are dealt with chemicaltreatment.

WATERPOLLUTION

Introduction: Water pollution may be defined as —the alteration in physical, chemical and biological characteristics of water which may cause harmful effects on humansandaquaticlife.‖

Sourcesofwaterpollution

1. **Pointsources:**Thesearepollutantsthataredischargedatspecificlocations throughpipes,ditches or sewers intobodiesof surfacewaters.

   Ex:Factories,sewagetreatmentplants,abandonedundergroundminesand oil tankers.

2. **Non point sources:** These pollutantscannot be traced to a single point of discharge. They are large land areas or air-sheds that pollute water by runoff, subsurfaceflowor depositionfrom theatmosphere.

   Ex: Acid deposition, runoff of chemicals into surface water from croplands, livestock feedlots, logged forests, urban streets, lawns, golfcourses andparking lots.

Types,effectsandsourcesofwaterpollution

Waterpollutionisanychemical,biologicalorphysicalchange inwaterqualitythathasa harmful effect on living organisms or makes water unsuitable for desired uses.

S.No	Pollutants	Humansources	HealthEffects
1	Infectiousagents Ex:Bacteria,Viruses, Protozoa,andparasitic worms.	Human and animal wastes	Varietyofdiseases
2	Oxygendemandingwastes (Dissolved oxygen) Ex:Organicwastessuchas animalmanureandplant debris	Sewage, Animal feedlots, paper mills and food processing facilities	Degrade water quality by depleting water of dissolved oxygen.Thiscausesfishand other forms of oxygen-consumingaquaticlifetodie.
3	Inorganicchemicals Ex:Watersolubleinorganic	Surface runoff, industrial effluents	• Makefreshwaterunusable fordrinkingandirrigation

	chemicals: Acids, Compounds of toxic metals such as lead (Pb), arsenic (As) and selenium (Se)andSaltssuchasNaCl in oceans and fluoride (F^-) found in some soils.	and household cleansers	• Cause skin cancer and neck damage, Damage to nervous system, liver and kidneys • Harm fish and other aquatic life • Lowercropyields • Accelerate corrosion of metals exposed to such water
4	Organicchemicals Ex:Oil,Gasoline,Plastics, Pesticides, Cleaning solvents and Detergents.	Industrial effluents, household cleansers and surface runoff from farms.	• Can threaten human health by causing nervous system damage and some cancers. • Harmfishandwildlife.
5	Plant nutrients Ex:Watersoluble compounds containing nitrate,Phosphateand Ammonium ions.	Sewage, manure and runoff of agricultural and urban fertilizers	• Can cause excessive growth of algae and other aquatic plants, which die, decay, deplete dissolved oxygen in water thereby killing fish • Drinking water with excessive levelsofnitrates lower the oxygen carrying capacity of the blood and can kill urban childrenandinfants.
6	Sediment Ex:Soil,silt, etc.	Land erosion	• Causes cloudy water thereby reducing photosynthetic activity • Disruptionofaquaticfood Chain

			• Carries pesticides, bacteria andotherharmfulsubstances • Settles and destroys feeding and spawning grounds of fish • Clogs and fills lakes, artificial reservoirs, stream channels and harbors
7	Radioactivematerials: Ex:Radioactiveisotopesof: Iodine, Radon, Uranium, Cesium and Thorium.	Nuclear power plants, mining and processing of uranium and other ores, nuclear weaponproduction and natural sources.	Geneticmutations,birthdefects and certain cancers.
8	Heat(Thermalpollution) Ex: Excessive heat	Water cooling of electric power plants and some types of industrial plants.	• Low dissolved oxygen levels thereby making aquatic organisms more vulnerable to disease, parasites and toxic chemicals. • When a power plant starts orshutsdownforrepair, fishandotherorganisms adapted to a particular temperaturerange, can bekilled byanabrupt temperature change known as thermal shock.

Controlmeasuresofwaterpollution

1. Administrationof waterpollutioncontrolshouldbeinthehandsof stateor central government
2. Scientifictechniquesshouldbeadoptedforenvironmentalcontrolofcatchment areas of rivers, ponds orstreams
3. Industrialplantsshouldbebasedon recyclingoperationsasithelpsprevent disposalofwastesintonaturalwatersbutalsoextractionofproductsfromwaste.
4. Plants,treesandforestscontrolpollutionastheyactasnaturalairconditioners.
5. Treesarecapableof reducingsulphurdioxideandnitricoxidepollutantsandhence more trees should beplanted.
6. Notypeofwaste(treated,partiallytreatedoruntreated)shouldbedischargedinto anynaturalwaterbody.Industriesshoulddevelopclosedloopwatersupply schemes and domesticsewage must be used forirrigation.
7. Qualified and experienced people must be consulted from time to time for effective control of waterpollution.
8. Public awareness must be initiated regarding adverse effectsof waterpollution using the media.
9. Laws, standards and practices should be established to prevent water pollution and these laws should be modified from timetotimebased on currentrequirements and technological advancements.
10. Basicandappliedresearchinpublichealthengineeringshouldbeencouraged.

THERMALPOLLUTION

Introduction

Thermalpollutionisdefinedastheadditionofexcessofundesirableheattowaterthereby making it harmful to man, animal or aquatic life. Thermal pollution may also cause no significant departures from or activities of aquatic communities.

SourcesofThermalPollution

Thefollowingsourcescontributetothermalpollution.

1. **Nuclearpowerplants:**Nuclearpowerplantsincludingdrainagefrom hospitals, research institutions, nuclear experiments and explosions,

discharge a lot of heat that is not utilized along with traces of toxic radio nuclides into nearby water streams. Emissions from nuclear reactors and processinginstallationsarealsoresponsiblefor increasingthetemperatures of water bodies.Theoperations of powerreactors andnuclearfuelprocessing units constitute the major contributor of heat in the aquatic environment. Heated effluents from power plants are discharged at 10 C higher than the receivingwaters that affecttheaquaticfloraandfauna.

2. **Coal-fired power plants:** Coal firedpower plants constitute a major source of thermal pollution.The condenser coils insuch plants are cooled with water from nearby lakes or rivers. The resulting heated water is discharged into streams thereby raising the water temperature by 15C. Heated effluent decreases the dissolved content of water resulting in death of fish and other aquatic organisms. The sudden fluctuation of temperaturealso leads to *"thermal shock"*killingaquatic lifethat has become acclimatized to livingina steady temperature.
3. **Industrial effluents:** Industries like textile, paper,pulpand sugar manufacturing release huge amounts of cooling water alongwitheffluents into nearby natural water bodies. The waters polluted by sudden and heavy organic loads result in severe drop in levels of dissolved oxygen leading to death of several aquaticorganisms.
4. **Domestic Sewage:** Domestic sewageisdischargedintorivers,lakes, canals or streams with minimal treatment or without any treatment. These wastes have a higher organic temperature and organic load. This leads to decrease in dissolved oxygen content in the receiving waters resulting in the set-up of anaerobic conditions causing release of foul and offensive gases in water. Eventually, this leads to development of anoxic conditions resulting in rapid death of aquatic organisms.
5. **Hydro-electric power:** Generationof hydroelectricpowersometimesleads to negative thermal loading in water systems. Apart from electric power industries, various factories with cooling requirement contribute to thermal loading.

Thermalpollutioninstreamsbyhumanactivities

- Industriesandpowerplantsusewatertocoolmachineryanddischargethewarm water into a stream
- Streamtemperatureriseswhentreesandtallvegetationprovidingshadearecut.
- Soilerosioncausedduetoconstructionalsoleadstothermalpollution
- Removalofstreamsidevegetation
- PoorfarmingPracticesalsoleadtothermalpollution

Effectsof Thermalpollution

1. **Reduction indissolved oxygen**: Concentration of Dissolved Oxygen (DO) decreases with increase in temperature.
2. **Increase in toxicity**: The rising temperature increases the toxicity of the poison present inwater. A 10C increase intemperature of water doublesthe toxicity effect of potassium cyanide, while 80C rise in temperature triples the toxic effects of o-xylenecausingmassive mortalityto fish.
3. **Interference in biological activity**: Temperature is considered to be of vital significance to physiology, metabolismand biochemical processes that control respiratory rates,digestion, excretion, and overall development of aquatic organisms. Temperaturechangescause totaldisruption to theentireecosystem.
4. **Interference in reproduction:**In fishes, several activities like nest building, spawning,hatching,migrationandreproduction dependon optimum temperature.
5. **Directmortality**:Thermalpollutionisdirectlyresponsibleformortalityofaquatic organisms. Increaseintemperature of water leadsto exhaustion of microorganisms thereby shortening thelifespan of fish.Above a certaintemperature, fish diedue tofailureof respiratorysystemandnervoussystemfailure.
6. **Food storageforfish**:Abruptchangesintemperature altertheseasonalvariation in the type and abundance of lower organisms leading to shortage of right food for fish at the right time.

Controlmeasuresforthermalpollution

Thefollowingmethodscanbeadaptedtocontrolhightemperaturecausedbythermal discharges:

1. **Cooling towers**: Use of water from water systems for cooling systems for cooling purposes, with subsequent return to the water way after passage through a condenser, is called cooling process. Cooling towers transfer heat from hot water to the atmosphere by evaporation. Cooling towers are of two types:

   (i) Wet cooling tower: Hotwatercomingoutfromthecondenser(reactor) is allowed to spray over baffles. Cool air, with high velocity, is passed from sides,which takes away the heat and coolsthewater.

   (ii) Dry cooling tower: Here, hot water is allowed to flow in long spiral pipes. Cool air with the help of a fan is passed over these hot pipes, which cools down hot water. Thiscool water can berecycled.
2. **Cooling ponds:** Cooling ponds are the best way to cool thermal discharges. Heated effluents on the surface of the water in cooling ponds maximize dissipation of heat to the atmosphere and minimize the water area and volume. Thewarmwater wedge actslikea coolingpond.
3. **Spray ponds**:Thewater comingout from condensers isallowed topass into the ponds through sprayers. Here water is sprayed through nozzles as fine droplets.Heatfromthefinedropletsgetsdissipatedtotheatmosphere.
4. **Artificiallakes:**Artificiallakesaremanmadewaterbodiesthatofferonce-through cooling. The heated effluents can be discharged into the lake at one end and water for cooling purposes may be withdrawn from the other end. The heat iseventually dissipated through evaporation

SOILPOLLUTION

Introduction

Soilpollutionisdefinedas,—contaminationofsoilbyhumanandnaturalactivitieswhich may cause harmful effect on living organisms‖ .

Types,effectsandsourcesofsoilpollution

S.No	Pollutants	Sources	HealthEffects
1	Industrialwastes	Industrial pollutants are mainly discharged from various origins such as pulp and paper mills, chemical fertilizers, oil refineries, sugar factories, tanneries, textiles, steel, distilleries, fertilizers, pesticides, coal and mineral mining industries, drugs, glass, cement, petroleum and engineeringindustriesetc.	These pollutants affect and alterthe chemical and biological properties of soil. As a result, hazardous chemicals can enter into human food chain from the soil or water, disturb the biochemical process and finally lead to serious effects onliving organisms.
2	Urbanwastes	Plastics, glasses, metallic cans,fibers,paper, rubbers, street sweepings, fuel residues,leaves,containers, abandoned vehiclesand other discarded manufactured products.	Altertheconstitutionof soil Cause Water logging Cause biomagnifications of toxic materials through food chain
3	Agricultural practices	fertilizers, pesticides, weedicides, farm wastes, manure debris, soil erosion	Water logging, Salinisation, micronutrientimbalance, loss of fertile soil
4	Radioactive pollutants	Atomic reactor, nuclear radioactive devices, Explosion of hydrogen weapons andcosmic radiations	Mutations, changes functionsoflivingbeings, Biomagnifications, cancers, Infant mortality

5	Biologicalagents	The human and animal wastes, garbage, waste water	Variety ofdiseases Causenutrientimbalance
6	Pesticides	chlorinated hydrocarbon insecticide Organic phosphorous pesticides	Reduces the activity of sex hormones of male and female. Causes diseases to human beings.
7	Fertilizers	Different fertilizers discharge N, Na, K, S, Nitrates etc	The nitrate causes cancer, blue baby syndrome in infants.
8	Polymer, Plastics & other water	Waste from different sources	Biomagnifications, water logging, create cancersinanimals and human beings.

Controlmeasuresofsoilpollution

1. **Soil erosion can be controlled** byavarietyof forestryandfarmpractices. Ex: Planting trees on barrenslopes
2. Contour cultivation and strip cropping may be practiced instead of shifting cultivation
3. Terracingandbuildingdiversionchannelsmaybeundertaken.
4. Reducing deforestation and substituting chemical manures by animal wastes also helpsarrest soil erosion inthe long term.
5. **Proper dumping of unwanted materials:**Excess wastes by man and animals pose a disposal problem. Open dumping isthe most commonly practiced technique. Nowadays, controlled tipping is followed for solid waste disposal.Thesurfaceso obtainedisusedfor housingor sportsfield.
6. **Production of natural fertilizers**: Bio-pesticidesshouldbe used inplaceof toxic chemical pesticides. Organic fertilizers should be used in place of

synthesized chemical fertilizers. Ex: Organicwastes inanimal dung maybe

usedtopreparecompostmanureinsteadofthrowingthemwastefullyand polluting the soil.

7. **Properhygieniccondition**:Peopleshouldbetrainedregardingsanitary habits.

   Ex:Lavatoriesshouldbeequippedwithquickandeffectivedisposal methods.

8. **Publicawareness**:Informalandformalpublicawarenessprogramsshould be imparted to educate people on health hazards by environmental education.

   Ex:Massmedia,Educationalinstitutionsandvoluntaryagenciescan achieve this.

9. **Recycling and Reuse of wastes:** To minimize soil pollution,thewastes such as paper, plastics, metals, glasses, organics, petroleum products and industrialeffluents etc should berecycled andreused.

   Ex:Industrialwastesshouldbeproperlytreatedatsource.Integrated wastetreatmentmethodsshouldbeadopted.

10. **Ban on Toxic chemicals:** Ban should be imposed on chemicals and pesticides like DDT, BHC, etc which are fatal to plants and animals. Nuclear explosions andimproperdisposalof radioactivewastes shouldbe banned.

NOISEPOLLUTION

Introduction

Noise is defined as, "the unwanted, unpleasant or disagreeable sound that causes discomfort to all living beings". Sound intensity is measured in decibels (dB) , that is the tenthpartofthe longestunitBel.OnedB isthefaintestsoundthatahumanearcanhear.

Typesofnoise: Environmentalnoisehasbeendoublingeverytenyears.Noiseis classified as:

1. IndustrialNoise
2. TransportNoise
3. DomesticNoise

IndustrialNoise:

Itissoundwithahighintensitysoundcausedbyindustrymachines.Sources of such noise pollution are caused by machines from machines in various factories, industries and mills. Noise from mechanical saws and pneumatic drills isunbearable and a nuisance to the public.TheIndian Institute of Oto-Rino Laryngology, Chennai reported that increasing industrial pollution damages the hearing ability by at least 20%. Workers in steel industry, who work close to heavy industrial blower, are exposed to112dB foreighthours sufferfrom occupational pollution.

TransportNoise:

Transport noise mainly consists of traffic noise from road, rail and aircraft. The number of automobiles on roads like motors, scooters, cars, motor cycles, buses, trucks and diesel engine vehicles has increased enormouslyintherecent past further aggravating the problem of transport noise. Noise levels in most residential areas in metropolitan cities are hovering around the border line due to increased vehicular noise pollution. This highlevel of noise pollution leads to deafening in the elderly.

Domesticnoise:

This type of noise includes disturbance from household gadgets and community. Common sources of noise are musical instruments, TV, VCR, Radios, Transistors, Telephones, and loudspeakers etc. Statistically ever since the industrial revolution,noise inthe environmenthasbeendoubledeveryten years.

EffectsofNoisepollution

- Noisepollutionaffectsbothhumanandanimalhealth.Itleadsto:
    - contractionofbloodvessels
    - makingskinpale
    - Excessiveadrenalininthebloodstreamwhichisresponsiblefor high blood pressure.
    - Blaringsoundsareknowntocausementaldistress
    - Heartattacks,neurologicalproblems,birthdefectsandabortion
- Musclecontractionleadingtonervousbreakdown,tension, etc

- The adverse reactions are coupled with a change in hormone content of blood, which in-turn increases heart beat, constrictionof bloodvessels,digestive spams and dilation of the pupil ofthe eye.
- Adverse affects health, work efficiency and behavior. Noise pollution may cause damage to the heart, brain, kidneys, liver and may produce emotional disturbance.
- The most immediate and acute effect of noise is impairment of hearing that diminishes some part of the auditory system. Prolonged exposure to noise of certainfrequencypatternleadstochronicdamagetotheinnerear.
- Impulsivenoisemaycausepsychologicalandpathologicaldisorders
- Ultrasonicsoundcanaffectthedigestive,respiratory,cardiovascularsystemand semicircular canals of the internalear.
- Thebrainisadverselyaffectedbyloudandsuddennoisebyjetsandairplanes. Peoplearesubjected to psychiatricillness.
- Recentreportssuggestthatbloodisthickenedbyexcessivenoise.
- Theopticalsystemofhumanbeingsisalsoaffectedbynoisepollution.Severe noise pollution causes:
    - Popularly dilation
    - Impairmentofnightvisionand
    - Decreaseinrateofcolorperception

Controlmeasures:

1. **SOURCE CONTROL:** This includes source modification such as acoustic treatment to machine surface, design changes, limitingoperational timings, etc
2. **TRANSMISSION PATHINTERVENTION:** This includes containing the source inside a sound insulating enclosure, constructing a noise barrier or provision of soundabsorbingmaterials along thepath.
3. **RECEPTOR CONTROL:** This includes protection of thereceiverbyaltering the work schedule or provision of personal protection devices such as ear plugs for operating noisy machinery. The measure mayincludedissipation and deflection methods.
4. **OILING:**Properoilingwillreducenoisefromthemachine.

Preventivemeasures

1. Prescribingnoiselimitsforvehiculartraffic
2. Banonhonking(usageofhorns)incertainareas
3. Creationofsilencezonesnearschoolsandhospitals
4. Redesigningbuildingstomakethemnoiseproof
5. Reductionoftrafficdensityinresidentialareas
6. Givingpreferencetomasspublictransportsystem.

MARINEPOLLUTION

Introduction

Thedischargeofwastesubstancesintothesearesultinginharmtothelivingresources, hazardstothehumanhealthhindrancestothefisheryandimpairmentof qualityuseof seawater.

Sources

1. **Dumping the wastes:** Dumpingof untreatedwastesandsewagesintheoceans by coastal towns, citiesand industries.Rivers on the way tosea carryhugeamount of sewage garbage agricultural discharge pesticide heavy metals. Huge quantity of plastic dumped into thesea.
2. **Oil:** This isdischargedin to the sea as crudeoil andas separate fraction.Oil and it's fractions are used in houses automobiles and industries.Thiscauses devastation of marineenvironment
3. **Radioactivematerials**entertheoceanfromnuclearweapontesting.
4. **Toxics:** Toxic waste is the most harmful form of marine pollution. Once toxic wastes affects an organism it quickly passes along the food chain and as sea food which cause various problems.
5. **MarineDebris:**Garbagelikeplasticbags,ropesheliumballoons

Effectsofmarinepollution

1. Heavymetalsandorganicpollutantsdamagesbirdsbythinningof eggshells and tissue damage of egg.

2. Oilpollutioncausesdamagetomarineanimalsandplantsincludingalgae bird, fish etc.
3. Oilspillingintheseacausesabnormallowbodytemperatureinbirds resultinginhypothermia.DuringExxonValdezaccident150rarespeciesof baldeagles are affected by ingestedoil.
4. Oilfilmsareabletoretardtherateofoxygenuptakebywater.
5. Hydrocarbonandbenzpyreneaccumulateinfoodchainandconsumptionof fish by man may cause cancer.
6. Manymarinebirdsingest plasticthatcausesgastrointestinaldisorders.
7. Oil spills inhibit photosynthesis and the growth of planktons. Allaquatic animals depend either directly of indirectly on planktons the basis of tropic chain.

Controlofmarinepollution

- Natureandworldconservation unionsuggesttheprinciples
    1. Theindustrialunitonthecoastallinesshouldbeequippedwithpollution controlinstrument.
    2. Urbangrowthnearthecoastshouldberegulated.
- Methodsofremovalofoil
    1. Physicalmethods.
        - skimmingtheoiloffthesurfacewithsuctiondevice
        - Floating oil can be absorbed using absorbing materials like ploy urethane foam. Chopped straw and saw dust also used to absorbed oil from the sea water.
    2. Chemical methods like dispersion , emulsification and usingchemical additives are used to coagulatedthe oil

Protectivemethod

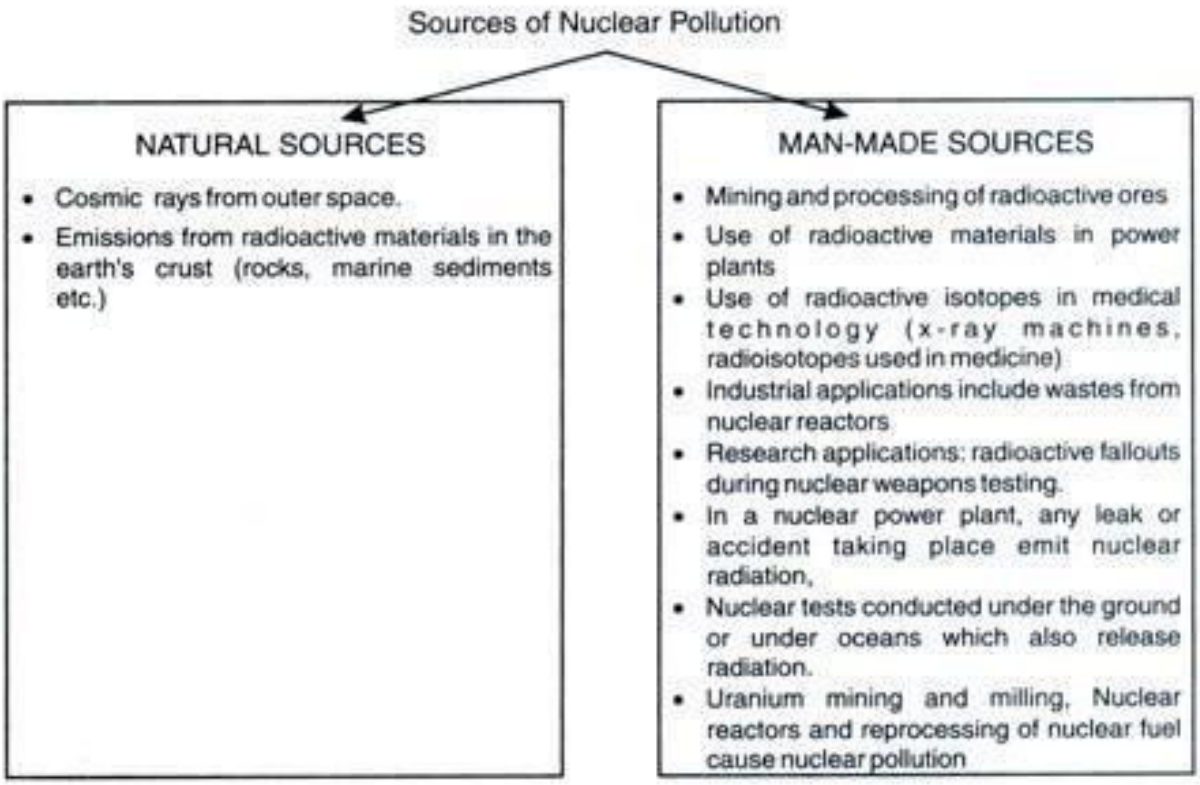
1. Municipalandindustrialwasteshouldbetreatedbeforedisposingintosea
2. Coastalwastearеperiodicallyanalyzedfordetectingpollutionlevel
3. Soilerosioninthecoastallandshouldbearrestedbesuitabletechniques
4. Recreation beaches should be maintained to meet hygienic and aesthetic standard.

NuclearPollution

Nuclearpollutionisthephysicalpollutionofair,waterandsoilbyradioactivematerials.

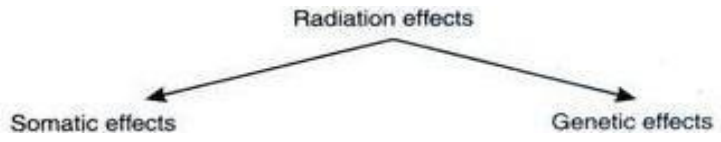
SourcesofNuclearPollution

Thesourcesofradioactivityincludebothnaturalandmanmade.



EffectsofNuclearPollution

Studieshaveshownthatthehealtheffectsduetoradiationaredependentonthelevelof dose,kindof radiation,duration of exposureandtypes of cellsirradiated.Radiation effects can be somatic or genetic.



1. **Somatic effects:** Somatic affects the function of cells and organs. It causes damagestocellmembranes, mitochondriaand cell nuclei resulting inabnormal cell functions, celldivision, growth and death.
2. **Genetic effects:** Genetic effects the future generations. Radiations can cause mutations, which are changes in genetic makeup of cells. These effects are mainly due to the damages to DNA molecules. People suffer from blood cancer and bone cancer if exposed to doses around100 to 1000 roentgens.

ManagementofRadioactiveWaste

- The radioactive waste which comes out from industry, nuclear reactors should be stored and allowed to decay either naturally in closed drums or invery largeundergroundair tight cemented tanks(Delayand Decay).
- The intermediateradioactive waste should be disposed off into the environment after diluting itwith some inert materials (Dilute and Disperse)
- Now-a-days small quantities of high activity wastes are convertedinto solids such as concrete and then it isburiedunderground or sea. (Concentrate and contain)

ControlMeasures

- Laboratory generated nuclear wastes should be disposed off safelyand scientifically.
- Nuclear power plants should be located in areas after careful study of the geology of the area, tectonic activity and meetingotherestablished conditions.
- Appropriateprotectionagainstoccupationalexposure.
- Leakage of radioactive elements from nuclear reactors, careless use of radioactive elements as fuel and careless handling ofradioactiveisotopes must be prevented.

- Safety measure against accidental release of radioactive elements must be ensured in nuclear plants.
- Unless absolutelynecessary, one shouldnot frequentlygo for diagnosis byx-rays.
- Regular monitoring of the presence of radioactive substance inhigh risk area should be ensured.
- Among the many options for waste disposal, the scientists prefer to bury the waste inhundreds of meters deep inthe earth's crust isconsidered to be the best safety long term option.

SOLIDWASTE MANAGEMENT

Introduction

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

Typesofsolidwastes

Dependingonthenatureoforigin,solidwastesareclassifiedinto

1. Urbanormunicipalwastes
2. Industrialwastes
3. Hazardous wastes

- **Sourcesofurbanwastes:**Domesticwastescontainingavarietyof materials thrown out from homes.
  Ex:Foodwaste,Cloth,Wastepaper,Glassbottles,Polythenebags,Waste metals, etc.
- **Commercialwastes:**Itincludeswastescomingoutfromshops, markets, hotels,offices,institutions,etc.
  Ex:Wastepaper,packagingmaterial,cans,bottle,polythenebags,etc.

- **Construction wastes:** It includes wastes of construction materials. Ex: Wood, Concrete, Debris,etc.
- **Biomedical wastes:** It includes mostly waste organic materials Ex: Anatomical wastes, Infectious wastes,etc.

CLASSIFICATIONOFURBANWASTES

urbanwastesareclassifiedinto:

- **Bio-degradablewastes**-Thosewastesthatcanbedegradedbymicroorganisms are called bio-degradable wastes
  Ex:Food,vegetables,tealeaves,dryleaves, etc.
- **Non-biodegradablewastes:**Urbansolidwastematerialsthatcannotbedegraded bymicroorganisms are callednon-biodegradable wastes.
  Ex:Polythenebags,scrapmaterials,glassbottles,etc.

SOURCESOFINDUSTRIALWASTES

- Themainsourceof industrialwastes ischemical industries,metalandmineral processing industries.
  Ex:Nuclearplants:Itgeneratedradioactivewastes
  - **Thermalpowerplants**:Itproducesflyashinlargequantities
  - **Chemical Industries**: It produces large quantities of hazardous and toxic materials.
  - **Other industries:** Other industries produce packing materials,rubbish, organic wastes, acid, alkali, scrap metals, rubber, plastic, paper, glass, wood, oils, paints, dyes, etc.

EFFECTOFIMPROPERSOLIDWASTEMANAGEMENT

1. Due to improper disposal of municipal solid waste on the roadsand immediate surroundings, biodegradable materials undergo decomposition producingfoul smell and become a breedinggroundfor diseasevectors.

2. Industrial solid wastes are the source for toxic metals and hazardous wastes that affect soilcharacteristicsandproductivityof soilswhen they aredumped on the soil
3. Toxic substances maypercolate into the ground and contaminate the groundwater.
4. Burning of industrial or domestic wastes (cans, pesticides,plastics, radioactive materials and batteries) produce furans, dioxinsand polychlorinatedbiphenylsthat areharmfulto human beings.
5. Solid waste management involves waste generation, mode of collection, transportation,segregation of wastes and disposal techniques.

STEPSINVOLVEDINSOLIDWASTEMANAGEMENT

Twoimportantsteps involvedinsolid waste managementare- Reduce,ReuseandRecycle of Raw Materials

1. **Discardingwastes**
   - Reduce - Ifusage of raw materials isreduced, the generation of waste also gets reduced.
   - Reuse - Refillable containers that are discarded after usecanbe reused. Rubber rings can be made from discarded cycle tubes and this reduceswastegenerationduringmanufactureof rubberbands.

2. Recycle- Recycling is the reprocessing of discarded materials into new useful products

   Ex: Old aluminumcans and glassbottlesare melted and recast intonew cans and bottles, preparation of cellulose insulation from paper,Preparation ofautomobilebodyandconstructionmaterialfromsteelcans This method (**Reduce, Reuse & Recycle**), i.e, **3R's** help savemoney, energy,rawmaterialsandreducespollution.

Discardingwastes

Thefollowingmethodsareadoptedfordiscardingwastes:

1. Landfill
2. Incineration and
3. Composting

1. LANDFILL: Solidwastesareplacedinasanitarylandfillinwhichalternatelayersof 80 cmthickrefuseiscoveredwithselectedearth-fillof 20cmthickness.After2-3yearssolid wastevolumeshrinksby25-30%andlandisusedfor parks,roadsandsmallbuildings. Thisisthemost commonandcheapestmethodof wastedisposalandismostlyemployed in Indian cities.

Advantages:

1. Itissimpleandeconomical
2. Segregationofwastesisnotrequired
3. Landfilledareascanbereclaimedandusedforotherpurposes
4. Convertslow-lying,marshywaste-landintousefulareas.
5. Naturalresources arereturnedtosoilandrecycled.

Disadvantages:

1. Largeareaisrequired
2. Landavailabilityisawayfromthetown,transportationcostsarehigh
3. Leadstobadodor,iflandfillisnotproperlymanaged.
4. Landfilledareaswillbesourcesof mosquitoesandfliesrequiringapplicationof insecticidesandpesticidesatregular intervals.
5. Causesfirehazardduetoformationof methaneinwetweather.

2. INCINERATION:

- It is a hygienic way of disposing solid waste. It is suitable if waste contains more hazardous material and organic content. It is a thermal process and very effective for detoxification of all combustible pathogens. It is expensive when compared to composting or land-filling.
- In this method municipal solid wastes are burnt in a furnace called incinerator. Combustible substances such as rubbish, garbage, dead organisms and non-combustible matter such as glass, porcelain and metals areseparatedbefore feeding to incinerators.

- The non-combustible materials can be left out for recycling and reuse. The leftover ashes andclinkersmay account for about10to20% which need further disposal by sanitary landfill or some othermeans.
- The heat produced in the incinerator during burning of refuse isused inthe form of steampowerfor generationof electricitythroughturbines.
- Municipal solid waste is generally wet and has a high calorificvalue. Therefore,it has to be dried first before burning. Waste is dried in a preheated from where it is taken to a large incinerating furnace called "destructor" which can incinerate about 100 to 150 tons per hour.
- Temperature normally maintained in a combustion chamber is about 700 C which maybeincreasedto1000Cwhen electricityisto begenerated.

ADVANTAGES:

1. Residueisonly20-25%oftheoriginalandcanbeusedasclinkeraftertreatment
2. Requiresverylittlespace
3. Costoftransportationisnothighiftheincineratorislocatedwithincitylimits
4. Safestfromhygienicpointofview
5. Anincineratorplantof3000tonsperdaycapacitycangenerate3MWofpower.

DISADVANTAGES:

1. Itscapitalandoperatingcostishigh.
2. Operationneedsskilledpersonnel.
3. Formationof smoke,dustandashesneedsfurtherdisposalandthatmaycauseair pollution.

3. COMPOSTING: Itisanother popularmethod practicedinmany citiesinour country. In this method, bulk organic waste isconverted into fertilizer by biological action. Separated compostable waste is dumped in underground trenches in layers of 1.5m and finally covered with earth of 20cm and left for decomposition. Sometimes, Actionmycetes are introduced for active decomposition. Within 2 to 3 days, biologicalactionstarts. Organic matter is destroyed by actinomycetes and lot of heat is liberated increasing the temperature of compostby75Candtherefuseisfinallyconverted intopowderybrown

colored odorless mass called humus that has a fertilizing value and can be used in agriculture. Humus contains lot of Nitrogen essential for plantgrowth apart from phosphates and other minerals.

ADVANTAGES:

1. Manureaddedtosoilincreaseswaterretentionandion-exchangecapacityofsoil.
2. Thismethodcanbeusedtotreatseveralindustrialsolid wastes.
3. Manurecanbesoldtherebyreducingcostofdisposingwastes
4. Recyclingcanbedone

DISADVANTAGES:

1. Non-consumableshavetobedisposedseparately
2. Thetechnologyhasnotcaught-upwiththefarmersandhencedoesnothavean assured market.

DISASTERMANAGEMENT

FLOODS

Increased rainfall or rapid snow melting causes more flow of water in the streams. This excess water flow in a stream covering the adjacent land is called a flood. Floodplain is defined in terms of a flood frequency. Flood frequency is referred as 10 -year flood, 100-year flood, etc. A 10-year flood at any point in a stream is that discharge of water which may be expected to occur on average once in 10 years. Floodplains are genera lly fertile, flat and easily formed.

CAUSESOFFLOOD

- Constructionofbuildingsinafloodplain
- Removingvegetation
- Pavingroadsandparkingareas
- Deforestation
- Heavyrainfall
- Urbanization

- Earthquakes

Effectsofflood

- Erosionoftopsoilandvegetation
- Damageandlosstoland,houseandproperty
- Spreadofendemicwaterbornediseases
- Interruptionofbasicfacilitiesofcommunitysuchashighways,railways, telephone,electricityandday-to-day essentials
- Siltingofreservoirsanddams
- FLOODCONTROL
- Constructionoffloodcontroldam
- Deepening,wideningandstraighteningofstreams
- Liningofstreams
- Banningofconstructionofbuildingsinfloodplains
- Convertingflood-plainsintowildlifehabitat,parks,andrecreationareas.

LANDSLIDES

- Landslides occur when mass of earth material move downward. It isalsocalled mass wasting or mass movement.
- sudden landslide occurs when unconsolidatedsedimentsof a hillsidearesaturated by rainfall or waterlogging.
- Many landslides take place in coincidence with earthquakes.Themostcommon form of landslides isearthquake induced landslidesor morespecificallyrockfalls and slidesof rock fragmentsthat formon steepslopes.
- The size of area affected by earthquake induced landslidesdependso n the magnitude of the earthquake, its focal depth,the topography andgeologic conditions near the causativefault, the amplitude, frequency, composition and duration of groundshaking.

Controlmeasuresforlandslides

- Avoidconstructionactivityinlandslideoccurringareas.
- Reducingslopeofhillyside
- Stabilizingtheslopeportion
- Increasingplantationofdeeprootedvegetationontheslope.

EARTHQUAKES

- Anearthquakeoccurswhenrocksbreakandslipalongafaultintheearth. Earthquakesoccurduetodeformationofcrustanduppermantleoftheearth.
- Duetoheatingandcoolingoftherockbelowtheseplates,movementofadjacently overlying plates and great stresses, deformationoccurs.
- Tremendousenergycansbuild-upbetweenneighboringplates.
- Ifaccumulatedstressexceedsthestrengthoftherocks,therocksbreaksuddenly releasingthe stored energyas an earthquake.
- Theearthquakereleasesenergyintheformofwavesthatradiatefromthe epicenter in all directions.
- The'p'waveorprimarywavealternatelycompressesandexpandsmaterialinthe same direction itistravelling.
- Thiswavecanmovethroughsolidrocksandfluids.
- These are the fastest waves. The iswave or secondary waveisslower and shake the ground up, down, back and forth perpendicular to the direction in which it is travelling.Surface waves followboth the 'P' and 'S' waves.
- The magnitude of an earthquake is measured in Richter scale. The Richter scale is logarithmic.

Effectsofearthquake

- Groundshaking
- Liquefactionofground
- Grounddisplacement
- Landslides
- Flood
- Fire

- Tsunami

Controlofearthquake

- Thereisvirtuallynotechniquetocontroltheoccurrenceofearthquake.However, certainpreventivemeasures can be taken to minimize the damage.
- Minimizingdevelopmentactivity(especiallyconstruction,mining,constructionof dams and reservoirs) inareas known tobe active seismic zones.
- Continuouslymonitoringseismicactivityusing'seismographs'andalertingpeople regarding any recorded disturbance in advance.

UNITVI SOCIALISSUESANDTHEENVIRONMENT

From Unsustainable To Sustainable Development – Urban Problems Related To energy– Water conservation, Rain Water Harvesting, Watershed Management – Resettlement and Rehabilitation of People, Its Problems and Concerns, Case Studies – Environmental Ethics:-Issues and Possible Solutions – Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust, Case Studies – Wasteland Reclamation – Consumerism and Waste Products – Environment Production Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and Control of Pollution) Act–Wildlife Protection Act – Forest Conservation Act – Issues Involvedin enforcement of Environmental Legislation – PublicAwareness.

Chapter6-SOCIALISSUESANDENVIRONMENT

Introduction:

FromUnsustainabletoSustainableDevelopment

Man ispartof the natureandhe isbound to obey the lawsof nature.He dependson his environment for basic things. More developmental activities are adopted in orderto increasethequalityof life.For that heuses the availableresources. TheEarthhaslimited supply of resources and renewable resources. These are to be managed in a scientific manner for availing the generations to come. Hence developmental activities are to be taken with more care about the environment and its protection. It brings benefitstoall notonlytothepresentgenerationbutalsofor futuregenerations.

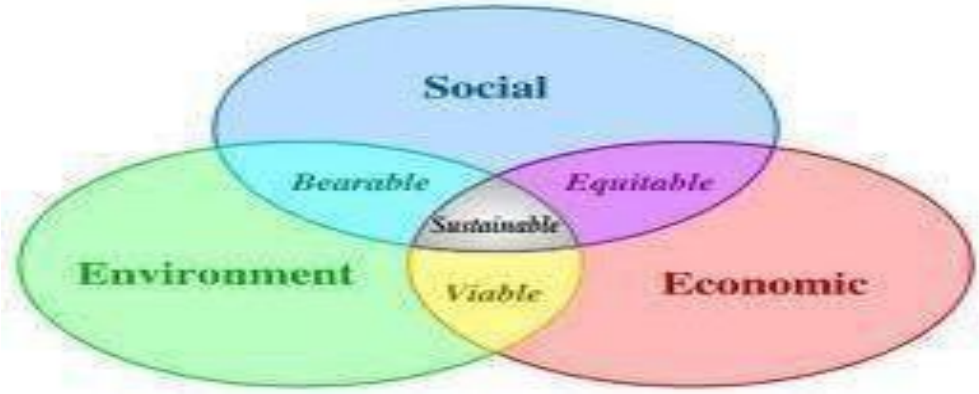
Sustainabledevelopment:Meetingtheneedsofthepresentwithoutcompromisingthe ability of future generation to meet their own needs.

ImportantcomponentsofSustainabledevelopment:

1. Economicdevelopment

2. Communitydevelopment

3. Environmentalprotection



True sustainable development aims at optimum use of natural resources with high degree of reusability, minimum wastage, least generation of toxic by-products and maximum productivity. Aspects of sustainable development:

Intergenerationalequity-Itstatesstatweshouldhandoverasafe,healthyand resourceful environment to future generation.

Intragenerationalequity:
Atechnologicaldevelopmentofrichcountriesshouldsupporttheeconomicgrowthof poorcountriesandhelpinnarrowingthewealthgapandleadtosustainability.

Approachesforsustainabledevelopment:

1. Devlopingappropriate technology-technology which islocallyadoptable,ecofriendly, resource efficient and culturally suitable should be adopted. It uses local labour, less resources and produces minimum waste.
2. Reduce ,Reuse and Recycle (3Rapproach) –Optimum use of natural resources using it againandagain instead of throwingiton wastelandor water andrecyclingthematerial into furtherproducts.Itreduceswaste generationand pollution.
3. Providing environmental education and awareness-Thinking and attitude of people towards earth and environment should be changed by providing environmental awareness and education.
4. Consumptionofrenewableresources-Itisveryimportanttoconsumethenatural resourcesinsuchawaythattheconsumptionshouldnotexceedtheregeneration capacity.
5. Non-renewableresourcesshouldbeconservedbyrecyclingandreusing.
6. Bypopulationcontrolwecanmakesustainabledevelopment.

Urbanproblemsrelatedtoenergy:

Urbanization–Movementofhumanpopulationfromrural;areastourbanareasfor want of better education, communication, health, employment etc.

Causes:

Citiesarethemaincentersofeconomicgrowth,tradetransportation,medical facilities and employment.

Urbansprawl:

The phenomenon of spreading of the cities in to sub-urban or rural areas is called urban sprawl. Urban growth is so fast and is difficult to accommodate all commercial industrial residential and educational facilities within the limited area.

Energydemandingactivities:

Urban people consume lot of energy and materials incomparison with ruralpeople. This is because urban people have high standard of life andtheir lifestyledemand more energy.

Examplesforenergydemands:

1. Residentialandcommerciallightings.
2. Industriesusinglargeproportionofenergy.
3. Usageoffansfridge,A.C,washingmachines.

Controlandpreventionofpollutiontechnologiesneedmore
energy.

Solutionforurbanenergyproblems:

1. Energyconsumptionmustbeminimizedinallaspects.
2. Publictransportationshouldbeusedinsteadofmotorcyclesandcars.
3. Usingofsolarenergyandwindenergy.
4. Productioncapacitymustbeincreased.

WATERCONSERVATION

The original source of water is precipitation from the atmosphere. The water available on the earth may occur in all three stages as gas, liquid or solid. Temperature is the main factor indecidingthe state of water. As a liquid,the water formshydrosphere.About75% of the Earth'ssurfaceiscovered bythe hydrosphere.
Theprocessofsavingwaterforfutureutilizationiscalledconservationofwater.

<u>Needforwaterconservation</u>.

1. Betterlifestylerequiresmorefreshwater.
2. AgricultureandIndustrialactivitiesrequiremorefreshwater.
3. Asthepopulationincreasestherequirementofwaterisalsomore .

Strategiesofwater conservation

Reducingevaporationlosses

Evaporationofwaterinhumidregionscanbereducedbyplacinghorizontal Barriers of asphalt below the soil surface.

Reducingirrigationlosses

Sprinkling and irrigation conserves water by 30- 40%. Irrigation in earlymorning (or) later evening reduces evaporation losses. Growing hybrid crop varieties also conserve water.

Reuseofwater

Treatedwastewatercanbereusedforirrigation.Waterfromwashings,bathroomsetc. can be used for washing cars,gardening.

Preventingofwastageofwater

Closingthetapswhennotinuseandrepairinganyleakagefrompipes.

Decreasingrunofflosses

Runoff,onmostofthesoilscanbereducedbyusingcontourcultivation (or)
Terrace farming.

Avoiddischargeofsewage

Disposalintonaturalwaterresourcesshouldbeavoided

Methodsofwater conservation

RainwaterHarvestingandWatershedmanagement

It means capturing rain where it falls or capturing the run offinyour own villageor town. And taking measures tokeep that water clean bynot allowing polluting activities to take place inthe catchment.

Therefore,waterharvestingcanbeundertakenthroughavarietyofways Capturing runoff from rooftops

- Capturingrunofffromlocalcatchments
- Capturingseasonalfloodwatersfromlocal streams
- Conservingwaterthroughwatershedmanagement

Thesetechniquescanservethefollowingthefollowingpurposes: Provide

- drinking water
- Provide irrigation water
- Increase groundwaterrecharge
- Reducestormwaterdischarges,urbanfloodsandoverloadingofsewagetreatmentplants

In general, water harvesting isthe activity of direct collection ofrainwater.The rainwater collected can be storedfor direct use or can be recharged into the groundwater. Rain is the first form of water that we know inthehydrological cycle, hence is a primary source of water for us. Rivers, lakes and groundwater are all secondary sources of water. In present times, we depend entirely on such secondary sources of water. In the process, it is forgotten that rainistheultimate source that feeds all these secondary sources and remain ignorant of its value. Water harvesting means to understand the value of rain, and to make optimumuse of the rainwater at the place where it falls.

Rainwater harvesting. Itisa techniqueof collectingandstoringrainwater for use in non-monsoon periods. In the present age, concrete houses,well-builtroads, footpaths and well –concreted courtyards have leftfew open grounds. With the decrease in natural forest cover, increase in concrete jungles and the decrease in exposed earth; very littleopen ground isleftfor water to soak inand thereby increase the ground water table. So, artificial recharging of the ground water is extremely essential. It is done through rainwater harvesting.For the purpose,rainwater iscollected at theroof top or in an open well and then carried down for immediate use or it is directedintothe aquifer.

Rainwaterharvestingtechniques

Therearetwomaintechniquesforrainwaterharvesting:

1. Storageof rainwateronthesurfaceforfutureuse
2. Rechargeofgroundwater

Recharge of ground water is a recent concept and the structures used for thepurpose are:

- Pits
- Trenches

- Dug wells
- Hand pumps
- Recharge shaft
- Lateralshaftswithborewells •

Spreading technique

Objectivesofrainwaterharvesting.

1. Toraisethewatertablebyrechargingthegroundwater.
2. Tominimizewatercrisesandwaterconflicts
3. Toreducerainwaterrunoffandsoilerosion.
4. Toreducethegroundwatercontaminationfromintrusionofsalinewater

Conceptofrainwaterharvesting

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

Methodofrainwaterharvesting

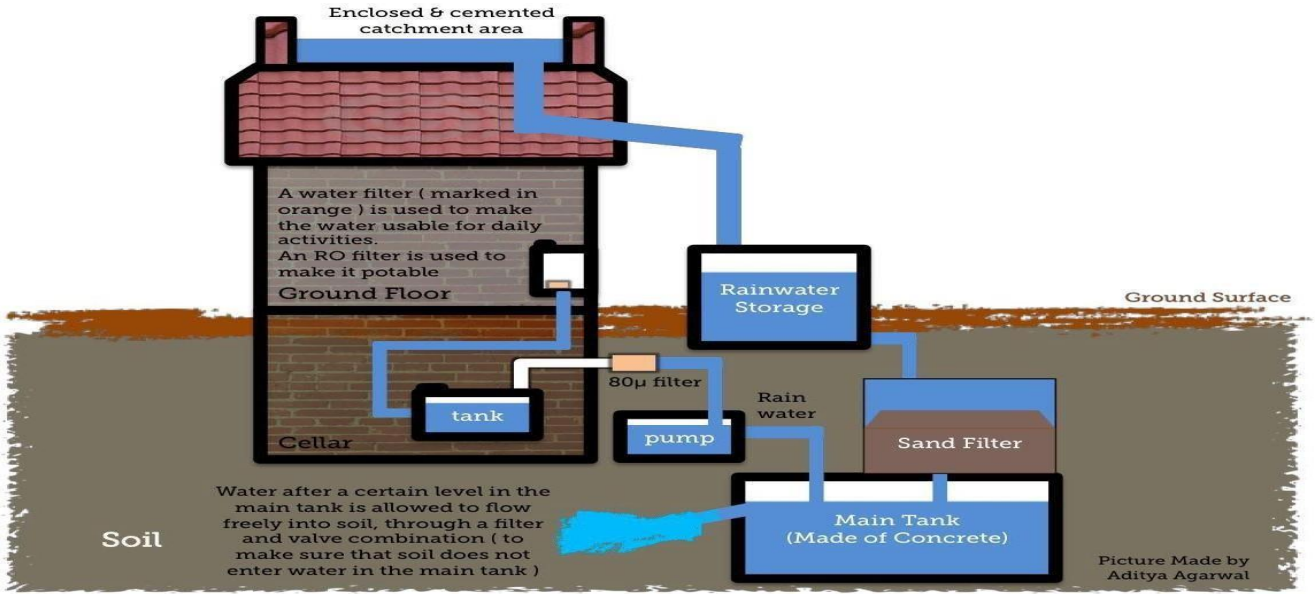
1. Rooftopmethod:collectingrainwaterfromroofofthebuildingandstoringinthe ground.Itisthelowcostandeffectivetechniqueforurbanhousesandbuildings.

2. The rain water from roofs, road surfaces, play grounds is diverted into the surface tank or recharge pits. The pit base is filled with stones and sand which serves as a

Advantages:

Rise ingroundwaterlevelandminimizingthesoilerosionandfloodHazards.Scarcityof water is reduced.

Rainwater harvesting systems channel rainwater that falls on toa roof into storage via a system of gutters and pipes. The first flush of rainwater after a dry season should be allowed to run to waste as it will be contaminated with dust, bird droppings etc. Roof gutters should have sufficient incline to avoid standing water. They must bestrong enough, and large enough to carry peak flows. Storage tanks should becovered to prevent mosquito breeding and to reduce evaporation losses, contamination and algal growth. Rainwater harvesting systems require regular maintenance and cleaning to keep the system hygienic.



WATERSHEDMANAGEMENT

Watershed(or)drainagebasin:Itisdefinedaslandareafromwhichwaterdrains under the influence of gravity into stream, lake, reservoir (or) other body of surface water. Watershed management of rain fall and resultant run off is called watershed management.

Factorsaffectingwatershed:

1. Overgrazing.deforestation,mining,constructionactivitiesaffectanddegrade watershed.
2. Droughtyclimatealsoaffectsthewatershed.

Needorobjectivesofwatershedmanagement

1. Toraisethegroundwaterlevel.

2. Toprotectthesoilfromerosionbyrunoff.

3. Tominimizetherisksoffloods,droughtandlandslides.

4. Togeneratehugeemploymentopportunitiesinbackwardrainfedareas to ensure securityfor livelihood.

Watershedmanagementtechniques

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

Farmpondcanbebuilttoimprovewaterstoragecapacityofthecatchment'sarea.

Maintenanceofwatershed

Waterharvesting:Properstorageof waterinwatershedcanbeusedin dry season Inlow rainfall areas.

Afforestation and agro-forestry help to prevent soil erosion and retention of moisture in watershedareas

Reducingsoilerosion:Terracing,contourcroppingminimizesoilerosionandrunoff on the slopes of watersheds

Scientific mining and quarrying minimize the destructive effect of mining in water shed areas **Public participation** is essential for water shed management. People should be motivated for maintainingwater harvestingstructures implemented by the government.

RESETTLEMENT& REHABILITATION

Based on the resettlement schemes proposed by each affected village and present policies, laws and regulations of different levels of governments and the resettlement requirementsof ADB,the Resettlement Planof LaudingExpressway Projectwas prepared by PPTA consulting team and the staff from NPAEC under GPCD assisted bydesign institute and Local County and townshipgovernments.

TargetandTask

The overall objective of resettlement and rehabilitation is to ensure that the affected production base will be restored, the affected labor force will be re-employed, and income and livelihood of affected people will be improved or at least restored to their previous levels before resettlement.

At present, the rural population of project impact area is mainly engaged in agricultural actives, with most of their income coming from planting, economic trees, and animal husbandry. According to the actual production and living standard among affected villages, and the approved economic and social development plans for the relevant counties, the target of

Resettlementandrehabilitationissetasfollows:

(1) Theresettle'sgrainproductionlevelwillbeself-sufficientafterresettlement.

(2) Theincomepercapitashallberecoveredtothestandardbeforeresettlement.

(3) The affected public infrastructures,school, hospitals, social welfare level, natural environment and traffic condition etc. shall be improved after resettlement.

ResettlementTask

In 2005, there were 2,829 households with 13,149 persons to be resettled or rehabilitated,inwhich520householdsand2,352personswillneedhouserelocation.

The basic resettlement policy of Lauding Expressway Project is to respect the wishes of affected People and maintain their current production and living traditions. Based on consultation of local affected peoples, the economic rehabilitation will be based on developing replaced farming Resources within their own townships andvillages.Planting will be the focus of economic Rehabilitation strategy by developing new farmland and improving the remainingfarmland in the affected villages, and supplemented by developing various other income generation opportunities in the project areas. In other words, the resettlement and rehabilitation strategy will first to reestablish the physical production bases for the affected persons, which will provide a long-term development potential by fully utilizing local land resources.

ResettlementPrinciple

Undersuchpolicy,anumberofresettlementandrehabilitation principleshavebeen developed for the Project.

(1) The resettlement plan will be based on detailed inventory for land acquisition and houses Demolition, and adopted compensation standards and subsidies.

(2) The resettlement shall be combinedwith the local development, resource utilization and Economic growth as well as environment protection. Considering the local conditions, a Practical and feasibleresettlementplan should be developed to restore or improve theirEconomic production and create basic conditions for long-term development.

OverallSchemeofResettlement

Since the construction of Lauding Expressway Project will only acquire limited land acquisition and demolition along the road alignment line, it will not have significant negative impacts on production and livelihood for most affected villages. A series of consultation meetings were held among affected villagesandtownships. Accordingto the resettle's opinion and suggestion, and combinedwith the actual condition of affected area, thebasicrehabilitationscheme was determinedasfollows:

(1) Project affected persons will be resettled within their original villages and village groups, so

that their way of production, livingandsocial relationshipcan be maintained, which will be beneficial for them to restore or improve their production and income level after resettlement.

(2) In order to reduce the impacts on the production and livelihood among resettle's, the demolished houses will be dismantled after the new housesbuilt.The reconstruction of houses will adopt two approaches. For mostrelocated households, they will choose to rebuild their houses by themselves, and all salvage materials will belong to them. The second approach isfor those who livenear towns, their rehabilitation will be carried out by local government in order to promote small town development and save farmland.

(3) The rural relocated households will be resettled in theiroriginal villages. For those who lose

Some farmland, the land-based rehabilitation will be adopted with a combination of developing new farmland, redistributing remaining farmland and receiving their share of resettlement subsidy among affected village groups.

EnvironmentalEthics

Itrefersto issues,principlesandguidelinesrelatedto humaninteractions with their Environment. **(OR)**

Ethicsisabranchofphilosophy.Itdealswithmoralsandvalues.Anethicisa principle or value that we use to decide whether an action is good or bad.

Ethicsdiffersfromcountrytocountry.

FunctionsofEnvironment:

1.Itmoderatesclimateconditionsofthesoil.

2 A healthy economy depends on healthy environment.3Itisthelifesupportingmediumfor all organisms.

3. Itprovidesfood,air,waterandotherimportantnaturalresourcestothehuman beings Environmental problems : Deforestation activities , population growth and urbanization water Pollution due to effluents and smoke from industries, Scarcity.

Solutiontoenvironmentalproblems:

Reducethewastematterandenergyresources.

Recycleandreuseasmanyofourwasteproduct Andresourcesas possible.
Avoid over exploitation of natural resources.

MinimsesoildegradationandProtectthebiodiversityoftheearth.Reducepopulationand increase the economic growth our country.

Ethicalguidelinesonenvironmentalprotection:

1. Theearthisthehabitatofallllivingspeciesandnotofhumanbeingsalone.
2. Naturalresourcesandenergiesaredepletingfast.Wemustprotectthem.
3. Involveyourselfinthecareoftheearthandexperiencenature.
4. Respectnature,youareapartofit.
5. Thinkoftheglobalcauseandactforlocalprotection
6. Keepyourselfinformedaboutecologicalchangesanddevelopments.
7. Observeausterity,reservescarceresourcesforthefutureandthefuturegenerations.
8. Wemustbecooperative,honest,affectionateandpolitetosocietyandnature.

CLIMATE:

Itisthe average weather of an area. Itisthe general weather condition,seasonal variationsoftheregion.Theaverageofsuchconditionsforalongperiodiscalledclimate.

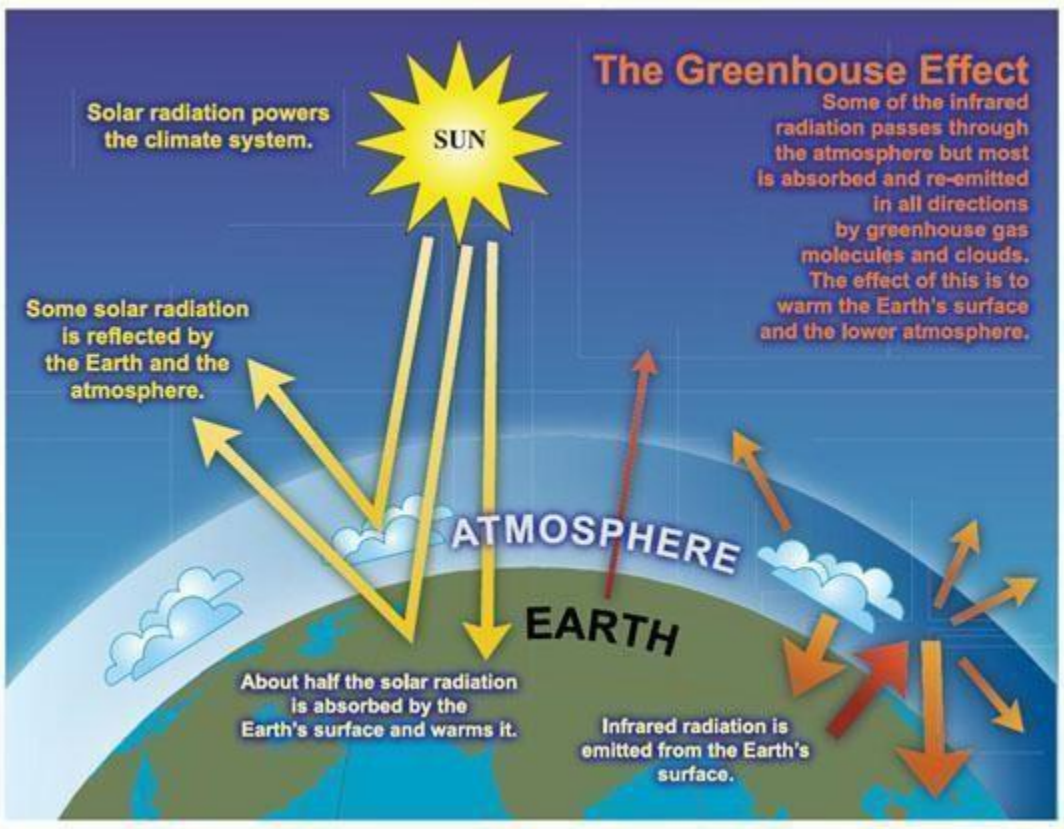
Causesofclimatechanges:

1. PresenceofgreenhousegasesintheatmosphereIncreasesthe globaltemperature.
2. Depletionofozonelayerincreasestheglobaltemperature.

Effectsofclimatechange:

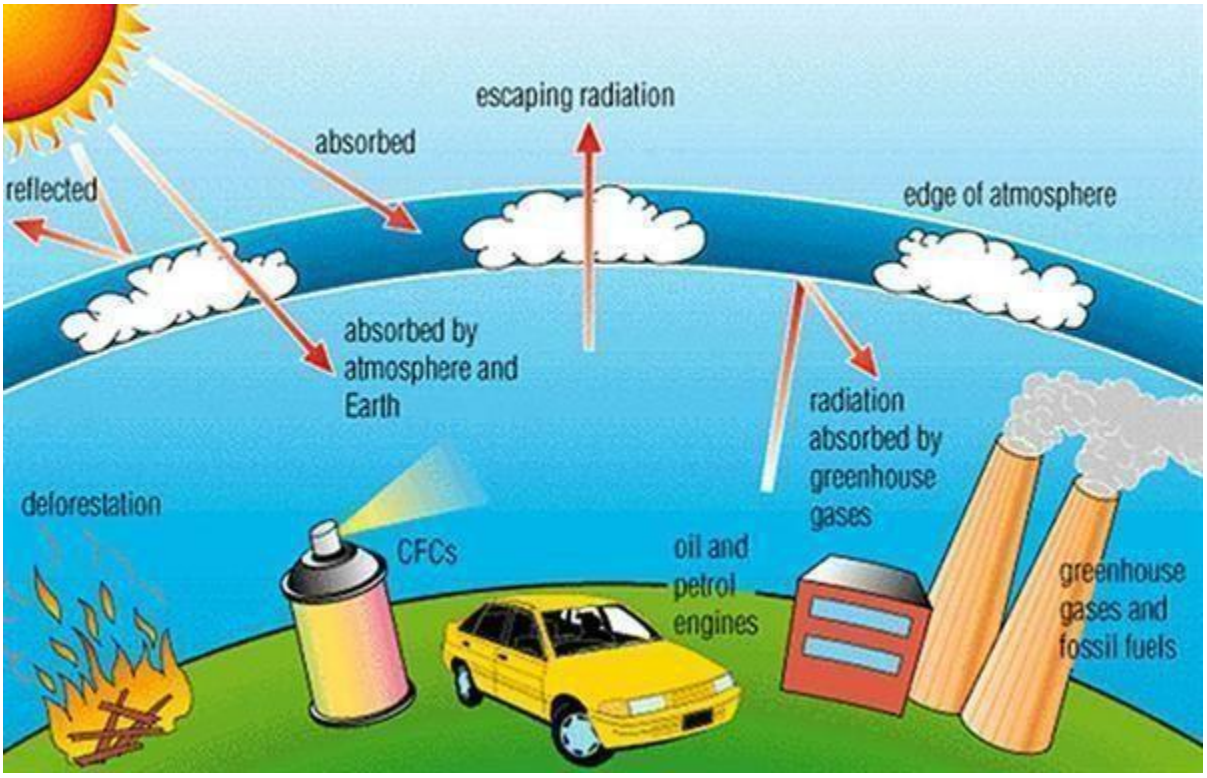
1. SmallclimatechangesdisturbagriculturewhichleadsTomigrationof animals and human.
2. Climatechangemayupsethydrologicalcyclewhichresultsinfloodsand droughts in different parts of the world.
3. Globalpatternofwindsandoceanscurrentsalsogetsdisturbedbyclimatechange.

Greenhouseeffect: GreenhousegasesareCO_2,Methane.NitrousoxideNO_2,CFC Among these CO_2 is the most important green house gas.O_3 and SO_2 act as serious pollutants causing global warming.Progrssive warming upof a gas surface due to blanketing effect of man made CO2atmosphere.



GLOBALWARMING:

Green house gases in the atmosphere are transparent to light but absorbIRradiation. These gases allow sunlight to penetrate the atmosphere and are absorbed by the earth surface. This sunlight is radiated back as IR which is absorbed by gases. As a resultthe earthsurfaceandloweratmospherebecomeswarm.Thisiscalled globalwarming.



EFFECTSOFGLOBALWARMING:

1. Sealevelincreasesasresultofmeltingandthermalexpansionofocean.

2. HighCO2levelintheatmospherehavealongtermnegativeeffecton cropproduction and forest growth.

3. Globalrainfallpatternwillchange.Droughtandfloodswillbecomemorecommon. Raisingtemperature willincreasedomesticwater demand.

4. Manyplantsandanimalspecieswillhaveaproblemof adapting.Manywillbeattherisk of extinction,more toweringverities willthrive.

5. Astheearthbecomeswarmerthefloodsanddroughtbecomesmorefrequent.There would be increase inwater-borne diseases.

MEASURESTOCHECKGLOBALWARMING:

1. CO2emissioncanbecutbyreducingtheuseof fossilfuel.
2. Plantmoretrees.
3. Shiftingfromcoaltonaturalgas.
4. Stabilizepopulationgrowth.
5. RemoveefficientlyCO2fromsmokestocks.
6. RemovalatmosphericCO2byutilizingphotosyntheticalgae.

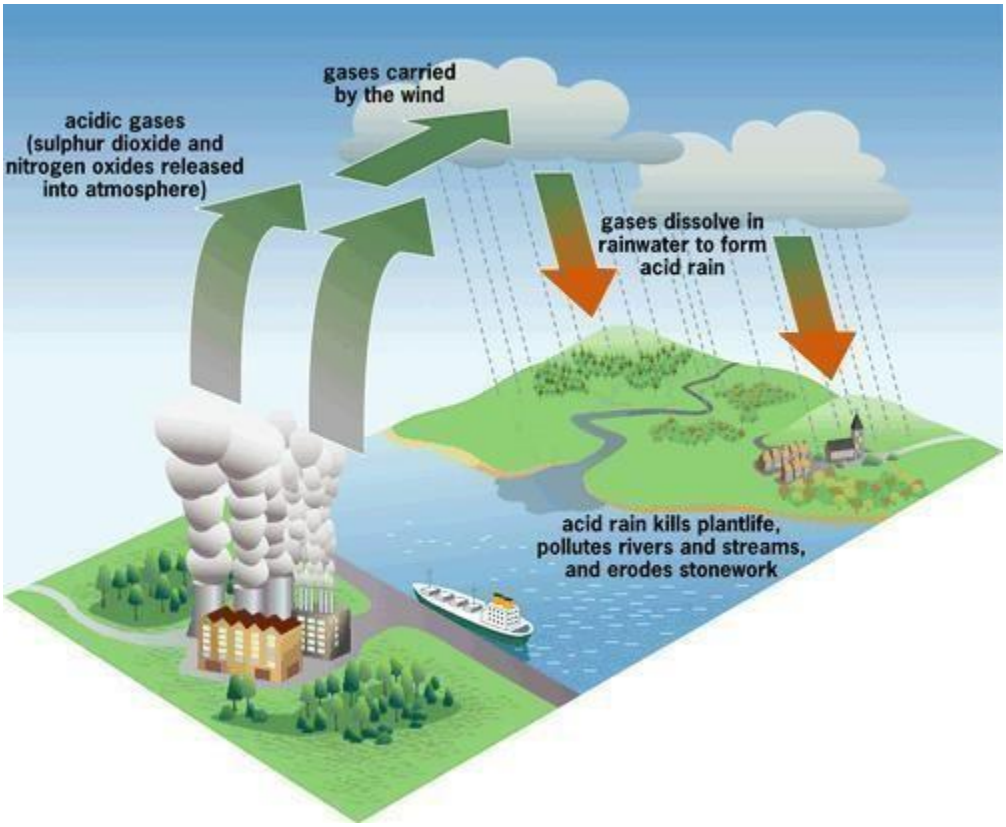
ACIDRAIN:

Normal rain water is always slightly acidic (pH 5-5.6) because of Co_2 present in the atmosphere gets dissolved init. Because presence of $SO_2$and NO_2gasesas pollutantsin theatmosphere.ThepHof therainisfurtherlowered. Thistype of precipitationof water is called acid rain.

Formation:

Acid rain means the presence of excessive acids in the rainwater. Thethermal power plants industries and vehicles release NO_2 and SO_2 in totheatmosphereduetothe burning of coal and oil. These gases reacts with water vapor in the atmosphere and from acids like HNO_3 ,$H2SO_4$ .These acids descends on to the earth as acid rain through rain water.

$SO_x + H_2O \rightarrow H_2SO_4$ NO_y
$+ H_2O \rightarrow HNO_3$



EFFECTS:

Effectonhumanbeing:

Humannervoussystemrespiratorysystemanddigestivesystemareaffectedbyacid rain.Itcauseprematuredeathfromheartandlungdisorderlikeasthma,bronchitis.

On building:

AtpresentTajmMahalinAgraissufferingduetoSO2andH2SO4fumesfromMadura refinery.Acidraincorrodeshouses,monuments,statues,bridgesandfences.

Acidraincausescorrosionofmetals.

TerestrialandlakeEcosystem.

Reducetherateofphotosynthesisandgrowthinterrestrialvegetation.

Acid rain retards the growth of crops like beans potatoe ,carrot ,spinach. Acid rain rduces fish population ,black flies,mosquitoes ,deer flies occurs largely which causes number of complications in ponds rivers and lakes.

Activity of bacteria and other microscopic animals is reduced in acidic water. The dead materials are not rapidly decomposed.Hence the nutrients like N,P are locked up in dead matter.

Controlofacidrain:

EmmisionofNo2andSO2fromindustriesfrompowerplantsshouldbereducedbyusing pollution control equipments.

Limingof lakesnadsoilsshouldbedonetocorrecttheadverseeffectof acidrain.In thermal points low sulphurcontent coal should beused.

OZONELAYERDEPLETION

Ozonegasispresentintheatmosphere.Itishighlyconcentratedatthestratosphere Between10to 50 Km above the sea level and is called as ozone layer.

Importance: O_3 protects us from damaging UV radiation of the sun. It filters UV- B radiation. Now days certain parts of O_3 layer is becoming thinner and O_3holesare formed. Because of this more UV–B radiation reaches the earth's surface. UV –B radiation affectsDNAmolecules,causesdamagestotheoutercellof plantsandanimals.

Itcausesskincancerandeyediseaseinhumanbeings.

Formation of O_3: It is formed in the atmosphere by photochemical reaction

$O_2 + hv$ ----------)$O^* + O^*$

The atomic oxygen reacts with molecular O_2 to form O_3

$O^* + O_2 + M$ ----------) $O_3 + M$

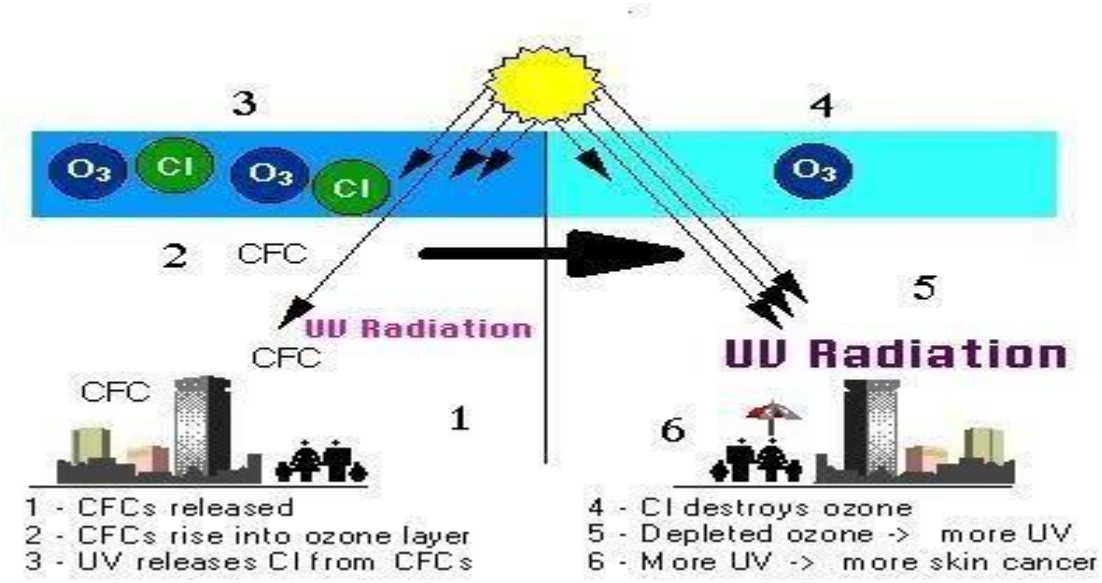
Where M = third body like nitrogen.

Causes of O_3 layer depletion : Refrigerators , air conditioners , aerosol sprays and cleaning solvents release CFCs into the atmosphere. CFCs releases chlorine which breakes O_3 to O_2

$Cl + O_3$ ----------)$ClO + O_2$(g) ClO
$+ O^*$----------) $Cl + O_2$

Each chlorine atom is capable of breaking several O_3 molecules. It is a chain reaction. 1% loss of O_3 results in 2% increase in UV rays reaching the earth surface .

Ozone depletion chemicals CFC, HCFC, BFC. Sometimes atmospheric sulfur dioxide Is converted into H_2SO_4 which increases the rate of O_3 layer depletion.



Effectsozonelayerdepletion:

Effectsonhumanbeings

1. UVrayscausesskincancer.
2. Increasestherateof nonmelaninskincancerinfaircoloredpeople.
3. ProlongedexposetoUVraysleadstoactiniaKatatities(slowblindness)andcataracts.

Effectsonaquaticsystem:

1. UVraysaffectsphytoplankton,fish,larvalcrabs.
2. phytoplanktonconsumeslargeamountsofCO_2.
3. Decrease inphytoplankton resultsinmore amount of CO_2 inatmosphere. This contributestoglobalwarming.3.OzoneDepletingchemicalscancausesglobalwarming.

Controlmeasures: ManufacturingandusingofO_3depletingchemicalsshouldbe stopped.Useof methylbromide.whichisa crop fumigantshouldbecontrolled. ReplacingCFCsbyothermaerialswhicharelessdamage

NUCLEARACCIDENTSANDHOLOCAUST

Energy released—during a nuclear reaction is called nuclear energy. Nuclear fission and Nuclearfusionare used topreparenuclearenergy.Duringnuclearaccidents largeamount of energyandradioactiveproductsarereleasedintotheatmosphere.

Typesofnuclearaccidents:-

NuclearTest-Nuclearexplosions–releaseradioactiveparticlesandradioactive rays into theatmosphere.

Nuclearpowerplantaccidents:Nuclearpowerplantslocatedinseismicvulnerable area may cause nuclear accidents which releases radiation.

Improperdisposalofradioactivewastes: Drumswithradioactivewastes,stored underground rust and leak radioactive wastes into water, land and air.

Accidentsduringtransport. Truckscarryingradioactivewastes(or)fuelsinaccidents. The major accident at a nuclear power plant is a core melts down.

Effectsofnuclearradiation

1. RadiationaffectsDNAincells.
2. Exposuretolowdoseofradiation(100to250rds)peoplesufferfromfatigue,vomiting ,andlossof hair.
3. Exposertohighradation(400-500rds)affectbonemarrow,bloodcells,natural resistance fail of bloodclot.
4. Exposuretoveryhighdoseofradiation(10000rds)killsorganismsbydamaging the tissues of heart andbrain.

NuclearHolocaust:-DestructionofBiodiversitybynuclearequipmentsand nuclear bombs is called nuclear holocaust.

Effectsofnuclearholocaust.

Nuclearwinter,Nuclearbombardmentwillcausecombustionofwood,plastics,forests etc.

Largequantityofsootwillbecarriedoutintotheatmosphere.

Black soot absorbs all UV radiation and will not allow the radiation to reach theearth. There fore cooling will result. This reduces evaporation of water .In stratospherethere wont be significantmoisture to rainout the black soot. Dueto nuclearexplosion a process opposite toglobalwarmingwill occur. ThisiscalledNuclearwinter.

NuclearholocaustinJapan

In1945twonuclearbombsweredroppedinHiroshimaandNagasakiinJapan.About 100000 people were

Killedandthecitieswerebadlydestroyed.Thisexplosionemittedforcefulneutronsand gamma radiation.

RadioactiveStrontiumliberatedintheexplosionreplacedcalciuminthebones.Large scale bone deformities occurred in the people of these cities.

WASTELAND RECLAMATION

Wasteland.Thelandwhichisnotinuseiscalledwasteland.Wastelandisunproductive, unfitforcultivationandgrazingetc.20%ofthegeographicalareaofIndiaiswasteland.

Typesofwasteland:
1. Uncultivablewasteland.
2. Cultivablewasteland.

Uncultivablewasteland:Barrenrockyareas,hillyslopes,
sandy deserts.
Cultivablewasteland:Thesearecultivablebutnotcultivatedformorethan5years.Ex Degraded forest land.

Causesofwastelandformation:

1. overexploitationofnaturalresources.
2. Industrialandsewagewastes.
3. Duetosoilerosion,deforestation,waterlogging,salinityetc.
4. Miningactivitiesdestroytheforestandcultivableland.

Objectsofwastelandreclamation:

1. Topreventsoilerosion,floodingandland
slides.
2. Toavoidover exploitationofnaturalresources.
3. Toimprovethephysicalstructureandqualityofthesoil.
4. Toconservethebiologicalresourcesandnaturalecosystem.

Methodswastelandreclamation:

Drainage: Excesswaterisremovedbyartificialdrainage.Thisisforwaterloggedsoil reclamation.

Leaching: Leachingisaprocessofremovalofsaltfromthesalt affectedsoilbyapplying excess amount of water. Leaching is done by dividing the field into small plots. In continuous leaching 0.5to 1.0cm

Waterisrequiredtoremove90%ofsoluble salts.

Irrigationpractices: Highfrequencyirrigationwithcontrolledamountofwaterhelpsto maintain better availability of water in the land. Application of green manure and bio fertilizers improves saline soil.

Application of gypsum: Soil sodality can be reduced with gypsum. Ca of gypsum replacessodiumfromtheexchangeablesites.Thisconvertsclaybackintocalciumclay.

SocialForestryprogramme:Theseprogramsinvolvestripplantationon road,canalsides and degraded forest land etc.

COSUMERISMANDWASTEPRODUCTS

The consumption of resources by the people iscalled consumerism. Itisrelated to both increaseInpopulation size as wellas increaseinourdemanddueto changeinlifestyle. Ifneedsincreases Theconsumerismof resourcesalsoincreases.

TRADITIONALFAVOURABLERIGHTSOFSELLERS

1. **T**herighttointroduceanyproduct.
2. Therighttochangeanyprice.
3. Therighttouseincentivestopromotetheirproducts

IMPORTANTINFORMATIONTOBEKNOWNTOBUYERS

1. Ingredientsoftheproducts.
2. Manufacturing date and expiry date .Whether the product has been manufactured against an established law of nature or involved inright variation.

Objectivesofconsumerism.

1. Itimprovestherightandpowersofbuyers.
2. Itinvolvesmakingmanufacturerliablefortheentirelifecycleofa product
3. Itforcethemanufacturertoreuseandrecycletheproductafter usage.
4. Active consumerism improves human health and happiness and also it saves resources. Sources of wastes are agriculture, mining, industrial and municipal wastes.

Exampleforwasteproducts.Itincludespaper,glass,plastic,garbage, food waste, Scrap, construction and factory wastes.

E-waste: Electronicequipmentslikecomputer,printers,mobilephones,calculatoretc After usage thrown aswaste.

Effectsofwaste:Wastefromindustriesandexplosivesaredangeroustohumanlife. Dumped wastes degrade soil and make it unfit for irrigation.

E-wastes contain more than 1000 chemicals which are toxic and cause environmental Pollution. In computers lead is present in monitors, cadmium in chips and cathode ray tube,pvcincables.Allthesecausecancerandotherrespiratoryproblemsifinhaledfor long long periods.

Plasticsarenon-degradableandtheircombustionproducesmanytoxicgases.

Factorsaffectingconsumerismandgenerationofwastes:

People over population –Over population cause degradation of sources, poverty and premature deaths. This situation occurs in less developed countries (LDC's).In LDC's the percaptia consumption f resources and waste generation are less.

Consumption Over population: It occurs when there are less people than the available Resources . due to luxurious life style per captia consumption of resources is very high. Consumption is more and waste generation is more. Environment is also degraded.

ENVVIRONMENTALLEGISLATIONANDLAWS

Water(preventionandcontrolofpollution)Act.1974.

Thisactprovidesformaintainingandrestoringthesourcesofwater.Italsoprovide for preventing and controlling water pollution.

Featuresofwateract.

1. Thisactaimstoprotectthewaterfromallkindofpollutionandtopreservethequality of water in allaquifers.
2. Theactfurtherprovidesfortheestablishmentofcentralboardandstateboards For prevention of waterpollution.
3. Thestatesareempoweredtorestrainanypersonfromdischarginga pollutant(or)sewageor)effluentintoanywaterbodywithouttheconsent of the board.
4. Theactisnotclearaboutthedefinitionofpollutant,dischargeof pollutantToxicpollutant.

Statepollutioncontrolboard

Theconsentofthisboardisneeded

1. To establishanyindustryor anytreatmentanddisposalsystemor anyextensionor additionwhichlikelydischargeOrtradeeffluentintoastreamorwellor riveroronland.
2. Touseanyneworalteredoutletforthedischargeofsewage.
3. Tobegintomakeanynewdischargeofsewage.

Actalsoempowersthestateboardtoorderclosureorstoppageof supply of Electricity, water or any other service to the polluting unit.

AIRPREVENTIONACT1981

This act was enacted in the conference held at Stock Holm. It envisages the establishmentsOfcentralandStatecontrolboardstomonitorair qualityand pollution control.

Importantfeatures:

1. Thecentralboardmaylaydownthestandardsforqualityofair.
2. The centralboardco-ordinatesandsettlethedisputesbetweenstateboards.
3. Thecentralboardprovidestechnicalassistanceandguidancetostateboards.
4. The state boards are empowered to laydown thestandardsfor emission of airpollutants from industriesor other resources.
5. Thestateboardsaretoexaminethemanufacturingprocessesandcontrol equipmentfor for the prescribedstandards.
6. Thedirectionofcentralboardismandatoryonstateboards.
7. Withouttheconsentof thecentralboardoperationof anindustrialunitis prohibited inheavily polluted area.
8. Violationoflawispunishablewithimprisonmentforthreemonthsor fineofRs 10000 or both.

Thisactappliestoallpollutionindustries.Thisactempowersthestate board to order closure of any industrial unit or stoppage of water supply or stoppage of electricity.

FOREST(COSERVATON)ACT 1980

Thisactisenactedin1980.Itaimstoarrestdeforestation.Thisactcovers all types of Forestsincludingreserved forests, protectedforestsandanyforest land.

IMPORTANTFeaturesoftheact:

1. Thereservedforestsshallnotbedivertedordereservedwitoutthe permission Of centralgovt.
2. Theforestlandmaynotbeusednonforestpurposes.
3. Thisactstopsillegalactivitieswithinforestarea.

Featuresofamendmentactof1988

.1.Forestdepartmentsaredepartmentsareforbiddentoassignanyforestlandbyway of leaseor toanyprivateperson or NG bodyforre-afforestation.

2. Forre-afforstationclearanceofanyforestlandisforbidden.
3. Thedivisionofforestlandfornon–forestusesispunishable.

WILDLIFEACT1972.

Thisact was amended in1983, 1986, and 1991.Thisact isaimed toprotectand preserve all animals and plants that are not Domesticated. Indiahas350 speciesof mammals, 1200speciesof birdsand about 20000Known species of insects.Someof themarelisted as endangered species in wild life protection act. Wild lifeisdecliningduetohuman action. Wild life products likeskins, firs, feathers, Ivory etc. havedecimatedthe population of many species. Wild life population monitored regularly and management strategies formulated to protect them.

ImportantFeatures

1Theactcoverstherightsandnon-rightsofforestdwellers.

2Itallowsrestrictedgrazinginsanctuariesbutprohibitsinnationalparks.

3. Italsoprohibitsthecollectionof nontimberforest.
4. Therightsofforestdwellersrecognizedbyforestpolicyof1988aretaken away by Amended wild life act of1991.

ENVIRONMENT(PROTECTION)ACT 1986

This act empowers the central govt. to fix the standards for quality of air, water, soil, and noise. The central govt. formulates procedures and safe guards for handling of hazard substances.

Important features: 1. this act empowers the govt. to lay down procedures and safe guards for the prevention of accidents which cause pollution and remedial measures if accidents occur.

2Thegovt.hastheauthoritytocloseorprohibitorregulateanyindustryorits operationif

Theviolationofprovisionsoftheactoccurs.

3. Violationoftheactispunishablewithimprisonmentfor5yearsor fineof onelakhor both.
4. Ifviolationcontinuesanadditionalfineof Rs5000perdaymaybeimposedforentire period of Violation ofrules.
5. Theactempowerstheofficerofthecentralgovt.toinspectthesightortheplantor machineryforpreventingpollutionandtocollectsamplesofair,water,soilandother materials from any

Factoryoritspremisesfor testing.

PUBLICAWARENESS

In order to conserve our environment each and every one must be aware about our environmentproblemsandobjectivesofvariousenvironmentalpoliciesatnaturaland local level.

Objectivesofpublicawareness:

1. Tocreateawarenessamongruralandcitypeopleaboutecological Imbalance,local environment and technological development.

2Toorganizemeetings,treeplantationprograms,groupdiscussionondevelopment, exhibitions.

3. Tofocusoncurrentenvironmentproblemsandsituations.

4. Totrainourplanners,decisionmakers,politiciansandadministrators.

5. Toeliminatepovertybyprovidingemploymentthatovercomesthebasic environmentalissues.

METHODSTOCREATEENVIRONMNTAL AWARENESS

1. Environmentaleducationmustbeimpartedtothestudentsinschoolsandcolleges.
2. Media likeTVRadioandcablenetworkcaneducatethepeopleonenvironmental issues through Cartoons, documentaries, street plays.
3. Cinemaaboutenvironmentaleducationshouldbepreparedandscreenedin theatrescompulsorily.Thisfilmsmaybereleasedwithtaxfreetoattractthe public.
4. Allthenewspapersandmagazinesmustpublishtheenvironmentrelatedproblems.
5. Specialaudiovisualandslideshowsshouldbearrangedinpublicplaces.
6. VoluntaryorganizationslikeNCC,NSS,andROTRACTClubshouldbeeffectively utilized for creating environmentalawareness.
7. Arranging competitions like story and essay writingpainting competition on environmental issues for student as well as public.Attreactiveprizesshouldbe awarded for the best effort.
8. Public leaders cine actors and popular social reformers can make anappealtothe publicabout theurgencyof environmentalprotection.

UNITVII HUMANPOPULATIONANDTHEENVIRONMENT

Population Growth, Variation Among Nations – Population Explosion – Family WelfareProgramme–environmentandHumanHealth–HumanRights–Value Education – HIV /AIDS – Women and Child Welfare – Role of Information Technology in Environment and Human Health – Case Studies.
FieldStudyofLocalAreatoDocumentEnvironmentalassets– River/Forest/Grassland/Hill/ Mountain.
FieldStudyofSimpleEcosystems–Pond,River,HillSlopes,etc
FieldStudyofLocalPollutedSite–Urban/Rural/Industrial/Agricultural

Chapter-7HumanpopulationandtheEnvironment

Population:-Groupofindividualsbelongingtothesamespecieswhichliveinagiven area at given time.
Populationdensity:-Numberofindividualsofthepopulationperunitarea®perunit- volume.
Parameterseffectingpopulation:-

Birthrate(OR)Nationality:-Numberoflivebirthsper1,000people inapopulationina given year.

DeathRate(OR)Mortality:-Numberofdeathsper1000peopleinapopulationina given year

Immigration:-Itdenotesthearrivalofindividualsfromneighboringpopulation.

Emigration:-Itdenotesthedisposalofindividualsfromtheoriginalpopulationtonew areas.

Rate =

Numberofbirths

Number of years

Mortality = ornofbabiesdied

er of babies born x Number of year

hrate=Changeofpopulation

Number of year

Population Growth :- Resultsfromthedifferencebetween the rate of birthanddeath. In 1980 the global population was about 1 billion people. In 1930 it reached 2 billion. In 1975 it reached 4 billion with in 45 years. Now the population in 6 billion. It reaches 10 billion by 2050 as per the world Bankcalculation.

Causes:-1. Duetodecreaseindeathrateandincreaseinbirthrate.

2. Availabilityofantibiotics,immunizationincreasedfoodproduction,cleanwaterandair, decreasesthefaminerelateddeathsandinfant mortality.
3. Thepovertyandilliteracyleadcontrolledgrowthofpopulation.
4. ChildMarriages
5. People'ssuperstitions.PeoplebelievethatitisbecauseofGod'sgrace.

CharacteristicsofP.G.:-

Exponentialgrowth:-Populationgrowthoccursexponentiallylive10,10^2, 10^3, 10^4etc., Which shows the dramatic increase in globalpopulation in the past 160 years.

DoublingTime:-Timerequiredforthepopulationtodoubleitssizeataconstantannual rate. It is calculated as follows:-

Td=70/rWhenr=annualgrowthrate

Ifarationhas2%annualgrowthitspopulationwilldoublein35 years.

InfantMentality:-

Percentageofinfantdiedoutofthoseborninoneyear.Thisrateisdecreasedin the last 50 years. This differs widely in developing and developed countries.

Totalfertilityrates(TFR):

Averagenumberofchildrendeliveredbyawomaninherlifetime.TheTFRvaries from 2 in developed to 4.7 in developing countries.

Thisratioshouldbefairlybalanceinthesociety.

Male–femaleratiohasbeenupsetinmanycountries including China-India.Inchinathe ratio of girls and boys is 100 – 140.

Demographictransition:

P.G. isredacted to economic development. The birth rate and death rate fulldue to improved living conditions. This results in low population growth.Thispheromonesin called demographic transition.

VariationofpopulationamongNation:

Atpresenttheworldspopulationhascrossed6billions.Lessdevelopedcountries (Africa,Asia,S.A) have 80% populationwhiledeveloped countrieshave only20%.

In most developed countries like USA, Canada, Australiapopulation increasesby lessthan 1%. But islessdeveloped countries the population increases by more than 1% / year.

Kenyaisthefastestpopulationgrowingcountriesintheworld.When 20millionare residing.

China& India's populate on was above 1000 million in 2000 years. Itsshare is1/3 of the worldpopulation.

EuropeandN.H.accoentsfor14%ofworldpopulation.

VariationofpollutionbasedonAgestructure

Agestructureofpopulationcanbeclassifiedinto3classes.

Pre-productivepopulation(0–14years)

Reproductivepopulation(15-44years)

Postreproductivepopulation(Above45years)

Variationofpopulationisnowexplainedbasedontheabovethreeclasses.

PyramidshapedVariationofpopulation(increase)

Eg.InIndia,Bangladesh,Ethiopia,AlgerianReproductivepopulationismoreincompanion toprereproductivepopulationandpostproductivepopulation.Hencethepopulation increases.

Bellshapedvariationofpopulation:

Eg:InFrance,USA,UK,Canadaetc.,prereproductivepopulationandreproductive population is more (OR) less equal. Hence population growth in stable.

Urnshapedvariationofpopulations

Eg:InGermany,Italy,Sweden,

InJapanpreproductiveagegrouppopulationinsmallerthanthereproductiveagegroup population. In the next 10 years. The number of people in reproductive age group less than before resulting in decrease of population.

PopulationExplosion:

Theenormousincreaseinpopulationduetolowdeathrateandhighbirthrateis called as population expansion.

Doublingtime: Thenumberof yearsneededforapopulationtodoubleinsize.Thedoubling time varies from country to country.

ofthecountry	ngtime
Turkey	rs
an	

Populationgrowthishigherinlessdevelopedcountries.

Causeofpopulationexplosion:

1. Inventionmodernmedicalfacilities,reducesthedeathrateandincreasesbirthrate,which leads to population explosion.
2. Increaseoflifeexpectancyisanotherimportantreasonforpopulationexplosion.Eg:-In 1956,theaverage life expectancyofthehumanbeingswas40years.Butnowitis61 years. 3.Illiteracy is one of the reasons for the population wxplosion.

Effectofpopulationexplosion(OR)environmentalandsocialimpactsofgrowingpopulation

Poverty:

1. Populationexplosionleadstoenvironmentaldegradation.
2. Populationexplosioncausesoverexploitationofnaturalresources.Hencetherewillbea shortage of resources for the futunegeneration.
3. Increaseinpopulationwillincreasesdiseases,economicinequityandcommandwars.
4. Forests,grasslandsareunderthreat.
5. Themainreasonforthegrowingunemploymentingrowingpopulation.
6. Educatingvast populationisa very bigtask.
7. Populationexplosionisthemaincauseforpollutionofair,land,waterandnoise.
8. Disposalofplasticsandwastagesisanotherproblemofoverpopulation.
9. Scancityoffuelisalsoduetopopulationexplosion.

Familywelfareprogrammes

Family welfare programme was implemented by Govt. of India as a voluntary programme.Itisapolicyofgrowthcoveringhumanhealth,familywelfarechildrenand women's right.

Objectives:

1. Slowdownthepopulationexplosionbyreducingfertility.
2. Pressureontheenvironment,duetooverexploitationofnaturalresourcesisreduces.

PopulationstabilizationRatio

Theratioisderivedbydividingcrudebirthratebycrudedeathrate.
Developedcountries:Thestabilizationratioofdevelopedcountriesis1.indicatingzero population growth.

Developingcountries:

Theratioof developingcountriesisrearing 3 whichinexpected tolower down by2025. Stabilizationindevelopingcountriesispossibleonlythroughfamilywelfareprogrammes.

FamilyplanningProgramme

If provides educational and clinical services that help couple to choosehowmany children to have and when to have them. Family planning programme provides information on birthspacing birth control and health care for pregnant woman and infants. Italso reduced the number of legal and illegal abortions per yearand decreased the risk of death from pregnancies.

Objectives:

1. Reduceinfantmortalityratetobelow30/1000infants.
2. Achieve100%registrationof births,deathsmarriageandpregnancies.
3. Encourages latemarriagesand latechildbearing.
4. Encourages breastfeeding.
5. Enablestoimprovewoman'shealtheducation,employment.
6. Constrain the spnead & Aids/ HIV.
7. Preventandcontrolofcommunicaldiseases.

Fertilitycontrolmethods

Traditional methods

Itincludestaboosandfolksmedicine.

Modernmethods

Itincludesbirthcontroltechniqueslikemechanicalbarriers,surgicalmethods,chemical pillsandphysicalbarrierstoimplantation.Morethan100contraceptivemethodsareontrial.

FamilyplanningprogrammeinIndia

1. In1952Indiastartedfamilyplanningprogramme.
2. In1970Indiangovt.forcedFPcampainalltheovercountry.
3. In1978govt.legallyraizedtheminimumageof marriageformenfrom18to21andfor women 15 to 18 years.
4. In1981censusreportshowedthereisnodropinpopulation.HencefundingforFP programme has been increased.

Environment&humanHealth

Healthyperson:-Physicallyfitpersonwithoutsufferinganydiseaseiscalledahealthy person.

Disease:-Harmfulchangesinthebody'sconditionbynutritional,biological,chemical(or) psychological factors are called diseases.

ImportantHazardsandtheirhealtheffectsrefer–bort

Chemical Hazards and their health effects refer T.B.

Biological Hazards and their health effects Refers T.B.

Preventive measures:

1. Alwayswashyourhandbeforeeating.

2. Cutshortandcleanyournailssystematic.
3. Drinkingchemicallytreatedandfilteredwater.
4. Eatfoodalwaysinhot condition.
5. Washthevegetablesandfruitsawithcleanwaterbeforecooking.
6. AvoidplasticcontainersandAlvessels.

7. Dophysicalexercisetohaveproperbloodcirculation.

HumanRights

Humanrightsarethefundamentalrightspossessedbyhumanbeingsirrespectivecaste, nationality, sex & language.

TheaimofGovt.istoensurehappinesstotheentirecitizenwithequalrights.

UndertheIndianconstitutionthefollowingfundamentalrightshavebeenguaranteedtohuman beings.

1. Humanrighttofreedom
2. Humanrighttoproperty
3. Humanrighttofreedomofreligion.
4. Humanrighttocultureandeducation.
5. Humanrighttoconstitutionalremedies
6. HumanrighttoEquality
7. Humanrighttoagainstexploitation.
8. Humanrighttofoodandenvironmental
9. Humanrighttohealth

1. Humanrightstofreedom

Every citizen has the freedom to express his view freely.

Citizencanassembleatanyplacetoexpresstheirviews.

Freedom to form unions (or) associations.

Freedomtoslantany profession.

IndianConstitution

Indianconstitutionprovidesforcivil,social,cultural,educationalandpoliticalrights.

Article14–equalitybeforelaw.

Article-15

Prohibitsdiscriminationonthegroundofrace,religioncaste,sex(or)placeofbirth.

Article16

Providesequalopportunityforallcitizensinregardingtoemployment.

Article19

Providesforfreedomofspeechandexpression,formingassociationandunion.

Article–20

Protectionfromconnectionexceptinaccordancewiththelawoftheland.

Article–22–laysdowntherightsofapersonincustody.

Article–24–prohibitsexploitationoflabourchildren.

Article–25–granteesfreedomtoprofess,practiceandpropagateareligionofone'schoice.

Valueeducation

Education isnothing but learning through which knowledge about a particular thingcan be acquired with the help of our knowledge and expedience we can identify our value to understandourselves andour relationshipwith other andtheirenvironment.

TypesofEducation:

Format Education:- (In this all leaning process areselfrelated). All peoplewill read write, willget good jobsandtake with anyproblemwith thehelpof formaleducation.

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

Eg:- If a person is highly,Qualified and wellsettled in life, something he does notknowhowto behave with his environment.

Valuebasedenvironmentaleducation

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

Objectives:

1. Improveintegralgrowthof humanbeing.
2. Tocreatealtitudesandimprovementtowardssustainablelifestyle.
3. To increaseawarenessaboutournationalhistory,culturalheritage,constitutionalrights, national integration.
4. Tounderstand(abouttheour)naturalenvironmentinwhichhowland,airandwaterare interlinked.
5. Toknowaboutvariouslivingandnonlivingorganismandtheirinteractionwiththe environment.

Typesofvalues:

1. Universalvalues(or)socialvalues:

These values tells about the importance of the human conditions. These are reflected in life, joy, love, tolerance, truthetc.

2. Culturalvalues:

These values various with respect to time and place. These are concerned with rights & wrong, good & bad true & false and behavior of human beings. It is reflected in language, education, law, economics, philosophy etc.

3. Individualvalues:

These are personal principles and the result of individual personality and experience parents& teachers arethemainkey to shapeandindividualvalues. I t isreflected in individual goods, relationship, commitments.

4. Globalvalues:

Human civilization is a part of the planet. Natureand natural pheromone on theearth are interconnected and inter-linked with special bonds of harmony. Ifthisharmonydisturbed anywhereleadstocatastrophicresultsduetoecologicalimbalance.

Aids/HIV–Discover in1983. Sourceof thevirusisnotbeer identifiedspread through Africanmonkey.Throughvaccineprogram–spreadbysmallpoxvaccineprogrammeofAfrica.
Hepatitis– B Viral vaccine legmyand new York.

Worldscenario

90% from developing countries. 13% of world's population live is Africa. Almost all states & AfricancountrieswereaffectersHIV.Indiaranks2nd intheworldwith5millionaffectspeople. **Scenario in India:**

Large number of infected people are in Maharastra & Tamil Nadu followed by Delhi, UP, Karnataka & Goa. Till sept. 2003 24,667 cases are found in Tamil Nadu.

Smog:- Mixture of smoke fromcoal combustion and fog insuspended droplets form photochemicalsmogcauseirritationtoeyesandlungs(ii)manydamageplants(iii)Irritation to nose & throat (iv) asthma

RoleofITinEnvironment

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

Remotesensing

It refers to any method which can be used to gather information about an object without comingincontact with it.Gravity, magnetic, electro magneticforces couldbeused for remote

sensing. Remote sensing covers various disciplines fromlaboratorytestingtoastronomies. Now remote sensing is used to denote identification of earth feathers by detecting the characteristicelectromagneticradiation.Thatisreflectedbytheearth.

Componentsofaremotesensingsystem

Thesystemconsistsofa**sensor**tocollectradiation.Otherimportantpartsarea**platform**, an **aircraft**,a**balloon,rocketandsatellite.**

The information received by the sensor is suitably manipulated and transported back to earth. The data's are reformed and processed on the ground to produce photographs, computer compatible magnetic taps and digital storage medium.

Applications

1 Agriculture: In India agriculture provides livelihood of 70% of population and contributes to about35%ofnetnationproduct.We require optimalmanagementofland andwaterresources along with high yielding variety seeds, fertilizer input.

Remotesensingcanprovidevaluableinformationforlandandwatermanagement.

2. Forests: Remote sensing provides information clearly on the type, density and extentof forest cover, wood volume and biomass, forest fire,encroachmentetc.

3. Land cover: Spatial information on land is required at different scalesdependsupon useremote sensingdata isconverted tomap. Thespatialresolution playsa role on thescaleof mapping.

4. Water resources: Remote sensing data has been used in many application related to surface water body mapping, ground water targeting, wet land, flood monitoring, reservoir sedimentation, water quality monitoringetc. One of the most simple applicationsis inventorying surface water body.

DATABASE

Itisthecollectionofinterrelateddataonvariousobjects.Inthecomputertheinformation of database is arranged in a systematic manner.

Applications:ITheministryofenvironmentandforest.Theyarecompilingdatabaseonvarious biotic components. Database is also available for diseases likes HIV | AIDS. Malaria, Fluorosis.

NationalManagementInformationSystem(NMIS):TheycompiledatabaseonR & D Projects alongwith information about researchscientistsand personnel involved.EnvironmentalInformationSystem:Itfunctionsin25centresallover the country.

Theygeneratenetworkofdatabaseinareaslikepollutioncontrol,remotesensing, biodiversity, and desertification.

GEOGRAPHICALINFORMATIONSYSTEM(GIS)

Itis**a**techniqueofsuperimposingvariousthematicmapsusingdigitaldataon large Number of inter related aspects.

Applications:Differentthematicmapshavingdigitalinformationonwaterresources,

Soiltype,forestland,cropland,grasslandsaresuperimposedonalayeredformin computer using soft ware.

Interpretationofpollutedzones,degradedlandscanbemadeonGIS base.
3. GIScanbeusedtocheckunplannedgrowthandrelatedenvironmentalproblems.

SATELLITEDATA:

Ithelpsinprovidingcorrectandreliableinformationforestcover

Providesinformationofmonsoon,ozonelayerdepletionSmogetc.
Helps in discovering reserves of oil, minerals.

WWW:

Morecurrentdataisavailableonwwwonlinelearningcentre. Www
.mhhe.com \ environmental science.
MultimediaDigitalcontentmanager(DCM)intheformofCDROMS.

ApplicationofcomputersinthefieldofEnvironment&humanhealth:

1.Unknown parameters can be stimulated by computer techniques
2.EIA(EnvironmentalImpactAssessment)problemscanbeanalyzed 3.Inventories
of emission sources are compiled and maintained
4. Net-workanalysis,statisticalanalysisandthestatusofenvironmentalpollutionscanbehigh lighted
5. Comprehensive administrative system canbedevelopedbyusingcomputernetwork techniques.
6. Remotesensing-GraphicalInterfaceSystemareusefulforcoralreefmappingandocean resources.Theyarealsousefultoaccesstheloss of biodiversity/hotspotsetc.